Appendix I. Source Control Area-Related Facility Information

List of Tables

List of Figures

List of Maps

I.1 Introduction

The Washington State Department of Ecology (Ecology), in consultation with the US Environmental Protection Agency (EPA), has identified 23 areas for source evaluation in the Lower Duwamish Waterway (LDW), in accordance with their source control strategy (Ecology 2004b, 2007f). This appendix outlines the overall approach used to summarize source control area (SCA)-related information and presents selected information for 11 SCAs based in large part on source information in Ecology documents. Additional information related to work by EPA, Ecology, and the Source Control Work Group (SCWG) is summarized in Section 9.2 of the main body of the RI.

I.2 Methods Used to Develop the SCA Information Summaries

Ecology's source control evaluation program is a continuous and dynamic process that will continue well beyond the completion of the remedial investigation/ feasibility study (RI/FS). In order to focus source-related information for presentation in the RI, Ecology and EPA identified 11 of the 23 SCAs that, at a minimum, had a draft data gaps report available for review as of March 2008 (see Section 9 of the main document for additional information about the contents of data gaps reports). This date was used to determine which SCAs would be included in this appendix,[1] and was selected based on discussions held with EPA and Ecology during the development of the scope and methods to be used for the SCA summaries. The 12 other SCAs that did not have a data gaps report available for review as of March 2008 are not summarized in this appendix. Information for SCAs not summarized in this appendix can be found in the data gaps reports and source control action plans (SCAPs) available on Ecology's website. The 11 SCAs summarized in this appendix are listed in Table I-1. Updated information for these 11 SCAs can also be found in the SCAPs on Ecology's website.

[1] Although March 2008 was used as the date for determining which SCAs would be included in this appendix (based on whether a draft data gaps report was available for an SCA, at a minimum), the date of July 11, 2008, was used as the cutoff date for which documents prepared for the 11 selected SCAs (source control action plans, data gaps, or other reports issued by Ecology) were eligible for review and summary in this appendix. This date was also determined based on discussions with EPA and Ecology.

Table I-1. SCAs identified for discussion in the RI

Source Control Area	Section	Approximate River Mile[a]
Duwamish/Diagonal Way (EAA 1)	I.4.1	0.2 to 0.9 E
Slip 3 to Seattle Boiler Works	I.4.2	2.0 to 2.2 E
Seattle Boiler Works to Slip 4	I.4.3	2.2 to 2.9 E
Slip 4 (EAA 3)	I.4.4	2.8 to 2.9 E
Boeing Plant 2/Jorgensen Forge (EAA 4)	I.4.5	2.9 to 3.7 E
Boeing Isaacson/Central KCIA (EAA 6)	I.4.6	3.7 to 3.9 E
Slip 6	I.4.7	3.9 to 4.3E
Norfolk CSO/SD[b] (EAA 7)	I.4.8	4.9 to 5.0 E
Glacier Bay	I.4.9	1.2 to 1.5 W
Trotsky Inlet (EAA 2)	I.4.10	2.2 to 2.3 W
Terminal 117 (EAA 5)	I.4.11	3.4 to 3.8 W

[a] River miles were estimated and rounded to the nearest tenth of a mile based on the boundaries established by Ecology on July 8, 2008 (Good 2008).

[b] A City pump station EOF also discharges through this outfall.

CSO – combined sewer overflow
KCIA – King County International Airport
RI – remedial investigation
SCA – source control area
SD – storm drain

Source control information available in data gaps reports, SCAPs, and other Ecology-issued reports (e.g., property review reports and source control status reports [SCSRs]) were used to develop the SCA-specific summaries included in this appendix. In addition to the information in these documents, any other relevant source-tracing data collected through December 31, 2007, by the Lower Duwamish Waterway Group (LDWG) members and reported by the cut-off date of July 11, 2008,[2] were also included, as applicable. Collectively, these documents and data sources are referred to in the SCA summaries as the source documents. The information in these documents provides a snapshot of available source control information for the 11 identified SCAs at the time that the RI was drafted.

The summaries in this section provide an overview of surface sediment data and potential source-related information for the facilities and outfalls discussed in the source documents for each of the 11 SCAs. In addition, the Duwamish/Diagonal Way and Norfolk combined sewer overflow/storm drain (CSO/SD) SCA summaries discuss sediment monitoring data collected since removal actions were conducted in each of these areas.

[2] These dates were also selected based on discussions with EPA and Ecology during development of the scope and methods for the SCA summaries.

The information summarized in this appendix was derived from more-detailed information presented in Ecology's SCAPs, data gaps reports, SCSRs, and other source documents for the associated upland facilities. The source documents should be reviewed for more detailed information pertaining to the SCAs. It is not the intent of this appendix to provide any conclusions about the origin of or responsibility for contamination found in sediments in the LDW study area or to determine whether the data reported are sufficient to make such a judgment. Source control efforts within the LDW drainage basin are ongoing. Information presented in tables and maps in this section reflects information available through July 17, 2009. Ecology will continue to issue status reports, update source control information, and post these reports on their website.

The information included in the source documents has not been independently verified for the summaries presented in this appendix. Therefore, information included in this appendix should not be considered complete, nor should it be relied upon to draw conclusions about the extent of contamination or the status of source control at these facilities. Additional evaluation of the raw data and primary source materials would be required for a quantitative evaluation. Furthermore, the level of quality assurance/quality control (QA/QC) and data validation for chemistry data presented in this section was not reviewed; it is likely that the data presented here represent varying levels of QA/QC.

I.3 Information Included in SCA Summaries

Information compiled for the 11 SCAs was included based on the SCA boundaries and the format agreed upon by EPA and Ecology. Boundaries for the individual SCAs were initially established by Ecology in February 2007 (Ecology 2007f). As Ecology's approach to producing data gaps reports and SCAPs evolved, these boundaries were updated (and generally expanded) in February 2008 (Ecology and SAIC 2008). The February 2007 SCA boundaries were used in this appendix to identify surface sediment data because these SCA boundaries were established at the time the draft RI was written. The February 2008 SCA boundaries were used to identify the upland features (e.g., facilities, outfalls) summarized for each SCA based on agreements reached with EPA and Ecology. The availability of source control information and the complexity of the individual SCAs varied; therefore, the following summaries present more information for some of the SCAs than for others. The volume of information presented for each SCA should not be interpreted as an indication of the relative importance of individual SCAs; instead, it reflects the current availability of source information meeting the criteria for this summation effort.

The following types of information were reviewed for each of the 11 SCAs, as available:

- **Surface sediment chemistry in the RI baseline dataset.** Section 4.1.2.1 in the main body of the RI defines the baseline dataset. Based on the February 2007 SCA boundaries and the RI baseline surface sediment dataset, the list of chemicals with concentrations exceeding the sediment quality standards (SQS) of the Washington State Sediment Management Standards (SMS) were identified. The list of chemicals was then used to focus the review and summary of upland media, porewater, and source-tracing data.
- History, ownership, environmental investigation, and remedial action information for several of the upland facilities associated with each SCA. Information was summarized for upland facilities that are adjacent to the LDW shoreline within each SCA (based on Ecology's February 2008 boundaries) and for other upland facilities if relevant[3] source-tracing data were available for the facility. The source documents may contain summarized information for additional upland facilities that are not included in this appendix. The SCAP and data gaps reports should be reviewed for additional information on all facilities associated with the SCAs.
- **History, ownership, and environmental and source-tracing investigation information for outfalls that discharge to each SCA.** Information was summarized for outfalls located within each SCA based on Ecology's February 2008 boundaries. In some cases, discrepancies existed between the outfall layer (discussed in Appendix H) and the source documents regarding the configuration or location of an outfall; these discrepancies are acknowledged where they exist.
- **Bank soil data collected from facilities adjacent to the LDW shoreline within each SCA.** Data from bank soil samples that were collected through December 2007 were summarized for each SCA (based on Ecology's February 2008 boundaries). The source documents also contain other soil data for samples collected away from the bank. These data were not summarized for this appendix in order to focus the scope of the data presented to samples collected along the LDW. Ecology will use both bank and upland soil data in their source control evaluations.

[3] Relevant source-tracing data were defined as the most recent data collected from a drainage structure (e.g., catch basin or drainage line), provided that the drainage structure was still in use at a facility.

- **Groundwater data for upland facilities adjacent to the LDW shoreline.** Groundwater data collected through December 2007 from shoreline facilities were summarized for each SCA (based on Ecology's February 2008 boundary). If both upland and shoreline wells were identified in the source documents for these facilities, only data from the wells nearest the shoreline were included in order to focus the data presentation on conditions likely to be most representative of groundwater in close association with the LDW. If no distinction was made between upland and shoreline wells, all groundwater data were included. The source documents may have also included additional groundwater data from facilities that are not adjacent to the LDW shoreline (i.e., from upland facilities). Ecology will consider all available groundwater data in their source control evaluations.
- **Seep and porewater data collected within each SCA.** Data from seep and porewater samples that were collected through December 2007 were summarized for each SCA (based on Ecology's February 2008 boundaries).
- **Stormwater data collected from outfalls or drainage systems discharging directly to each SCA.** Stormwater samples that were collected from drainage systems located within Ecology's February 2008 boundary and were collected through December 2007 were summarized for each SCA.
- **Source-tracing data collected within drainage basins discharging to each SCA.** Source-tracing data collected from drainage systems through December 2007 were summarized for each SCA (based on Ecology's February 2008 boundaries).
- **Other pertinent information depending on the unique aspects of each SCA.**

The following sections provide additional detail on how the different types of information included in these SCA summaries were selected and summarized.

I.3.1 FACILITY INFORMATION

The majority of Ecology's SCAPs and data gaps reports made a distinction between adjacent facilities (those immediately bordering the LDW) and upland facilities (farther inland or within the drainage basin discharging to the SCA). If the Ecology documentation did not differentiate between adjacent and upland facilities, the adjacent facilities were identified based on a review of the SCA-specific maps. The first table in each of the SCA summaries provides facility-specific information for the adjacent facilities and for those upland facilities with source-tracing information. The inclusion of a facility does not necessarily imply that it is a potential source of sediment contaminants to the SCA, nor does the exclusion of a facility imply that it is not a potential source of sediment contaminants.

Although all facilities identified in the data gaps reports and SCAPs are listed in Appendix I, some are not discussed in detail or shown on maps because they did not meet the facility selection criteria (i.e., adjacent to the LDW or located upland with source-tracing data) (Table I-2). No analysis has been conducted as part of the RI to assess the potential significance of excluded facilities as sources; excluded facilities could represent potential sources to the LDW. Instead, the list of facilities with summarized information was limited to focus the SCA summaries on shoreline facilities or upland facilities with source-tracing data. Information for all facilities associated with the SCAs is provided in the data gaps reports and SCAPs.

Table I-2. List of facilities associated with each SCA as identified in the data gaps reports and SCAPs

Facilities Identified in SCAP and Data Gaps Reports for Each SCA	Facility Information Provided in the SCA Summaries in This Appendix?[a]	Facility Included on SCA-Specific Maps in This Appendix?[b]
Duwamish/Diagonal Way		
Terminal 106 SW (currently T-106)	yes	yes
Terminal 106 SE (no longer Port of Seattle property)	no	yes
Terminal 106 NE (no longer Port of Seattle property)	no	yes
Federal Center South	yes	yes
Union Pacific Railroad Argo Yard	yes	yes
Terminal 108	yes	yes
JANCO United Inc. (historical)	no	no
Slip 3 to Seattle Boiler Works		
Bunge Foods	yes	yes
Glacier Marine Services	yes	yes
SCS Refrigerated Services	yes	yes
Rainier Petroleum Corporation	yes	yes
Shultz Distributing	no	yes
Seattle Distribution Center	yes	yes
Cascade Columbia Distribution	no	yes
South Seattle Community College	no	yes
Riverside Industrial Park	no	yes
V. Van Dyke property	no	yes
Muckleshoot Seafood Products	yes	yes
Seattle Boiler Works to Slip 4		
Seattle Iron and Metals Corp.	yes	yes
Puget Sound Truck Lines	yes	yes
Crowley Marine Services	yes	yes
SCL Pumping Station	yes	yes

Table I-2, cont. List of facilities associated with each SCA as identified in the data gaps reports and SCAPs

Facilities Identified in SCAP and Data Gaps Reports for Each SCA	Facility Information Provided in the SCA Summaries in This Appendix?[a]	Facility Included on SCA-Specific Maps in This Appendix?[b]
Seattle Boiler Works	yes	yes
Bunge Foods/Guimont parcel	yes	yes
Sternoff parcel (former)	yes	yes
Fox Avenue Building (GWI)	no	yes
Fox Avenue Building No. 2 (GWI)	no	yes
El Gallo D'Oro/James Dore	no	yes
Markey Machinery Co.	no	yes
Nelson Trucking	no	yes
Nitze-Stagen/Frye parcels	no	yes
Trim Systems	no	yes
Whitehead Company, Inc./former Tyee Industries/former Perkins Lot	no	yes
Slip 4		
Crowley Marine Services	yes	yes
First South Properties/Emerald Services	yes	yes
Boeing Plant 2	yes	yes
North Boeing Field	yes	yes
KCIA[c]	yes	yes
Georgetown Steam Plant	yes	yes
Boeing Plant 2/Jorgensen Forge		
Boeing Plant 2	yes	yes
Jorgensen Forge	yes	yes
KCIA[c]	yes	yes
E Marginal Way S	no	yes
Boeing Isaacson/Central KCIA		
Boeing Isaacson	yes	yes
Boeing Thompson	yes	yes
KCIA[c]	yes	yes
Slip 6		
Rhône-Poulenc (former)	yes	yes
Boeing Developmental Center (northern drainage area)	yes	yes
PACCAR/Kenworth Trucking (former)	yes	yes
Museum of Flight	no	yes
KCIA[c]	yes	yes
Norfolk CSO/SD[d]		
Boeing Developmental Center (southern drainage area)	yes	yes

Table I-2, cont. List of facilities associated with each SCA as identified in the data gaps reports and SCAPs

Facilities Identified in SCAP and Data Gaps Reports for Each SCA	Facility Information Provided in the SCA Summaries in This Appendix?[a]	Facility Included on SCA-Specific Maps in This Appendix?[b]
Boeing Military Flight Center	yes	yes
KCIA[c]	yes	yes
Arco gas station	yes	yes
Associated Grocers	no	yes
Northwest Auto Wrecking	no	yes
Affordable Auto Wrecking	no	yes
Glacier Bay		
Alaska Marine Lines	yes	yes
Duwamish Shipyard (former)	yes	yes
Glacier Northwest	yes	yes
Former MRI Corporation (historical)	yes	yes
Chemithon Corp.	yes	yes
Alaska Marine Lines (ancillary properties)	no	yes
Wise Property (vacant)	no	no
DV Klier parcel	no	no
Allen property	no	no
Sayler property	no	no
City of Seattle Parks Department parcels	no	yes
Trotsky Inlet		
Alaska Marine Lines/Douglas Management Company	yes	yes
Industrial Container Services/Trotsky property/former NW Cooperage	yes	yes
Boyer Towing	yes	yes
Wells Trucking and Leasing	yes	yes
Da Vinci Gourmet	no	no
Boyer Logistics/Boyer Alaska Barge Lines	no	no
Vacant parcel	no	no
NW Center for the Retarded	no	no
Pioneer Human Services	no	yes
Pacific Plumbing Supply	no	no
Pacific American Commercial	no	yes
PCT Construction	no	no
WHECO	no	no
Cunningham Manufacturing	no	no
United Iron Works	no	yes
Ferguson Construction	no	no
Alki Construction Co.	no	no

Table I-2, cont. List of facilities associated with each SCA as identified in the data gaps reports and SCAPs

Facilities Identified in SCAP and Data Gaps Reports for Each SCA	Facility Information Provided in the SCA Summaries in This Appendix?[a]	Facility Included on SCA-Specific Maps in This Appendix?[b]
Hurlen Construction	no	no
Alaska Washington Co.	no	no
Fox Plumbing and Heating	no	no
Pacific NW Fasteners/Twilley Industrial Tool	no	no
W.G. Wright and Associates	no	no
Tucker-Weitzel and Associates	no	no
ATC Distribution Group/Automatic Transmission Parts	no	no
Cascade Mattress Factory	no	no
J & M Stamp and Form/M & M Roofing	no	no
Industrial Battery Systems	no	no
NW Building Tech, Inc.	no	no
Terminal 117		
Terminal 117	yes	yes
Basin Oil Co.	yes	yes
South Park Marina	yes	yes
Boeing South Park	yes	yes
City of Seattle Street Rights-of-Way (Dallas Ave S vicinity)	yes	yes

[a] Facilities that are either adjacent to the LDW or that have source-tracing data available are discussed in the SCA summaries; for information on SCA-associated facilities not discussed in this appendix, see the appropriate data gaps reports and SCAPs.

[b] Properties that are not included on Appendix I maps were, in most cases, either located outside of the map coverage area or had insufficient information to allow a determination of their exact location.

[c] KCIA drains to several different SCAs. All portions of KCIA are associated with SCAs, depending on the ultimate discharge location of site drainage.

[d] A City pump station EOF also discharges through this outfall.

CSO – combined sewer overflow
EOF – emergency overflow
GWI – Great Western International
KCIA – King County International Airport
LDW – Lower Duwamish Waterway
SCA – source control area
SCAP – source control action plan
SD – storm drain

For the facilities with information summaries in this appendix, summary tables have been developed to provide an overview of current property ownership, current and historical operations, environmental investigations, remedial activities, and ongoing or planned source control activities or investigations for each facility, as available. An additional table summarizing facility identification information (i.e., street addresses and parcel numbers) and regulatory information (e.g., permit types and identification numbers) is also included in Attachment I-1 for the same facilities.

I.3.2 OUTFALL AND DRAINAGE BASIN INFORMATION

Outfalls within each SCA (based on the February 2008 SCA boundaries) are shown on the SCA-specific maps at the locations identified in the 2003 LDW outfall survey (Herrera 2004). Information on these outfalls is presented in the individual SCA summaries. Some outfalls (in general, publicly owned outfalls with relatively large drainage basins) were discussed as individual source control entities in the data gaps reports and SCAPs, or were otherwise identified as individual source control entities by Ecology; these outfalls are referred to as major outfalls in the SCA summaries. Other outfalls (in general, private storm drains with relatively small drainage basins) are also included in the summaries based on the information derived from the LDW outfall survey (see Appendix H) and information provided in the source documents. These outfalls are referred to as other outfalls. When available, the drainage basins and stormwater systems are shown on the SCA-specific maps. Drainage basin information was provided by Seattle Public Utilities (SPU) (Schmoyer 2008a) and in SCAP and data gaps reports.

Appendix H provides additional information on outfalls in the entire LDW study area based on the LDW outfall survey (Herrera 2004), which is the source of the outfall location information for the maps in the RI. Several discrepancies exist between the number, system configuration, or location of outfalls identified in the LDW outfall survey and the outfalls discussed in the SCA-specific source documents. The discrepancies are generally the result of changes in outfall configuration or the discovery of additional outfall information since the LDW outfall survey was conducted in 2003. The symbology on the SCA-specific maps is consistent with the results of the 2003 survey and with the presentation on the other maps throughout the RI. The discrepancies are discussed in the text and noted on tables and maps, when appropriate. Maps provided in the data gaps reports and SCAPs, which are sometimes included in the summaries, may have different outfall names or locations because they may have been produced based on different outfall source information derived using different methods or survey periods.

I.3.3 SUMMARY OF SOURCE CONTROL CHEMICAL INFORMATION BY MEDIA TYPE

For each of the 11 SCAs, surface sediment data in the RI baseline dataset (see Section 4.1.2.1) were reviewed to identify chemicals with at least one SQS exceedance[4] within the SCA boundaries delineated by Ecology in February 2007 (Ecology 2007f) (Map I-1). In addition, dioxin and furan data were summarized if the dioxin and furan toxic equivalent (TEQ) was highly elevated (i.e., greater than 100 ng/kg dw) in at least one sediment sample within the SCA; SMS criteria do not exist for dioxins and furans.

[4] Note that some chemicals in surface sediment may be of concern at concentrations below the SQS. Additional source analyses may be conducted prior to remediation for specific sites as part of cleanup-related activities.

The February 2007 boundaries were used because they were the boundaries that were available when the draft RI was produced. Once the lists of chemicals for each of the SCAs had been generated, the source documents were reviewed to assess whether these same chemicals were detected in upland media (i.e., bank soil, groundwater, seep, and stormwater samples), porewater, or source-tracing samples.

The lists of chemicals derived using the methods described above often differed from the chemical of concern (COC) lists provided for the SCAs in the data gaps reports and SCAPs (Table I-3). These discrepancies are the result of differences in the methods used by EPA and Ecology to define COCs and temporal differences between the RI baseline dataset and sediment datasets used by the agencies. In many cases, the lists of COCs in the data gaps reports and SCAPs were based on several different types of data, including surface sediment, subsurface sediment, and upland media. The lists of chemicals developed for use in the SCA summaries in this appendix were generated based only on SQS exceedances (or dioxin and furan TEQs greater than 100 ng/kg dw) in surface sediment samples collected within the February 2007 SCA boundaries and included in the RI baseline dataset. The differences in chemical lists are not the result of any additional analyses of source control information.

Matrix tables were developed for each SCA to provide a broad overview of the types of data reported for that SCA. The matrix table presented in each SCA summary section indicates which chemicals were detected above the SQS in at least one RI baseline surface sediment sample (within the 2007 SCA boundaries) and were also identified as being present in one or more types of environmental media collected within the SCA (including soil, groundwater, stormwater, source-tracing samples, seep water, or porewater [5], based on information in the source documents.

An "X" is used in the matrix tables to indicate that a chemical detected above the SQS in surface sediment was also identified in another media type. The presence of an "X" does not infer a connection between contamination in surface sediment and other media types. Instead, it indicates that further evaluation may be appropriate. Conversely, the absence of an "X" in any cell in the table does not imply the absence of a chemical in specified media; in many cases, that chemical may not have been analyzed in that media type.

[5] A chemical was considered to be identified if either actual analytical data were reported in the source documents or if the source documents made reference to investigations in which the chemical was detected in analytical samples in one or more types of environmental media.

Table I-3. Comparison of Appendix I SCA chemical lists to lists of COCs provided in data gaps reports, SCAPs, and source control status reports

CHEMICALS CURRENTLY INCLUDED IN SCA SUMMARIES[a]	COCS IDENTIFIED IN DATA GAPS REPORTS AND SCAPS	BASIS FOR COCS IDENTIFIED IN DATA GAPS REPORTS AND SCAPS	COCS IDENTIFIED IN SCSRS
Duwamish/ Diagonal Way			
PCBs, *cadmium, chromium*, lead, mercury, *silver*, zinc, *2-methylnaphthalene*, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo-fluoranthenes, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, total HPAHs, total LPAHs, BEHP, BBP, *dimethyl phthalate*, *1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2,4-dimethylphenol, 4-methylphenol, benzoic acid, benzyl alcohol, n-nitrosodiphenylamine, phenol, dioxins and furans TEQ*	No data gaps report will be produced for this SCA. SCAP: The COCs identified were lead, mercury, PCBs, BEHP, BBP, chrysene, and "any other chemical that could recontaminate sediment" (Ecology 2004a).	No data gaps report will be produced for this SCA. SCAP: COCs were identified based on sediment data collected in 1994 and modeling studies of sediment deposition off the Duwamish/Diagonal CSO/SD outfall conducted by King County in 1999 and 2001 (Ecology 2004a).	2007 SCSR: The COCs identified in the 2007 SCSR (Ecology 2007f) were the same as those identified in the SCAP. May 2008 SCSR: The COCs identified were lead, zinc, PCBs, BEHP, and PAHs (individual PAHs not specified) (Ecology and SAIC 2008).
Slip 3 to Seattle Boiler Works			
Arsenic and benzyl alcohol	Data gaps report:: The COCs identified were arsenic, benzyl alcohol**, copper, lead, mercury, zinc, acenapthene, bezo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzofluoranthenes, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, total HPAH, PCBs, 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, cadmium, chromium, oil, grease, TPH-G, TPH, benzene, ethylbenzene, toluene, xylenes, PCE, TCE, vinyl chloride, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, 1,1,1-TCA, 1,2-DCA, pentachlorophenol, chlorinated dioxins and furans, methylene chloride, and 1,4-dichlorobenzene** (Ecology and Environment 2008a). A SCAP has not yet been completed for this SCA.	Data gaps report:: Arsenic, benzyl alcohol**, copper, lead, mercury, zinc, acenapthene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzofluoranthenes, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, total HPAH, PCBs, 1,2,4-trichlorobenzene,** and **1,2-dichlorobenzene** were identified as COCs because they were detected above the SQS in either surface or subsurface sediment based on data in the draft Phase 2 LDW RI (Ecology queried the online RI sediment database). **Cadmium, chromium, oil, grease, TPH-G, TPH, benzene, ethylbenzene, toluene, xylenes, PCE, TCE, vinyl chloride, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, 1,1,1-TCA, 1,2-DCA, pentachlorophenol, chlorinated dioxins and furans, methylene chloride, and 1,4-dichlorobenzene**were also identified as COCs because they were detected above applicable screening levels in one or more samples of upland media (stormwater, seeps, soil, groundwater, storm drain solids) (Ecology and Environment 2008a). A SCAP has not yet been completed for this SCA.	2007 SCSR: No information was provided for this SCA in the 2007 status report (Ecology 2007f). May 2008 SCSR: No information was provided for this SCA in the 2008 status report (Ecology and SAIC 2008).

Table I-3, cont. Comparison of Appendix I SCA chemical lists to lists of COCs provided in data gaps, SCAP, and source control status update reports

CHEMICALS CURRENTLY INCLUDED IN SCA SUMMARIES[a]	COCS IDENTIFIED IN DATA GAPS REPORTS AND SCAPS	BASIS FOR COCS IDENTIFIED IN DATA GAPS REPORTS AND SCAPS	COCS IDENTIFIED IN SCSRS
Seattle Boiler Works to Slip 4			
Mercury, fluoranthene, and PCBs(VOCs included for groundwater: 1,1-dichloroethene, 1,2-dichlorobenzene, 1,2-dichloroethane, 1,2-dichloropropane, 1,4-dichlorobenzene, benzene, cis-1,2-dichloroethene, tetrachloroethene, toluene, trans-1,2-dichloroethene, trichloroethene, vinyl chloride)	Data gaps report:: The COCs identified were mercury, fluoranthene, PCBs, b**enzo(a)anthracene, chrysene, dibenzofuran, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, total HPAH, total LPAH, dioxins and furans,** and **organo-tin compounds** (Ecology and Environment 2008a). A SCAP has not yet been completed for this SCA.	Data gaps report:: COCs were identified as chemicals with concentrations greater than the SQS in RM 2.3 to RM 2.8 E surface or subsurface sediments (Ecology and Environment 2008a). Dioxins and furans were also identified because of their presence in "high concentrations," Organo-tin compounds were selected as COCs because of their presence at "various locations." The data gaps report stated that chemicals detected above regulatory standards or screening levels in soil, groundwater, stormwater, or storm solids were not selected as COCs. A SCAP has not yet been completed for this SCA.	2007 SCSR: No information was provided for this SCA in the 2007 status report (Ecology 2007f). May 2008 SCSR: No information was provided for this SCA in the 2008 status report (Ecology and SAIC 2008).
Slip 4			
Mercury, *acenaphthene*, benzo(a)anthracene, benzo(a)pyrene, benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, total HPAHs, BBP, BEHP, and PCBs (VOCs included for groundwater: acetone, cis-1,2-dichloroethene, and dichloromethane)	NBF/GTSP data gaps report: PCBs and BEHP were identified as the primary COCs; and metals, phthalates, pesticides, and other organics were identified as other COCs (SAIC 2007e). Slip 4 data gaps report: The COCs identified were PCBs, **cadmium, lead,** mercury, **zinc,** BEHP, BBP, **di-n-octyl phthalate,** benzo(a)anthracene, benzo(a)pyrene, benzofluoranthenes, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, chrysene, fluoranthene, **phenanthrene**, total HPAHs, **n nitrosodiphenylamine, DDT, dieldrin,** and **alpha-chlordane** (SEA 2004)**.** SCAP**:** The COCs identified were PCBs and BEHP (Ecology 2006).	NBF/GTSP data gaps report: The COCs identified were the same as those identified in the SCAP, with the addition of chemicals identified as "potential sources of sediment recontamination" (SAIC 2007e). Slip 4 data gaps report: COCs were identified as chemicals detected above the SQS (or the SL if no SQS is available for a chemical) in at least one surface sediment sample (SEA 2004). SCAP: PCBs and BEHP were identified as COCs because they "are the most common problem chemicals in waterway sediment" (Ecology 2006). PAHs and metals were also noted to have been detected in Slip 4 surface and subsurface sediment, but the SCAP stated, "remediation of PCB-contaminated sediment will also result in the cleanup of areas where PAHs and metals exceed the SQS or CSL."	2007 SCSR: The 2007 SCSR (Ecology 2007f) identified the same COCs as the SCAP. May 2008 SCSR: The COCs identified were PCBs, phthalates, PAHs, metals (Ecology and SAIC 2008).

Table I-3, cont. Comparison of Appendix I SCA chemical lists to lists of COCs provided in data gaps, SCAP, and source control status update reports

CHEMICALS CURRENTLY INCLUDED IN SCA SUMMARIES[a]	COCS IDENTIFIED IN DATA GAPS REPORTS AND SCAPS	BASIS FOR COCS IDENTIFIED IN DATA GAPS REPORTS AND SCAPS	COCS IDENTIFIED IN SCSRS
Boeing Plant 2/Jorgensen Forge			
Cadmium, chromium, copper, lead, mercury, silver, zinc, acenaphthene, benzo(a)anthracene, benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, total HPAH, total LPAH, BBP, BEHP, *phenol*, PCBs, and *dioxins and furans* (VOCs included for groundwater: 1,1-dichloroethene, benzene, cis-1,2-dichloroethene, ethylbenzene, tetrachloroethene, toluene, trans-1,2 dichloroethene, trichloroethene, vinyl chloride, m,p-xylene, and o-xylene)	Data gaps report:: The COCs identified were PCBs, **antimony, arsenic**, cadmium, copper, **cyanide,** hexavalent chromium, lead, **manganese**, mercury, **nickel, selenium,** silver, **thallium,** and zinc (Ecology and Environment 2007b). SCAP: The COCs identified in the SCAP (Ecology 2007c) were the same as those in the data gaps report.	Data gaps report:: COCs were selected based on the results of fill sampling conducted between 2004 and 2007 in the southeast corner (i.e., 2-40s, 2-60s, and 2-66s areas) (Ecology and Environment 2007b). SCAP: COCs were selected using the same criteria as those in the data gaps report (Ecology 2007c).	2007 SCSR: PCBs, phthalates, PAHs, and metals were identified as COCs because they have been identified "at levels of concern" (Ecology 2007f). May 2008 SCSR: The COCs identified were PCBs, phthalates, PAHs, and metals (Ecology and SAIC 2008).
Boeing Isaacson/Central KCIA			
Arsenic, BEHP, BBP, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, total HPAHs, total LPAHs, benzoic acid, and PCBs	Data gaps report:: The COCs identified were arsenic, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, total HPAHs, total LPAHs, BEHP, BBP, benzoic acid, **benzyl alcohol,** and PCBs (SAIC 2008b). Draft SCAP: The COCs identified in the draft SCAP (Ecology 2008a) were the same as those in the data gaps report.	Data gaps report:: COCs were identified based on surface or subsurface sediment concentrations above the SQS (SAIC 2008b). Chemicals in upland media were not considered to be COCs. Draft SCAP: COCs in the draft SCAP were selected using the same criteria as those in the data gap report (Ecology 2008a).	2007 SCSR: COCs were not identified (Ecology 2007f). May 2008 SCSR: The COCs identified were arsenic, PAHs, phthalates, PCBs, benzoic acid, benzyl alcohol, and dibenzofuran (Ecology and SAIC 2008).

Table I-3, cont. Comparison of Appendix I SCA chemical lists to lists of COCs provided in data gaps, SCAP, and source control status update reports

CHEMICALS CURRENTLY INCLUDED IN SCA SUMMARIES[a]	COCS IDENTIFIED IN DATA GAPS REPORTS AND SCAPS	BASIS FOR COCS IDENTIFIED IN DATA GAPS REPORTS AND SCAPS	COCS IDENTIFIED IN SCSRS
Slip 6			
Lead, mercury, acenaphthene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, total HPAHs, BBP, BEHP, benzoic acid, phenol, PCBs, and, *dioxins/furans* (VOCs included for groundwater: 1,1 dichloroethene, cis-1,2-dichloroethene, methylene chloride, tetrachloroethene, trichloroethene, vinyl chloride, and toluene)	Data gaps report:: The COCs identified were mercury, lead, PCBs, benzoic acid, phenols, BBP, BEHP, PAHs, dibenzofuran, **arsenic, chromium, copper, nickel, selenium, vanadium, zinc, PCE, TCE, cis-1,2-DCE, 1,1-DCE, toluene, vinyl chloride,** phthalates, and **petroleum hydrocarbons** (Ecology and Environment 2008b). Draft SCAP: The COCs identified included the same list as that in the data gaps report, except acenaphthene, benzo(g,h,i)perylene, dibenzo(a,h,)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and total HPAHs were listed instead of just "PAHs;" phenol and **pentachlorophenol** were listed instead of just "phenols;" and **diethyl phthalate, di-n-octyl phthalate**, and benzoic acid were added (Ecology and Ecology and Environment 2008).	Data gaps report:: Mercury, lead, PCBs, benzoic acid, phenols, BBP, BEHP, PAHs, and dibenzofuran were identified as COCs because they were detected above the SQS in one or more Slip 6 surface sediment samples. **Arsenic, chromium, copper,** lead, mercury, **nickel, selenium, vanadium, zinc, PCE, TCE, cis-1,2-DCE, 1,1-DCE, toluene, vinyl chloride,** PCBs, PAHs, phenols, phthalates, and **petroleum hydrocarbons** were also identified as COCs because they were detected above "an applicable screening level" in one or more samples of upland media (Ecology and Environment 2008b). Draft SCAP: COCs were identified because they were detected above the SQS in either surface or subsurface sediment or because they were detected above an "applicable screening level" in one or more samples of upland media (Ecology and Ecology and Environment 2008).	2007 SCSR: COCs were not specified for this SCA (Ecology 2007f). May 2008 SCSR: The COCs identified were metals, PCBs, PAHs, phthalates, VOCs, and petroleum hydrocarbons(Ecology and SAIC 2008).
Norfolk CSO/SD			
fluoranthene, BBP, BEHP, 1,4-dichlorobenzene, PCBs	Data gaps report:: The COCs identified were **benzo(g,h,i)perylene**, BEHP, BBP, **hexachlorobenzene**, PCBs, **2,4-dimethylphenol, 2-methylnaphthalene, dibenzo(a,h)anthracene, dibenzofuran, hexachlorobutadiene, and n-nitrosodiphenylamine**. (Ecology and Environment 2007a)**.** SCAP: The COCs identified in the SCAP (Ecology 2007d) were the same as those in the data gaps report.	Data gaps report:: B**enzo(g,h,i)perylene**, BEHP, BBP, **hexachlorobenzene**, and PCBs were identified as COCs because they were detected above the SQS in one or more surface sediment samples in the SCA. N**-nitrosodiphenylamine, 2,4-dimethylphenol, 2-methylnaphthalene, dibenzo(a,h)anthracene, dibenzofuran, and hexachlorobutadiene** were also identified as COCs because the MDLs of non-detected results were above the SQS (Ecology and Environment 2007a). SCAP: COCs were selected in the SCAP (Ecology 2007d) using the same criteria as those in the data gaps report.	2007 SCSR: COCs were not specified for this SCA (Ecology 2007f). May 2008 SCSR: The COCs identified were PCBs, PAHs, phthalates, hexachlorobenzene, metals (Ecology and SAIC 2008).

Table I-3, cont. Comparison of Appendix I SCA chemical lists to lists of COCs provided in data gaps, SCAP, and source control status update reports

CHEMICALS CURRENTLY INCLUDED IN SCA SUMMARIES[a]	COCS IDENTIFIED IN DATA GAPS REPORTS AND SCAPS	BASIS FOR COCS IDENTIFIED IN DATA GAPS REPORTS AND SCAPS	COCS IDENTIFIED IN SCSRS
Glacier Bay			
PCBs, arsenic, copper, lead, mercury, zinc, BBP, BEHP, acenaphthene, chrysene, fluoranthene, phenanthrene, benzo(g,h,i,)perylene, indeno(1,2,3,-cd)pyrene, total HPAHs, pentachlorophenol, and dioxins/furans (VOCs included for groundwater: benzene and vinyl chloride)	Data gaps report:: The COCs identified were PCBs, arsenic, **antimony**, copper, lead, mercury, **tin**, zinc, dioxins/furans, BEHP, BBP, PAHs (individual PAHs not specified), **1,2-dichlorobenzene**, pentachlorophenol, **benzyl alcohol**, and **organo-tin compounds** (SAIC 2007d)**.** SCAP: The COCs identified were the same as in the data gaps report (Ecology 2007e).	Data gaps report:: A COC was identified as any detected chemical with a concentration greater than the SQS in surface or subsurface sediment "offshore of the Glacier Bay SCA." Dioxins and furans were also identified as COCs because they were detected at "high concentrations," and organo-tin compounds were identified as COCs because of their presence at various locations (SAIC 2007d). SCAP: COCs were selected using the same criteria as the those in the data gaps report (Ecology 2007e).	2007 SCSR: The list of COCs was the same as that identified in the data gaps report except organo-tins were not listed (Ecology 2007f). May 2008 SCSR: The COCs identified in the May 2008 SCSR (Ecology and SAIC 2008) were the sameas those identified in the data gaps report.
Trotsky Inlet			
Lead, mercury, zinc, BEHP, *BBP*, PCBs, *dioxins and furans* (VOCs included for groundwater: benzene, methylene chloride, trans-1,2-dichloroethylene, and vinyl chloride)	Data gaps report:: The COCs identified were PCBs, **DDT,** mercury, BEHP, **dieldrin**, lead, and zinc (SAIC 2007c). SCAP: The COCs identified were the same as those in the data gaps report (Ecology 2007b).	Data gaps report:: A COC was identified as any detected chemical with a concentration greater than the SQS in surface sediment samples (SAIC 2007c). SCAP: COCs were selected using the same criteria as those in the data gaps report; data from one additional sediment sample (a subsurface sample collected in 2006) were reviewed, but no additional COCs were added (Ecology 2007b).	2007 SCSR: The list of COCs was the same as that identified in the data gaps report (Ecology 2007f). May 2008 SCSR: The list of COCs was the same as that identified in the data gaps report (Ecology and SAIC 2008).

Table I-3, cont. Comparison of Appendix I SCA chemical lists to lists of COCs provided in data gaps, SCAP, and source control status update reports

CHEMICALS CURRENTLY INCLUDED IN SCA SUMMARIES[a]	COCS IDENTIFIED IN DATA GAPS REPORTS AND SCAPS	BASIS FOR COCS IDENTIFIED IN DATA GAPS REPORTS AND SCAPS	COCS IDENTIFIED IN SCSRS
Terminal 117			
2-Methylnaphthalene, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzofluoranthenes, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, phenol, total HPAHs, total LPAHs, benzyl alcohol, PCBs	Data gaps report:: Sediment COCs were not identified in the data gaps report (Windward et al. 2003). SCAP: The COCs identified were PCBs, phenol, PAHs, **BBP, BEHP, hexachlorobenzene, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, DDT, dieldrin, pentachlorophenol, benzoic acid**, benzyl alcohol, lead, **arsenic, zinc, cadmium,** and **silver** (Ecology 2005)**.**	Data gaps report:: Sediment COCs were not identified in the data gaps report (Windward et al. 2003). SCAP: PCBs, phenol, PAHs, **BBP,** and **BEHP** were identified as COCs because they were detected above the SQS in sediment (the SCAP did not indicate whether both surface and subsurface data were reviewed). **Hexachlorobenzene, 1,2-dichlorobenzene,** and **1,2,4-trichlorobenzene** were identified as COCs because they had MDLs that exceeded the SQS (Ecology 2005). **DDT** and **dieldrin** were identified as COCs based on either detected (DDT) or non-detected (dieldrin) concentrations. **Pentachlorophenol, benzoic acid**, benzyl alcohol, lead, **arsenic, zinc, cadmium,** and **silver** were also identified as COCs because they were identified in upland soil or catch basin sediments.	2007 SCSR: The COCs identified included PCBs, phenol, phthalates, and DDT (Ecology 2007f). May 2008 SCSR: The COCs identified were PCBs, PAHs, phenol, phthalates, and DDT (Ecology and SAIC 2008).

[a] The SMS chemicals listed are those that were detected at concentrations greater than the SQS in the RI baseline surface sediment dataset within the 2007 SCA boundaries. VOCs were added to the groundwater and porewater tables in Appendix I at the request of the agencies. The VOCs were selected based on VOCs of concern identified in the groundwater pathways assessment (Appendix G in Windward 2003a) and chemicals identified in the source documents with concentrations greater than a cleanup standard or screening level. Dioxins and furans were identified as COCs if the dioxin and furan TEQ was greater than 100 ng/kg dw at any location in the RI baseline surface sediment dataset within the 2007 SCA boundaries.

Chemicals in *italics* are currently included in Appendix I but are not listed as COCs for the associated SCA in the data gaps report or SCAP.

Chemicals in **bold** are listed as COCs for the SCA in the data gaps report or SCAP but are not currently included in Appendix I.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
COC – chemical of concern
CSO – combined sewer overflow
DCA – dichloroethane
DCE – dichloroethene
DDT – dichlorodiphenyltrichloroethane
EAA – early action area
GTSP – Georgetown Steam Plant
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
KCIA – King County International Airport
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
MDL – method detection limit
NBF – North Boeing Field
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
PCE – tetrachloroethene
RM – river mile
SAIC – Science Applications International Corporation
SCA – source control area
SCAP – source control action plan
SCSR – source control status report
SD – storm drain
SMS – Washington State Sediment Management Standards
SQS – sediment quality standards
TCA – trichloroethane
TCE – trichloroethene
TEQ – toxic equivalent
TPH – total petroleum hydrocarbons (includes diesel, oil, and all other petroleum products)
TPH-G – total petroleum hydrocarbons – gasoline
VOC – volatile organic compound

I.3.4 UPLAND AND OTHER MEDIA INFORMATION

In addition to the matrix tables, media-specific data tables are provided to summarize data reported in the SCA source documents. Chemicals included in these tables are those that exceeded the SQS in the RI baseline surface sediment dataset within the boundaries for each SCA established in February 2007 (Ecology 2007f) or were added at the request of the agencies (volatile organic compounds [VOCs], dioxins and furans).

If sufficient data were provided in the source documents for a chemical in a given media type, ranges of detected concentrations, median concentrations, and detection frequencies were presented. The ranges and median concentrations in these tables do not take into consideration non-detected values. For this reason, estimated ranges and median values presented in the media-specific data tables may be skewed higher than the actual ranges or median values (using non-detect values). Significant figures were kept consistent with the values reported in the source document, and the units in which the data were reported were converted for consistency, when necessary.

Bank soil data were tabulated for each SCA if it was clear from source documentation that the soil sample was collected from the bank or shoreline of the SCA. Soil data from the banks were included in order to focus the data presentation on conditions along the LDW shoreline. Other soil data were reported in the data gaps reports and SCAPs but are not summarized in this appendix; all soil data will be considered by Ecology as part of their source control evaluations.

Groundwater data were included for adjacent (shoreline) facilities associated with each SCA. If both upland and shoreline wells were identified in the source documents for these facilities, only data from the shoreline wells were included in order to focus the data presentation on conditions likely to be most representative of groundwater in close association with the LDW. If both historical and recent groundwater data were available for a facility, only the data collected during the most recent reported monitoring events were selected in order to present data as close to representative of current conditions as possible.

All groundwater data were included in the table if: 1) the source documentation did not identify shoreline wells, 2) it was unclear whether samples collected in separate years were from the same location, or 3) few groundwater data were reported. Historical data were selected if they were the only groundwater data available for a facility. All groundwater data (for both shoreline and upland facilities) will be considered by Ecology as part of their source control evaluations; the data gaps reports and SCAPs should be reviewed for information on additional groundwater data not summarized in this appendix.

Within the individual SCA summaries, there are several instances where an "X" appears in the matrix table but an associated media-specific data table is not presented. This would be the situation in cases where:

- None of the soil data available for an SCA were collected from the bank (only bank soil data are presented in media-specific data tables).
- None of the groundwater data available for an SCA were collected from a shoreline facility (only groundwater data from shoreline facilities are presented in media-specific data tables).
- None of the chemicals that exceeded the SQS in the RI baseline surface sediment dataset within the February 2007 boundary for an SCA were detected in samples of that media type (the media-specific data tables only include chemicals with detected concentrations that exceeded the SQS in surface sediment).
- Actual data for a given media type were either not presented in the source documents or were not available in a format that would allow the data to be summarized in the media-specific data tables. For example, the existence of stormwater data were reported for the Alaska Marine Lines and Duwamish Shipyard facilities in the Glacier Bay SCA, and the source documents reported that copper and zinc were detected in stormwater samples; however, actual copper and zinc data were not reported in the source documents so a stormwater data table was not included for that SCA.

VOC groundwater data were also summarized by facility, if available, for each of the 11 SCAs. A large number of groundwater VOC data were reported in the data gaps reports and SCAPs for some facilities. Individual VOCs for which data were summarized in the groundwater tables for these facilities were selected based on discussions with EPA and Ecology (Hiltner 2008). Individual VOCs were selected for the data summary if they had been evaluated in the groundwater pathways assessment in the Phase 1 RI (Appendix G in Windward 2003a) or if they were reported in the source documents as having been detected in groundwater above a cleanup standard or screening level used by Ecology. Detected VOC porewater data collected for the RI were also summarized for the same individual VOCs, if available. All groundwater data will be considered by Ecology as part of their source control evaluations.

Seep and porewater data reported in the LDW RI data reports (Windward 2004, 2006a) or in the SCAPs, data gaps reports, or other source documents were also summarized for each SCA. If known, metal concentrations are reported to be either dissolved (filtered) or total (unfiltered). Concentrations of organic chemicals are total (unfiltered), unless otherwise specified.VOC porewater data were also included in the SCA data summary tables.

Stormwater data were also tabulated for each area, when available. Stormwater data were collected from outfalls discharging to the SCAs, or in some cases, from surface water runoff discharging directly to the SCA. Stormwater data were reported as total or dissolved concentrations when the information was available.

As part of ongoing source control efforts in the LDW, source-tracing samples have been collected to help identify potential sources of contamination. Source-tracing data provided in the SCAPs, data gaps reports, and other source documents or data files provided by LDWG members were included in tables in the SCA summaries. Source-tracing samples include samples from catch basins, manholes, oil/water separators, and in-line sediment traps. In-line sediment grab samples and samples of joint caulking materials were also included. Additional information about the different types of source-tracing samples is provided in Section 9.4.4.7 of the main body of the RI.

Most of the available source-tracing data were collected between 2000 and 2007; in some cases, historical source-tracing data are also available. When multiple rounds of source-tracing data from the same sampling location were available, only the most recent data were included in the data summary tables. If the only source-tracing data available for a certain location or drainage basin were historical data, these data were included in the table. Samples collected from locations within decommissioned drainage lines or other components of drainage systems that are no longer in service were not included in the data tables. The focus on the most recent data is intended to provide a snapshot of current conditions. The source documents should be reviewed for information on additional source-tracing data not presented in this appendix; all source-tracing data will be considered by Ecology as part of their source control evaluations. Also note that the focus on current conditions in this appendix is in contrast to the source-tracing data summarized in Section 9 of the main body of the RI, where all data collected through December 2007 were summarized together.

The City of Seattle has identified several drainage basins that discharge to the LDW (SPU 2008). When possible, data in the source-tracing tables were presented according to the drainage basin from which they were collected. For areas that do not have delineated drainage basins, data were presented according to the facility from which they were collected. When available, the various drainage basins currently delineated along the LDW were also provided on SCA-specific maps.

I.3.5 SCA MAPS

As part of each SCA summary, multiple maps were prepared to provide a visual summary of pertinent information for each area. These maps include text boxes that provide surface sediment data for chemicals with detected concentrations exceeding the SQS or CSL in the RI baseline dataset within the SCA boundaries identified by Ecology in February 2007 (Ecology 2007f). Dioxin and furan data were also presented

In text boxes on the maps if the dioxin and furan TEQ[6] was highly elevated (i.e., greater than 100 ng/kg dw) in at least one sediment sample within the February 2007 SCA boundary. In addition to the data text boxes, surface sediment exceedances of SMS criteria based on the RI baseline dataset within the February 2008 SCA boundaries (Ecology and SAIC 2008) were indicated with color-coded symbols on the SCA maps; however, chemical-specific data were not provided on the maps for samples collected in the area between the 2007 and 2008 boundaries. All surface sediment data will be considered by Ecology during their source control evaluations.

In addition to surface sediment sampling locations, seep, porewater, and source-tracing sampling locations are also shown on the maps if location information (i.e., geographic coordinates) was available.

Facilities associated with each SCA are outlined and labeled on the maps if they were selected for the summary in the text and tables (based on the criteria discussed in Section I.3.1). Facilities associated with the SCAs but not selected for the summary are also labeled on the maps in most cases (but are not outlined). In a few instances, upland facilities are not labeled on the maps because the map coverage does not extend to their location or because insufficient information was available to determine their exact location.[7] For facilities selected for the summary in this appendix, and outlined and labeled on the maps, information on environmental and source control investigations and regulatory status was provided in text boxes, when available.

All outfalls associated with the SCAs (based on the February 2008 SCA boundaries) are shown on the maps as they were identified in the 2003 LDW outfall survey (Herrera 2004). The outfalls are labeled with identification and ownership information linking them to further information provided in Appendix H. If information was available, drainage basins and drain line networks associated with the SCA outfalls were also shown on the maps (this information was generally only available for outfalls designated as major outfalls). It is important to note that the SCA maps only display the drainage basins that discharge to the specific SCA being shown. Areas adjacent to the drainage basin boundaries shown on the SCA maps also likely discharge to the LDW. The full extent of all the LDW drainage basins is shown on Map 9-1 of the main body of the RI.

As noted earlier, in some instances, there are differences between the LDW outfall survey and the source documents regarding the configuration or location of outfalls. In these instances, the discrepancies are acknowledged in text and tables. In addition, if the source documents provided maps that clearly showed outfall locations or configurations different than those shown on the SCA maps, the map from the source document has also been included for comparison.

---

[6] SMS criteria do not exist for dioxins and furans.

[7] The facilities for which this situation applies are noted in Table I-2.

A matrix table was also prepared for each SCA for inclusion on the maps to indicate the availability of data for each media type for the facilities selected for information summary in the appendix and for major outfalls associated with the SCA. An X on these matrix tables indicates that data exist for the specified media type based on information in the SCA source documents; however, the analytical data may not have been provided in the source documentation. The absence of an X on these matrix tables indicates that data were not identified during information compilation for the source documents.

For the Duwamish/Diagonal Way and Norfolk CSO/SD SCAs, maps displaying sediment monitoring data collected since removal actions were conducted at each of these areas were also included. All of these monitoring data are not included in the RI baseline dataset.

I.4 SCA Summaries

The following sections include the 11 SCA-specific summaries for those areas identified for inclusion in the RI. These summaries were developed based on the approaches outlined in the sections above. The size and complexity of each summary varies greatly because of the level of information available and presented in the source documents and because of the unique histories of the facilities in each area.

I.4.1 Duwamish/Diagonal Way Source Control Area (RM 0.2 E to RM 0.9 E, EAA 1)

The Duwamish/Diagonal Way SCA was originally identified as a priority cleanup area by the Elliott Bay/Duwamish Restoration Program in the mid-1990s because of contamination associated with the Diagonal Avenue S CSO/SD and Duwamish emergency overflow (EOF) outfalls. Subsequently, the area was identified as one of seven early action areas (EAAs) because of contaminated surface sediment (Windward 2003c). Removal actions were implemented in this SCA between November 2003 and March 2004 and a project closure report was prepared in 2005 (King County and SPU 2005). A thin-layer cap of sand was placed to the west and south of the Area B cap in February 2005 in response to elevated chemical concentrations that resulted from the previous dredging activity (Ecology 2004a). The removal and capping actions were not intended to address all of the sediment contamination within this SCA. The Duwamish/Diagonal Way SCA is shown on Map I-2.

As part of the ongoing source control efforts for the LDW, Ecology prepared a SCAP for the Duwamish/Diagonal Way SCA in December 2004 (Ecology 2004a). One of the main purposes of the SCAP was to identify potential sources of recontamination to the dredged and capped sediment area. Property reviews have also been completed for several of the upland properties associated with this SCA (Ecology 2008b, c, d, e), and source control status update reports for the LDW included information for the Duwamish/Diagonal Way SCA (Ecology 2007f; Ecology and SAIC 2008). An

environmental site assessment report (Pinnacle Geosciences 2005) prepared for the Port of Seattle also contained information on some of the upland properties associated with this SCA. In addition, source-tracing data provided by the City of Seattle (Schmoyer 2008d), bank soil data collected as part of Duwamish/Diagonal sediment remediation monitoring program by King County (Anchor 2007a), groundwater data collected by the Port of Seattle (Pacific Groundwater Group 2006, 2007), and seep data collected as part of the RI (Windward 2004) are also summarized in this section. These references are referred to collectively as the "source documents" throughout this section and on the maps.

CSL exceedances in the surface sediment in this SCA, prior to the removal action, included bis(2-ethylhexyl) phthalate (BEHP), butyl benzyl phthalate (BBP), dimethyl phthalate, total polychlorinated biphenyls (PCBs), 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2,4-trichlorobenzene, 2-methylnaphthalene, n-nitroso-diphenylamine, 4-methylphenol, 2,4-dimethylphenol, cadmium, chromium, mercury, silver, and several polycyclic aromatic hydrocarbons (PAHs) (Map I-3).[8] SQS exceedances included phenol, several other individual PAHs, total high-molecular-weight PAHs (HPAHs), total low-molecular-weight PAHs (LPAHs), and zinc. These exceedances are based on the RI baseline surface sediment dataset (which is prior to the removal action) and the 2007 SCA boundary, as discussed in the introduction to this appendix. A dioxin and furan TEQ of 180 ng/kg dw was also detected in this area prior to the removal action; dioxins and furans have no related SMS criteria for comparison. Ecology identified COCs for this SCA based on different criteria (Table I-3); therefore, the chemicals identified for summary in this appendix are different than the COCs that Ecology identified for this SCA.

Commercial and industrial operations within the vicinity of the SCA have included vehicle manufacturing (historical), upland PCB dredge material disposal (historical), shipping container transfer and refurbishing (historical and current), warehouse storage and transfer (historical and current), and railroad refueling (historical and current). A former wastewater treatment plant (WWTP) (historical), and federal government offices and warehouses (historical and current) have also been located within the SCA.

Several upland facilities were discussed in source documents associated with the Duwamish/Diagonal Way SCA. Adjacent facilities included Federal Center South, Terminal 106 (T-106) SW,[9] and Terminal 108 (T-108) (Map I-2). Upland properties

---

[8] The CSL and SQS exceedances discussed and displayed on Map I-3 are based on the surface sediment baseline dataset and represent surface sediment conditions prior to the sediment remedial actions in 2003-2004, and thin-layer cap placement in 2005.

[9] T-106 was formerly divided into several properties that were named T-106 NW, SW, NE, and SE. Currently the name T-106 applies only to the property that was formerly called T106 SW. The property that was formerly called T-106 NW is now named Terminal 104 (T-104).

identified in the source documents included T-106 W, former T-106 NE, former T-106 SE,[10] JANCO-United, and the Union Pacific Railroad (UPRR) Argo fueling site. The UPRR Argo fueling site is located approximately a half mile east of the LDW. Table I-4 summarizes facility-specific information for the adjacent facilities associated with the Duwamish/Diagonal Way SCA. With the exception of the UPRR Argo fueling site, no upland (non-shoreline) properties are discussed in this section because of the lack of source-tracing information (Table I-2). The SCAP, property reviews, and LDW status reports present additional information on all facilities associated with this SCA.

Five major outfalls that discharge into the Duwamish/Diagonal Way SCA were identified in the SCAP (Ecology 2004a). These outfalls include the Diagonal Avenue S CSO/SD (No. 2155), the Duwamish EOF (No. 2153), and the Diagonal Avenue S SD (No. 2003) (Maps I-2 through I-4). The former Diagonal Avenue S WWTP outfall (No. 2002) was also identified as a major outfall in the Duwamish/Diagonal Way SCAP. This outfall has been decommissioned and is no longer in use. Based on information in the SCAP (Ecology 2004a), the Nevada Street storm drain is located on the northern portion of the T-106 SW shoreline (Map I-5). This outfall is active, but was not found during the LDW low-tide outfall survey (Herrera 2004); therefore, it is not shown on Maps I-2 through I-4.[11]

In total, runoff from approximately 2,620 ac of land discharges to the Duwamish/Diagonal Way CSO/SD basin. The drainage basin for the Diagonal Ave S CSO/SD system is shown on Map I-6. The Diagonal Avenue S CSO/SD basin makes up the majority of the drainage area; the Nevada Street storm drain and Diagonal Avenue S storm drain basins are relatively small in comparison. Stormwater runoff also has the potential to discharge directly to the Duwamish/Diagonal Way SCA from adjacent facilities, either through private storm drains or as surface flow. Four private storm drains discharge to the Duwamish/Diagonal Way SCA from Federal Center South (Nos. 2005, 2006, 2246, and 2247), and one Port of Seattle public storm drain (No. 2225) discharges from T-108 (Maps I-2 through I-4).

[10] The properties referred to as T-106 NE and T-106 SE in the source documents were purchased by a private landowner; they are no longer referred to as T-106 NE and T-106 SE.

[11] The maps produced for this appendix are based on outfall locations provided in the 2003 LDW outfall survey (Herrera 2004) because this is the outfall information source used throughout the RI. The treatment of discrepancies between outfall configurations shown on the RI maps and the maps provided in source documents is discussed in the introduction to this appendix.

Table I-4. Summary of facility information for the Duwamish/Diagonal Way SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/Investigations
Federal Center South	US Government	leased office space	facility used by several entities in the past including the Ford Motor Company, USACE, Federal Bureau of Investigation, US Air Force, and Bureau of Indian Affairs	A hazardous waste inspection was conducted by Ecology in 1993. Soil and groundwater investigations conducted in the 1990s in association with UST removals identified a gasoline plume in groundwater; an environmental site assessment was conducted in 2001.	Five USTs were removed in the 1990s. Three additional USTs were pumped dry in the early 2000s.	A site inspection was conducted by Ecology in 2004 and 2005 to assess whether surface water, soil, or groundwater from the facility were potential sources to LDW sediment.
T-106 SW[b]	Port of Seattle	shipping container, chassis, and refrigeration unit storage and repair (tenant is ConGlobal Industries)	similar to current operations since at least 1990; information on historical operations prior to 1990 not reported in source documents but expected to be similar to current operations	Site inspections have been conducted by Ecology and SPU; historical soil and groundwater investigations were conducted in association with a compressor area, a steam cleaning area, and with UST removals.	Three USTs were decommissioned in 1991 (one may have been closed in place). Petroleum-contaminated soil associated with the compressor area was removed in early 1990s.	Business inspections have been conducted by Ecology and SPU at T-106 SW, and the Port of Seattle is conducting stormwater compliance inspections at all terminals. One catch basin solids sample was collected by SPU in 2003.
T-108	Port of Seattle	shipping container and chassis storage and repair (tenant is ConGlobal Industries)	wastewater treatment plant, PCB-contaminated sediment settling ponds/ disposal pits, equipment storage, soil treatment, cement storage and shipment facility	Numerous soil and groundwater investigations have been conducted over the past 20 years; site inspections have been conducted by Ecology and SPU.	No remedial activities were reported in source documents.	A source control strategy plan for this property is being developed.

Table I-4, cont. Summary of facility information for the Duwamish/Diagonal Way SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/Investigations
UPRR Argo fueling site	UPRR	railroad fueling site	railroad fueling site	A groundwater plume related to a diesel release at the fueling site was identified in the late 1990s; Seattle-King County Public Health is planning to conduct a site hazard assessment at the property.	Groundwater remediation operations, including pumping and air sparging, were conducted between 2001 and 2004; over 38,000 gal. of diesel were recovered. An independent cleanup by UPRR under MTCA is underway.	Stormwater samples were collected from the Diagonal Avenue S CSO/SD by King County after discontinuation of the air sparging system in 2004 to assess whether petroleum hydrocarbons were entering the system. A source-tracing sample was collected from the facility by SPU in 2002.

Sources: Ecology (2004a, 2007f, 2008b, c, d), Ecology and SAIC (2008), Pinnacle Geosciences (2005), King County (2008b)

[a] Facilities listed are those identified as adjacent properties in the SCAP (Ecology 2004a) and property reviews (Ecology 2008b, c, d). The UPRR Argo fueling site (identified as an upland property in the source documents) is also included because source-tracing data were included in the source documentation.

[b] This property is also referred to as Container Care International (the former tenant of the property) in the SCAP (Ecology 2004a) and property report (Ecology 2008c). The property is currently referred to as T-106 (rather than T-106 SW).

CSO – combined sewer overflow
Ecology – Washington State Department of Ecology
GSA – General Services Administration
LDW – Lower Duwamish Waterway
MTCA – Model Toxics Control Act
PCB – polychlorinated biphenyl
SAIC – Science Applications International Corporation
SCA – source control area
SCAP – source control action plan
SD – storm drain
SPU – Seattle Public Utilities
T-106 – Terminal 106
T-108 – Terminal 108
UPRR – Union Pacific Railroad
USACE – US Army Corps of Engineers
UST – underground storage tank
US – United States

Nine separate overflow points exist from the combined sewer system to the Duwamish Avenue S CSO/SD outfall, eight owned by the City, with a combined service area of approximately 624 ac and one owned by King County with a total service area of 4,890 ac. In the event of a CSO discharge from the Diagonal Avenue S CSO/SD, sanitary sewer and runoff from up to about 4,890 ac could potentially discharge to the Duwamish/Diagonal Way SCA. In the event of an EOF discharge from the Duwamish EOF outfall, sanitary sewage/runoff from a combined sewer service area of approximately 2,200 ac (1,200 ac in West Seattle and 1,000 ac in drainage basins upstream of the Duwamish pump station) could potentially discharge to the SCA (Ecology 2004a).

Industrial facilities and contaminated sites within both the storm drain basin and the combined sewer service area have the potential to contribute chemicals to the Duwamish/Diagonal Way SCA through storm drain, CSO, and EOF discharges. There are approximately 37 confirmed or suspected contaminated sites, 105 LUSTs, and 196 underground storage tanks (USTs) in the Duwamish/Diagonal Way SCA drainage basin (Ecology 2004a). King County and SPU have inspected over 130 businesses in the Duwamish/Diagonal Way drainage basin (Ecology and SAIC 2008) as part of their source control efforts within the basin. The business inspection program is discussed in additional detail in Section 9.4.4.5 in the main body of the RI. Environmental investigations as well as remedial and source control activities also have been conducted in association with the public outfalls in the Duwamish/Diagonal Way SCA. Information on the outfalls within this SCA is included in Table I-5 and on Map I-4; additional details are provided in Appendix H.

Table I-5. Summary of specific information for outfalls in the Duwamish/Diagonal Way SCA

Outfall	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
Outfalls Identified in the SCAP as Major Outfalls[a]					
Nevada Street SD outfall[b]	City of Seattle	Storm drain is 24-in. in diameter and drains approximately 26 ac of land, including portions of T-106 SW.	No historical operations were reported.	Source-tracing sediment sample was collected for the Elliott Bay Action Program in 1985. Manholes connected to the drainage system were inspected by SPU in 2005. Additional source-tracing sampling is planned.	Discharges from T-106 SW are regulated under the Port of Seattle's NPDES permit.
Diagonal Avenue S CSO/SD outfall (No. 2155)	City of Seattle and King County	Concrete outfall is 144 in. in diameter and discharges an average 1,100 million gallons of stormwater per year. The stormwater drainage basin is approximately 2,600 ac in size and includes approximately 3.6 mi of I-5 and parts of the Central District, Duwamish industrial area, Rainier Valley, and Beacon Hill. In the event of a CSO discharge, stormwater and wastewater from nine other CSO systems (one (one owned by King County [i.e., the Hanford CSO, also referred to as Hanford No. 1 or Hanford at Rainier] and eight owned by the City of Seattle) could discharge through this outfall.	No historical operations were reported.	Stormwater samples were collected by King County in 1995 and in the early 2000s. Source-tracing solids were collected for the Elliott Bay Action Program in 1985 and by SPU from 2003 through 2007. Source-tracing investigations are ongoing. Business inspections have been conducted within the drainage basin.	The City of Seattle cleaned approximately 6,200 LF of pipe in the lower portion of the drainage system in 2002 through 2004. The main trunk line was cleaned in 2003 and 2004. The lines were video inspected after being cleaned. The City of Seattle also cleaned all catch basins located in the right-of-way (over 3,500 structures) in 2007 and 2008.

Table I-5, cont. Summary of specific information for outfalls in the Duwamish/Diagonal Way SCA

Outfall	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
Duwamish EOF outfall (No. 035)	King County	Outfall (36-in.) serves as the emergency overflow for the Duwamish pump station and Duwamish Siphon. In the event of an EOF, discharge from the siphon, stormwater, and wastewater could be conveyed from the Delridge Trunk Sewer and the Chelan Avenue Regulator Station in West Seattle (in total comprising a CSO basin of approximately 1,200 ac). In the event of an EOF discharge from the Duwamish pump station, stormwater and wastewater could be conveyed from approximately 1,000 ac of land in drainage basins upstream of the pump station.	Outfall has historically been an EOF for the Duwamish pump station and Duwamish siphon; the EOF has not discharged since 1989.	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.
Diagonal Avenue S SD outfall (No. 2003)	City of Seattle	Steel SD (12-in.) drains approximately 12 ac of land, including the portion of Diagonal Avenue S west of E Marginal Way S.	No historical operations were reported.	A source-tracing sediment sample was collected for the Elliott Bay Action Program in 1985. Business inspections have been conducted by SPU within the drainage basin.	No remedial or source control activities were reported.
Former Diagonal Avenue S WWTP outfall (No. 2002)	City of Seattle	Steel outfall (30-in.) is no longer in use.	Formerly served as an outfall for the Diagonal Avenue S WWTP (1938-1969) which discharged primary-treated sewage and stormwater effluent originating from 5,100 ac of land on the eastern side of the LDW.	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported. The WWTP was decommissioned in 1969.

Table I-5, cont. Summary of specific information for outfalls in the Duwamish/Diagonal Way SCA

Outfall	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
Other Outfalls					
T-108 public SD outfall (No. 2225)	Port of Seattle	Concrete SD (18-in.) drains the southwestern portion of T-108.	No historical operations were reported.	No environmental or source-tracing investigations were reported.	The Port of Seattle is conducting stormwater compliance inspections at all terminals to identify and control sources.
Federal Center South private SD outfalls (Nos. 2005, 2006, 2246, and 2247[c])	USACE (No. 2006) and GSA/US Gov. (Nos. 2005, 2246, and 2247)	Outfalls discharge stormwater from the Federal Center South property.	No historical operations were reported.	Site inspections were conducted at Federal Center South by Ecology in 2004 and 2005 to assess whether surface water draining from the site was a potential source to LDW sediment.	Cleanout and repair of the SD system at Federal Center South is planned by the GSA.

Sources: Ecology (2004a, 2007f), Ecology and SAIC (2008), Schmoyer (2008d)

[a] Major outfalls listed are those discussed as individual source control entities in the SCAP (Ecology 2004a).

[b] The Nevada Street SD outfall was not found during the LDW low-tide outfall survey (Herrera 2004); however, it is located on the northern portion of the T-106 SW shoreline and is shown on Map I-5, which was provided in the SCAP for the Duwamish/Diagonal Way SCA (Ecology 2004a) .

[c] Outfall No. 2247 is located on the boundary of the Duwamish/Diagonal Way SCA and the Slip 1 SCA.

CSO – combined sewer overflow
Ecology – Washington State Department of Ecology
EOF – emergency overflow
GSA – General Services Administration
I-5 – Interstate 5
LDW – Lower Duwamish Waterway
NPDES – National Pollutant Discharge Elimination System
SAIC – Science Applications International Corporation
SCA – source control area
SCAP – source control action plan
SD – storm drain
SPU – Seattle Public Utilities
T-106 – Terminal 106
T-108 – Terminal 108
USACE – US Army Corps of Engineers
WWTP – wastewater treatment plant

Several remedial activities and environmental investigations have been completed or are currently in progress within the Duwamish/Diagonal Way SCA (Tables I-4 and I-5). Information about these activities has been summarized in the source documents. Several of the chemicals that have been detected above the SMS criteria in surface sediment in the Duwamish/Diagonal Way SCA have also been detected in various upland media, including soil, groundwater, seeps, stormwater, and source-tracing solids (Table I-6). In both Table I-6 and the table on Map I-4, an X indicates that the source documents reported data or indicated that data exist; therefore, an X does not necessarily mean that the actual data were presented in the source document. Data are only summarized in media-specific and source-tracing tables if the data were reported in the source documents and if they met the criteria for data summation discussed in the introduction to this appendix (e.g., soil data were collected along the SCA shoreline; groundwater data were collected from shoreline facilities). The availability of data (by media type) is also presented in the table on Map I-4 for each of the facilities and major outfalls associated with this SCA. The identification of a chemical in these media at facilities or within the drainage systems of the Duwamish/Diagonal Way SCA does not necessarily indicate that these potential sources contributed to sediment contamination in the past or will result in sediment contamination in the future.

Table I-6. Chemicals identified in various media in the Duwamish/Diagonal Way SCA

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater[c]	Source-Tracing Samples	Sources
Cadmium	X		X		X	X	Ecology (2004b); Windward (2004); Anchor (2007a)
Chromium	X	X			X	X	Ecology (2004b); Anchor (2007a); Pacific Groundwater Group (2006, 2007)
Lead	X	X	X		X	X	Ecology (2004b); Windward (2004); Schmoyer (2008d); Anchor (2007a); Pacific Groundwater Group (2006, 2007)
Mercury	X	X	X		X	X	Ecology (2004b); Windward (2004); Schmoyer (2008d); Anchor (2007a); Pacific Groundwater Group (2006, 2007)
Silver			X				Windward (2004)
Zinc	X	X	X		X	X	Ecology (2004b); Windward (2004); Schmoyer (2008d); Anchor (2007a); Pacific Groundwater Group (2006, 2007)

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater[c]	Source-Tracing Samples	Sources
2-Methylnaphthalene[d]							
Benzo(a)anthracene	X					X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)
Benzo(a)pyrene	X					X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)
Benzo(g,h,i)perylene	X					X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)
Benzofluoranthenes	X					X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)
Chrysene	X					X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)
Dibenzo(a,h)anthracene	X					X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)
Fluoranthene	X				X	X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)
Indeno(1,2,3-cd)pyrene	X					X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)
Naphthalene		X				X	Schmoyer (2008d); Pacific Groundwater Group (2006, 2007)
Phenanthrene	X					X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)
Pyrene	X				X	X	Schmoyer (2008d); Anchor (2007a)
Total HPAHs	X					X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)
Total LPAHs	X					X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)
BEHP	X				X	X	Ecology (2004a); Schmoyer (2008d); Anchor (2007a)
BBP	X				X	X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)
Dimethyl phthalate					X	X	Ecology (2004b)
1,2,4-Trichlorobenzene[d]							
1,2-Dichlorobenzene	X					X	Ecology (2004b); Anchor (2007a)
1,4-Dichlorobenzene						X	Ecology (2004b)
2,4-Dimethylphenol						X	Schmoyer (2008d)
4-Methylphenol						X	Ecology (2004b)
Benzoic acid	X						Anchor (2007a)
Benzyl alcohol[d]							
n-Nitrosodiphenylamine[d]							
Phenol	X					X	Ecology (2004b); Schmoyer (2008d); Anchor (2007a)

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater[c]	Source-Tracing Samples	Sources
Total PCBs	X	X				X	Ecology (2004a); Schmoyer (2008d); Anchor (2007a); Pacific Groundwater Group (2006, 2007)
Dioxins and furans TEQ[d, e]							

Note: An X indicates that the source documents reported that data are available for the identified media. The absence of an X in any cell in this table does not necessarily mean that the chemical is absent in the upland media or in source-tracing samples; in some cases, that chemical may not have been analyzed for or, if analyzed, could have been present but at concentrations below the RL.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Duwamish/Diagonal Way SCA. The chemical list is based on SMS exceedances in the RI baseline surface sediment dataset and the 2007 SCA boundary. Therefore, this list may differ from the list of exceedances in source documents. The baseline surface sediment dataset includes only data collected before the Duwamish/Diagonal cleanup action (see Section 4.1.2.1 of the main body of the RI).

[b] No porewater data were identified in the source documents for any chemical.

[c] Based on information contained in the SCAP (Ecology 2004a), a surface water sample was collected from the Federal Center South facility; however, no data were provided for this sample. Stormwater data collected from the Diagonal Avenue S CSO/SD were provided in the SCAP (Ecology 2004a).

[d] No soil, groundwater, seep, porewater, stormwater, or source-tracing data were identified in the source documents for this chemical.

[e] There are no SMS criteria for dioxins and furans. They were included in this table because they are a risk driver chemical with highly elevated concentrations (i.e., TEQ > 100 ng/kg dw) in one or more surface sediment samples in this area.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
CSO – combined sewer overflow
Ecology – Washington State Department of Ecology
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
RI – remedial investigation
RL – reporting limit
SCA – source control area
SD – storm drain
SMS – Washington State Sediment Management Standards
SQS – sediment quality standard
TEQ – toxic equivalent

Upland data for these media have been summarized in the source documents. The following is a summary of the upland data as they were presented in these documents for bank soil, groundwater, seep water, stormwater, and source-tracing samples. No porewater data were provided in the source documents for this area.

If sufficient data were provided in the source documents, ranges of detected concentrations, medians, and sample count (n) are provided accordingly. In some instances, the source documents acknowledged the existence of certain data but did not provide actual concentrations. Data were included on these tables only if specific concentrations or a range of concentrations were included in the source documents.

Data from two bank soil samples were identified within the Duwamish/Diagonal Way SCA (Table I-7). Both samples were collected from the northern portion of the T-108 shoreline by King County in 2005 (Anchor 2007a) as part of the sediment removal area monitoring program. No bank soil data were identified for any of the other

shoreline properties within the SCA. Table I-8 summarizes the groundwater data presented in groundwater investigation reports provided by the Port of Seattle for T-108 (Pacific Groundwater Group 2006, 2007). The source documents did not include any VOC groundwater data; however, they reported that a diesel plume is present beneath the UPRR Argo fueling site. Groundwater remediation has been conducted at the UPRR Argo fueling site. The diesel plume may still be migrating toward the LDW (Ecology 2004a). Groundwater information for several of the shoreline facilities within this SCA (T-106, T-108, and Federal Center South) is also summarized in Table 9-15, in Section 9 of the main body of the RI. Table I-9 presents the seep data collected as part of the LDW RI (Windward 2004); no seep data were presented in the SCAP. Stormwater data collected in 1995 from the Duwamish/Diagonal CSO/SD system are summarized in Table I-10 as they were presented in the SCAP.

Table I-7. Summary of chemical concentrations detected in bank soil in the Duwamish/Diagonal Way SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/kg dw, unless noted)[c, d]	Sampling Location	Sources	Additional Information
T-108	cadmium	2005	0.28 mg/kg dw n = 1/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	chromium	2005	31, 55.9 mg/kg dw n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	lead	2005	7.8, 94.4 mg/kg dw n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	mercury	2005	0.031, 0.468 mg/kg dw n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	silver	2005	0.79, 2.62 mg/kg dw n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	zinc	2005	61.9, 85.8 mg/kg dw n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	benzo(a)anthracene	2005	8.36, 41 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.

Table I-7, cont. Summary of chemical concentrations detected in bank soil in the Duwamish/Diagonal Way SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/kg dw, unless noted)[c, d]	Sampling Location	Sources	Additional Information
T-108	benzo(a)pyrene	2005	13.7, 47.4 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	benzo(g,h,i)perylene	2005	13.2, 45.8 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	benzofluoranthenes	2005	29.1, 107.9 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	chrysene	2005	14.8, 55 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	dibenzo(a,h)anthracene	2005	3.3 n = 1/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	fluoranthene	2005	22.6, 112 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	indeno(1,2,3-cd)pyrene	2005	10.9, 38.9 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	phenanthrene	2005	8.84, 43.8 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.

Table I-7, cont. Summary of chemical concentrations detected in bank soil in the Duwamish/Diagonal Way SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/kg dw, unless noted)[c, d]	Sampling Location	Sources	Additional Information
T-108	pyrene	2005	19.5, 98.8 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	total HPAHs	2005	135.46, 546.8 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	total LPAHs	2005	8.84, 43.8 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	BEHP	2005	39.3, 138 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	BBP	2005	61.1 n = 1/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	1,2-dichlorobenzene	2005	7.21 n = 1/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	benzoic acid	2005	116, 846 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.
T-108	phenol	2005	14.7, 1,300 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.

Table I-7, cont. Summary of chemical concentrations detected in bank soil in the Duwamish/Diagonal Way SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/kg dw, unless noted)[c, d]	Sampling Location	Sources	Additional Information
T-108	total PCBs	2005	16.5, 815 n = 2/2	along the northern portion of the T-108 shoreline at approximately RM 0.5	Anchor (2007a)	Two bank soil samples were collected by King County as part of the Duwamish/Diagonal cap monitoring plan.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Duwamish/Diagonal Way SCA.

[b] Dimethyl phthalate, 2-methylnapthalene, naphthalene, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 2,4-dimethylphenol, 4-methylphenol, benzyl alcohol, n-nitrosodiphenylamine, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from µg/kg to mg/kg), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges were calculated using only detected data. For this reason, some estimated ranges may be higher than actual concentrations.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
CSO – combined sewer overflow
dw – dry weight
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
RM – river mile
SCA – source control area
SD – storm drain
SQS – sediment quality standard
T-108 – Terminal 108

Table I-8. Summary of chemical concentrations detected in groundwater in the Duwamish/Diagonal Way SCA

FACILITY	CHEMICAL[a, b]	YEAR COLLECTED	LOCATION	CONCENTRATION INFORMATION (µg/L)[c, d, e]	SOURCES	ADDITIONAL INFORMATION
T-108	chromium	2006 – 2007	multiple groundwater wells throughout the facility	1.27 – 13.5 (total) median = 8.32 n = 10/18	Pacific Groundwater Group (2006, 2007)	Groundwater samples were collected by the Port of Seattle.
T-108	chromium	2006 – 2007	multiple groundwater wells throughout the facility	1.08 –14.3 (dissolved) median = 2.31 n = 16/18	Pacific Groundwater Group (2006, 2007)	Groundwater samples were collected by the Port of Seattle.
T-108	lead	2006 – 2007	multiple groundwater wells throughout the facility	2.49 – 16.8 (total) median = 5.27 n = 4/18	Pacific Groundwater Group (2006, 2007)	Groundwater samples were collected by the Port of Seattle.
T-108	zinc	2006 – 2007	multiple groundwater wells throughout the facility	10.1 – 360 (total) median = 46.8 n = 8/18	Pacific Groundwater Group (2006, 2007)	Groundwater samples were collected by the Port of Seattle.
T-108	zinc	2006 – 2007	multiple groundwater wells throughout the facility	12.9 – 435 (dissolved) median = 43.6 n = 5/18	Pacific Groundwater Group (2006, 2007)	Groundwater samples were collected by the Port of Seattle.
T-108	naphthalene	2006 – 2007	multiple groundwater wells throughout the facility	0.136 n = 1/19	Pacific Groundwater Group (2006, 2007)	Groundwater samples were collected by the Port of Seattle.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Duwamish/Diagonal Way SCA.

[b] Silver, BBP, BEHP, dimethyl phthalate, 2-methylnapthalene, benzo(a)anthracene, benzo(a)pyrene, benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, total HPAHs, total LPAHs, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 2,4-dimethylphenol, 4-methylphenol, benzoic acid, benzyl alcohol, n-nitrosodiphenylamine, phenol, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table. .

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] One groundwater sampling result was rejected (R-qualified) because of poor sample quality. Limited groundwater yield resulted in low sample volume, and it was concluded that suspended solids were likely present in the sample (Pacific Groundwater Group 2006). Rejected sample results were not included in the range, median, or n calculations. Total PCBs and cPAHs were detected in the rejected sample.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
cPAH – carcinogenic polycyclic aromatic hydrocarbon
CSO – combined sewer overflow
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
SCA – source control area
SD – storm drain
SQS – sediment quality standard
T-108 – Terminal 108

Table I-9. Summary of chemical concentrations detected in seeps in the Duwamish/Diagonal Way SCA

Facility	Chemical[a, b]	Year Collected	Location	Concentration Information (µg/L)[c, d]	Sources	Additional Information
Federal Center South	cadmium	2004	central portion of property at approximately RM 0.8	0.021 (dissolved) n = 1/1	Windward (2004)	Seep samples were collected as part of the LDW RI.
Federal Center South	lead	2004	central portion of property at approximately RM 0.8	0.056 (dissolved) n = 1/1	Windward (2004)	Seep samples were collected as part of the LDW RI.
Federal Center South	mercury	2004	central portion of property at approximately RM 0.8	0.00077 (dissolved) n = 1/1	Windward (2004)	Seep samples were collected as part of the LDW RI.
Federal Center South	silver	2004	central portion of property at approximately RM 0.8	0.081 (dissolved) n = 1/1	Windward (2004)	Seep samples were collected as part of the LDW RI.
Federal Center South	zinc	2004	central portion of property at approximately RM 0.8	5.35 (dissolved) n = 1/1	Windward (2004)	Seep samples were collected as part of the LDW RI.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Duwamish/Diagonal Way SCA.

[b] Chromium, total PCBs, BBP, BEHP, dimethyl phthalate, 2-methylnapthalene, benzo(a)anthracene, benzo(a)pyrene, benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, total HPAHs, total LPAHs, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 2,4-dimethylphenol, 4-methylphenol, benzoic acid, benzyl alcohol, n-nitrosodiphenylamine, and phenol were not detected, and dioxins and furans were not analyzed.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
CSO – combined sewer overflow
LDW – Lower Duwamish Waterway
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low- molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
RI – remedial investigation
RM – river mile
SCA – source control area
SD – storm drain
SQS – sediment quality standard

Table I-10. Summary of chemical concentrations detected in stormwater in the Duwamish/Diagonal Way SCA

Outfall	Chemical[a, b]	Year Collected	Location	Concentration Information (µg/L)[c, d]	Sources[e]	Additional Information
Duwamish/Diagonal CSO/SD	cadmium	1995	samples collected from two locations (the 8th Avenue S and S Hinds Street lateral and the 13th Avenue S and S Horton Street lateral); data for both locations presented together as one set in source documents)	0.4 – 1.3 median = nr n = 10/10	Stern (2002), as cited in Ecology (2004a)	Ten unfiltered stormwater samples were collected by King County. The data for both locations were presented together as one set in the source documents.
Duwamish/Diagonal CSO/SD	chromium	1995	samples collected from two locations (the 8th Avenue S and S Hinds Street lateral and the 13th Avenue S and S Horton Street lateral)	2 – 22 median = nr n = 10/10	Stern (2002), as cited in Ecology (2004a)	Ten unfiltered stormwater samples were collected by King County. The data for both locations were presented together as one set in the source documents.
Duwamish/Diagonal CSO/SD	lead	1995	samples collected from two locations (the 8th Avenue S and S Hinds Street lateral and the 13th Avenue S and S Horton Street lateral)	9 – 68 median = nr n = 10/10	Stern (2002), as cited in Ecology (2004a)	Ten unfiltered stormwater samples were collected by King County. The data for both locations were presented together as one set in the source documents.
Duwamish/Diagonal CSO/SD	mercury	1995	samples collected from two locations (the 8th Avenue S and S Hinds Street lateral and the 13th Avenue S and S Horton Street lateral)	0.3 n = 1/10	Stern (2002), as cited in Ecology (2004a)	Ten unfiltered stormwater samples were collected by King County. The data for both locations were presented together as one set in the source documents.
Duwamish/Diagonal CSO/SD	zinc	1995	samples collected from two locations (the 8th Avenue S and S Hinds Street lateral and the 13th Avenue S and S Horton Street lateral)	50 – 225 median = nr n = 10/10	Stern (2002), as cited in Ecology (2004a)	Ten unfiltered stormwater samples were collected by King County. The data for both locations were presented together as one set in the source documents.

Table I-10, cont. Summary of chemical concentrations detected in stormwater in the Duwamish/Diagonal Way SCA

Outfall	Chemical[a, b]	Year Collected	Location	Concentration Information (µg/L)[c, d]	Sources[e]	Additional Information
Duwamish/Diagonal CSO/SD	fluoranthene	1995	samples collected from two locations (the 8th Avenue S and S Hinds Street lateral and the 13th Avenue S and S Horton Street lateral)	0.84 n = 1/10	Stern (2002), as cited in Ecology (2004a)	Ten unfiltered stormwater samples were collected by King County. The data for both locations were presented together as one set in the source documents.
Duwamish/Diagonal CSO/SD	pyrene	1995	samples collected from two locations (the 8th Avenue S and S Hinds Street lateral and the 13th Avenue S and S Horton Street lateral)	0.998 n = 1/10	Stern (2002), as cited in Ecology (2004a)	Ten unfiltered stormwater samples were collected by King County. The data for both locations were presented together as one set in the source documents.
Duwamish/Diagonal CSO/SD	BEHP	1995	samples collected from two locations (the 8th Avenue S and S Hinds Street lateral and the 13th Avenue S and S Horton Street lateral)	0.9 – 14.7 median = nr n = 9/10	Stern (2002), as cited in Ecology (2004a)	Ten unfiltered stormwater samples were collected by King County. The data for both locations were presented together as one set in the source documents.
Duwamish/Diagonal CSO/SD	BBP	1995	samples collected from two locations (the 8th Avenue S and S Hinds Street lateral and the 13th Avenue S and S Horton Street lateral)	0.79 – 1 median = nr n = 5/10	Stern (2002), as cited in Ecology (2004a)	Ten unfiltered stormwater samples were collected by King County. The data for both locations were presented together as one set in the source documents.
Duwamish/Diagonal CSO/SD	dimethyl phthalate	1995	samples collected from two locations (the 8th Avenue S and S Hinds Street lateral and the 13th Avenue S and S Horton Street lateral)	0.825 n = 1/10	Stern (2002), as cited in Ecology (2004a)	Ten unfiltered stormwater samples were collected by King County. The data for both locations were presented together as one set in the source documents.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Duwamish/Diagonal Way SCA.

Table I-10, cont. Summary of chemical concentrations detected in stormwater in the Duwamish/Diagonal Way SCA

[b] Silver, total PCBs, 2-methylnapthalene, benzo(a)anthracene, benzo(a)pyrene, benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, total HPAHs, total LPAHs, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 2,4-dimethylphenol, 4-methylphenol, benzoic acid, benzyl alcohol, n-nitrosodiphenylamine, phenol, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
CSO – combined sewer overflow
Ecology – Washington State Department of Ecology
LPAH – low- molecular-weight polycyclic aromatic hydrocarbon
nr – not reported
PCBs – polychlorinated biphenyls
SCA – source control area
SD – storm drain
SQS – sediment quality standard

Several types of source-tracing data have been collected from the Diagonal Avenue S CSO/SD basin and from the Nevada Street and Diagonal Avenue S storm drains. Data reported in the SCAP (Ecology 2004a) and by SPU (Schmoyer 2008d) were reviewed. Table I-11 presents source-tracing data collected within the Duwamish/Diagonal Way SCA. Most of the source-tracing data from the Diagonal Avenue S CSO/SD basin were collected since 2002 as part of SPU's source-tracing program. Data collected prior to 2004 were included in Table I-11 only if newer data from the same sampling locations were not available. In the case of the Diagonal Avenue S and Nevada Street storm drains, the only source-tracing data available in source documents were collected in the mid-1980s. Data relevant to source-tracing efforts include data from various sample types, drainage lines, and in-line sediment trap samples. Map I-6 shows the locations of stormwater drainage lines and source-tracing samples within the Duwamish/Diagonal Way SCA.[12] Additional details on source-tracing sampling programs conducted within the Diagonal Avenue S CSO/SD SCA are presented in Section 9.4.4.7 of the main body of the RI. King County and SPU have inspected several businesses within this SCA as part of ongoing source control efforts. The business inspection program is discussed in Section 9.4.4.5 of the main body of the RI.

[12] Source-tracing sampling locations were mapped when coordinates were available. Therefore, not all source-tracing samples with chemical data are mapped.

Table I-11. Summary of chemical concentrations detected in source-tracing samples in the Duwamish/Diagonal Way SCA

Sample Source	Year Collected	Concentration Information (mg/kg dw)[a, b, c, d]					Concentration Information (µg/kg dw unless noted)[a, b, c, d]				Sources[e]	Additional Information
		Cadmium	Chromium	Lead	Mercury	Zinc	Benzo(a)-anthracene	Benzo(a)pyrene	Benzo(g,h,i)-perylene	Benzo-fluoranthenes		
Onsite Catch Basin Solids Samples												
Diagonal Avenue S CSO/SD (excluding Rainier Commons facility)[f]	2003 – 2005 and 2007	nr	nr	10 – 5,830 median = 120 n = 43/44	0.06 – 2.05 median = 0.14 n = 28/44	55 – 3,940 median = 430 n = 44/44	120 – 27,000 median = 610 n = 19/39	130 – 30,000 median = 510 n = 17/39	66 – 12,000 median = 370 n = 17/39	74 – 57,000 median = 1,300 n = 25/39	Schmoyer (2008d)	Multiple onsite catch basin solids samples were collected within the Diagonal Avenue S CSO/SD basin. The most recent round of data collected from each location is included in this data presentation.
Diagonal Avenue S CSO/SD (Rainier Commons facility)[f]	2005	nr	nr	430 n = 1/1	1.51 n = 1/1	1,810 n = 1/1	190 n = 1/1	98 n = 1/1	nd	370 n = 1/1	Schmoyer (2008d)	Four onsite catch basin solids samples were collected from the Rainier Commons facility. All samples were analyzed for PCBs; only one sample was analyzed for other chemicals.
ROW Catch Basin Solids Samples												
Diagonal Avenue S CSO/SD (excluding Rainier Commons facility)[f]	2004 - 2006	nr	nr	19 – 1,370 median = 100 n = 36/36	0.07 – 1.17 median = 0.2 n = 16/36	85 – 966 median = 265 n = 36/36	42 – 1,700 median = 280 n = 25/36	47 – 2,200 median = 260 n = 27/36	40 – 1,300 median = 180 n = 21/36	81 – 4,000 median = 490 n = 28/36	Schmoyer (2008d)	Multiple ROW catch basin solids samples were collected within the Diagonal Avenue S CSO/SD basin. Each location has been sampled one time.
Diagonal Avenue S CSO/SD (Rainier Commons facility)[f]	2004	nr	nr	61, 62 n = 2/2	nd	189, 213 n = 2/2	180, 520 n = 2/2	160, 420 n = 2/2	63, 130 n = 2/2	590, 1,300 n = 2/2	Schmoyer (2008d)	Six ROW catch basin solids samples were collected from the Rainier Commons facility. All samples were analyzed for PCBs; only two samples were analyzed for other chemicals.
In-line Sediment Trap Samples												
Diagonal Avenue S CSO/SD	2007	nr	nr	59 – 124 median = 95 n = 6/6	0.06 – 0.28 median = 0.12 n = 5/6	277 – 620 median = 430 n = 6/6	180 – 1,400 median = 270 n = 5/6	210 – 1,400 median = 310 n = 5/6	130 – 680 median = 170 n = 4/6	420 – 3,000 median = 770 n = 6/6	Schmoyer (2008d)	Samples were collected from six trap locations. Multiple rounds of samples were collected from each trap; the most recent round of data is included in this data presentation.
Other In-line Samples (e.g., manhole solids, sediment grabs)												
Diagonal Avenue S CSO/SD	2002 – 2004 and 2007	nr	nr	15 – 4,910 median = 60 n = 24/24	0.08 – 3.30 median = 0.61 n = 6/24	85 – 718 median = 245 n = 24/24	31 – 1,300 median = 260 n = 18/23	29 – 1,700 median = 250 n = 19/23	21 – 900 median = 110 n = 15/23	60 – 2,800 median = 360 n = 21/23	Schmoyer (2008d)	Multiple in-line solids samples, including manhole solids and sediment grabs, were collected within the Diagonal Avenue S CSO/SD basin. The most recent round of data collected from each location is included in this data presentation.
Diagonal Avenue S CSO/SD	1985	nr	nr	nr	nr	293, 419 n = 2/2	12, 210 mg/kg OC n = 2/2	3.4, 140 mg/kg OC n = 2/2	130 mg/kg OC n = 1/2	66, 350 mg/kg OC n = 2/2	Tetra Tech (1988) as cited in Ecology (2004a)	Samples were collected for the Elliott Bay Action Program.
Diagonal Avenue S SD	1985	nr	287 n = 1/1	nr	nr	675 n = 1/1	nr	nr	nr	nr	Tetra Tech (1988) as cited in Ecology (2004a)	Samples were collected for the Elliott Bay Action Program.
S Nevada Street SD	1985	12.3 n = 1/1	1,790 n = 1/1	1,330 n = 1/1	nr	654 n = 1/1	nr	nr	nr	nr	Tetra Tech (1988) as cited in Ecology (2004a)	Samples were collected for the Elliott Bay Action Program.

Table I-11, cont. Summary of chemical concentrations detected in source tracing samples in the Duwamish/Diagonal Way SCA

Sample Source	Year Collected	Concentration Information (µg/kg dw unless noted)[a, b, c, d]									Sources[e]	Additional information
		Chrysene	Dibenzo(a,h)-anthracene	Fluoranthene	Indeno(1,2,3-cd)-pyrene	Naphthalene	Phenanthrene	Pyrene	Total HPAHs[g]	Total LPAHs[g]		
Onsite Catch Basin Solids Samples												
Diagonal Avenue S CSO/SD (excluding Rainier Commons facility)[f]	2003 – 2005 and 2007	80 – 26,000 median = 705 n = 30/39	250 – 6,800 median = 630 n = 5/39	120 – 50,000 median = 1,400 n = 30/39	69 – 16,000 median = 280 n = 16/39	40 – 9,500 median = 1,700 n = 13/39	67 – 32,000 median = 1,400 n = 32/39	160 – 32,000 median = 1,400 n = 35/39	320 – 260,000 median = 4,800 n = 35/39	67 – 45,000 median = 2,700 n = 33/39	Schmoyer (2008d)	Multiple onsite catch basin solids samples were collected within the Diagonal Avenue S CSO/SD basin. The most recent round of data collected from each location is included in this data presentation.
Diagonal Avenue S CSO/SD (Rainier Commons facility)[f]	2005	280 n = 1/1	nd	920 n = 1/1	44 n = 1/1	2,500 n = 1/1	870 n = 1/1	490 n = 1/1	2,400 n = 1/1	3,500 n = 1/1	Schmoyer (2008d)	Four onsite catch basin solids samples were collected from the Rainier Commons facility. All samples were analyzed for PCBs; only one sample was analyzed for other chemicals.
ROW Catch Basin Solids Samples												
Diagonal Avenue S CSO/SD (excluding Rainier Commons facility)[f]	2004 - 2006	63 – 3,100 median = 370 n = 32/36	130, 590 n = 2/36	100 – 6,000 median = 585 n = 34/36	55 – 1,300 median = 270 n = 12/36	83 – 520 median = 180 n = 5/36	57 – 5,900 median = 460 n = 33/36	100 – 4,600 median = 550 n = 33/36	360 – 24,000 median = 1,800 n = 34/36	57 – 8,900 median = 560 n = 33/36	Schmoyer (2008d)	Multiple ROW catch basin solids samples were collected within the Diagonal Avenue S CSO/SD basin. Each location has been sampled one time.
Diagonal Avenue S CSO/SD (Rainier Commons facility)[f]	2004	360, 750 n = 2/2	nd	640, 1,700 n = 2/2	140 n = 1/2	70 n = 1/2	570, 1,000 n = 2/2	700, 1,600 n = 2/2	2,700, 6,600 n = 2/2	750, 1,500 n = 2/2	Schmoyer (2008d)	Six ROW catch basin solids samples were collected from the Rainier Commons facility. All samples were analyzed for PCBs; only two samples were analyzed for other chemicals.
In-line Sediment Trap Samples												
Diagonal Avenue S CSO/SD	2007	340 – 2,000 median = 520 n = 6/6	nd	630 – 4,600 median = 900 n = 6/6	100 – 620 median = 140 n = 3/6	nd	310 – 2,200 median = 520 n = 6/6	430 – 2,700 median = 700 n = 6/6	2,310 – 16,400 median = 3,600 n = 6/6	310 – 2,200 median = 570 n = 6/6	Schmoyer (2008d)	Samples were collected from six trap locations. Multiple rounds of samples were collected from each trap; the most recent round of data is included in this data presentation.

Table I-11, cont. Summary of chemical concentrations detected in source tracing samples in the Duwamish/Diagonal Way SCA

Sample Source	Year Collected	Concentration Information (µg/kg dw unless noted)[a, b, c, d]									Sources[e]	Additional information
		Chrysene	Dibenzo(a,h)-anthracene	Fluoranthene	Indeno(1,2,3-cd)-pyrene	Naphthalene	Phenanthrene	Pyrene	Total HPAHs[g]	Total LPAHs[g]		
Other In-line Samples (e.g., manhole solids, sediment grabs)												
Diagonal Avenue S CSO/SD	2002 – 2004 and 2007	42 – 2,300 median = 260 n = 22/23	100, 210 n = 2/23	52 – 4,100 median = 540 n = 22/23	23 – 1,000 median = 120 n = 13/23	41, 50 n = 2/23	54 – 4,000 median = 400 n = 18/23	49 – 4,200 median = 450 n = 22/23	140 – 15,000 median = 2,000 n = 22/23	54 – 4,000 median = 460 n = 18/23	Schmoyer (2008d)	Multiple in-line solids samples, including manhole solids and sediment grabs, were collected within the Diagonal Avenue S CSO/SD basin. The most recent round of data collected from each location is included in this data presentation.
Diagonal Avenue S CSO/SD	1985	29, 240 mg/kg OC n = 2/2	47 mg/kg OC n = 1/2	74, 230 mg/kg OC n = 2/2	170 mg/kg OC n = 1/2	nr	49, 270 mg/kg OC n = 2/2	nr	1,001, 1,697 mg/kg OC n = 2/2	379 mg/kg OC, 574 mg/kg OC n = 2/2	Tetra Tech (1988) as cited in Ecology (2004a)	Samples were collected for the Elliott Bay Action Program.
Diagonal Avenue S SD	1985	nr	nr	nr	85 mg/kg OC n = 1/1	nr	nr	nr	nr	nr	Tetra Tech (1988) as cited in Ecology (2004a)	Samples were collected for the Elliott Bay Action Program.
Nevada Street SD	1985	nr	nr	nr	nr	nr	nr	nr	nr	nr	Tetra Tech (1988) as cited in Ecology (2004a)	Samples were collected for the Elliott Bay Action Program.

Table I-11, cont. Summary of chemical concentrations detected in source tracing samples in the Duwamish/Diagonal Way SCA

Sample Source	Year Collected	Concentration Information (µg/kg dw unless noted)[a, b, c, d]									Sources[e]	Additional information
		BEHP	BBP	Dimethyl Phthalate	1,2-Dichloro-benzene	1,4-Dichlorobenzene	2,4-Dimethyl-phenol	4-Methylphenol	Phenol	Total PCBs[g]		
Onsite Catch Basin Solids Samples												
Diagonal Avenue S CSO/SD (excluding Rainier Commons facility)[f]	2003 – 2005 and 2007	130 – 200,000 median = 17,000 n = 39/39	20 – 18,000 median = 930 n = 27/39	nr	nr	nr	58 – 89,000 median = 1,800 n = 18/39	nr	52 – 5,700 median = 650 n = 11/39	18 – 3,200 median = 150 n = 28/39	Schmoyer (2008d)	Multiple onsite catch basin solids samples were collected within the Diagonal Avenue S CSO/SD basin. The most recent round of data collected from each location is included in this data presentation.
Diagonal Avenue S CSO/SD (Rainier Commons facility)[f]	2005	13,000 n = 1/1	1,000 n = 1/1	nr	nr	nr	17,000 n = 1/1	nr	1,900 n = 1/1	20,000 - 2,200,000 median = 760,000 n = 4/4	Schmoyer (2008d)	Four onsite catch basin solids samples were collected from the Rainier Commons facility. All samples were analyzed for PCBs; only one sample was analyzed for other chemicals.
ROW Catch Basin Solids Samples												
Diagonal Avenue S CSO/SD (excluding Rainier Commons facility)[f]	2004 - 2006	740 – 48,000 median = 4,200 n = 36/36	60 – 37,000 median = 300 n = 28/36	nr	nr	nr	nd	nr	58 – 2,000 median = 280 n = 6/36	21 – 670 median = 59 n = 22/36	Schmoyer (2008d)	Multiple ROW catch basin solids samples were collected within the Diagonal Avenue S CSO/SD basin. Each location has been sampled one time.
Diagonal Avenue S CSO/SD (Rainier Commons facility)[f]	2004	4,400, 8,300 n = 2/2	280, 410 n = 2/2	nr	nr	nr	nd	nr	nd	160 – 23,000 median = 9,800 n = 6/6	Schmoyer (2008d)	Six ROW catch basin solids samples were collected from the Rainier Commons facility. All samples were analyzed for PCBs; only two samples were analyzed for other chemicals.
In-line Sediment Trap Samples												
Diagonal Avenue S CSO/SD	2007	4,300 – 12,000 median = 7,100 n = 6/6	150 – 1,800 median = 280 n = 4/6	nr	nr	nr	nd	nr	93, 1,100 n = 2/6	101 – 890 median = 180 n = 6/6	Schmoyer (2008d)	Samples were collected from six trap locations. Multiple rounds of samples were collected from each trap; the most recent round of data is included in this data presentation.

Table I-11, cont. Summary of chemical concentrations detected in source tracing samples in the Duwamish/Diagonal Way SCA

Sample Source	Year Collected	Concentration Information (µg/kg dw unless noted)[a, b, c, d]									Sources[e]	Additional information
		BEHP	BBP	Dimethyl Phthalate	1,2-Dichloro-benzene	1,4-Dichlorobenzene	2,4-Dimethyl-phenol	4-Methylphenol	Phenol	Total PCBs[g]		
Other In-line Samples (e.g., manhole solids, sediment grabs)												
Diagonal Avenue S CSO/SD	2002 – 2004 and 2007	230 – 8,900 median = 1,400 n = 23/23	23 – 900 median = 87 n = 10/23	nr	nr	nr	110 – 7,500 median = 180 n = 3/23	nr	nd	20 – 940 median = 196 n = 10/23	Schmoyer (2008d)	Multiple in-line solids samples, including manhole solids and sediment grabs, were collected within the Diagonal Avenue S CSO/SD basin. The most recent round of data collected from each location is included in this data presentation.
Diagonal Avenue S CSO/SD	1985	nr	nr	56 mg/kg OC n = 1/2	39 mg/kg OC n = 1/2	5, 200, 7,100 mg/kg OC n = 2/2	nr	870, 5,900 mg/kg OC n = 2/2	75, 1,500 mg/kg OC n = 2/2	nr	Tetra Tech (1988) as cited in Ecology (2004a)	Samples were collected for the Elliott Bay Action Program.
Diagonal Avenue S SD	1985	nr	nr	nr	nr	nr	nr	nr	nr	nr	Tetra Tech (1988) as cited in Ecology (2004a)	Samples collected for the Elliott Bay Action Program.
Nevada Street SD	1985	nr	nr	nr	nr	nr	nr	nr	nr	nr	Tetra Tech (1988) as cited in Ecology (2004a)	

Note: If multiple rounds of data were available for a single location, only the data collected during the most recent event were presented in order to represent the most current conditions possible.

a Chemicals with at least one detected exceedance of an SQS in surface sediment within the Duwamish/Diagonal Way SCA.

b Silver, 2-methylnaphthalene, 1,2,4-trichlorobenzene, benzoic acid, benzyl alcohol, n-nitrosodiphenylamine, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

c Significant figures are reported as available in source documentation; when converting units (i.e., from mg/kg to µg/kg), the number of significant figures was kept consistent with the number in the reported value.

d n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

e Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

f Onsite and ROW catch basin sampling at the Rainier Commons facility (formerly the Rainier Brewery) identified PCB-containing paint present on the exterior of the building . The buildings at the facility have been pressure washed and repainted, and storm drain lines and catch basins have been cleaned. SPU is continuing source-tracing investigations at this facility.

g Only detected concentrations were used in calculating total HPAHs, total LPAHs, and total PCBs.

BEHP – bis(2-ethylhexyl) phthalate
BBP – butyl benzyl phthalate
CSO – combined sewer overflow
dw – dry weight
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
nd – not detected
nr – not reported
OC – organic carbon
PCB – polychlorinated biphenyl
ROW – right-of-way
SCA – source control area
SD – storm drain
SPU – Seattle Public Utilities
SQS – sediment quality standard

An early action sediment removal was initiated in 1994 in response to elevated chemical concentrations in surface sediment in that area. Removal actions including sediment dredging and capping were implemented in a portion of the SCA sediment area between November 2003 and March 2004 (King County et al. 2005). Between November 2003 and January 2004, sediment was dredged from an approximately 7-ac area between River Mile (RM) 0.4 and RM 0.6 (Maps I-7 and I-8). The dredged area was then capped between January and March of 2004 by placing clean cap material over a 5-ac rectangle (Area A) and a 2-ac rectangle (Area B), as shown on Maps I-7 and I-8.

Prior to the removal actions, BEHP had the most exceedances of SMS criteria in surface sediment in the area (26 CSL and 14 SQS), followed by BBP (3 CSL and 23 SQS), total PCBs (7 CSL and 27 SQS), and mercury (3 CSL and 5 SQS) (Map I-3). CSL exceedances of metals (i.e., cadmium, chromium, and silver) were detected in the southern dredged area. PAHs exceeded the CSL primarily in the northern dredged area within the vicinity of the Diagonal Ave S CSO/SD and Duwamish EOF outfalls, and one sample had a dioxin and furan TEQ of 180 ng/kg dw in this area. Monitoring of surface sediment chemistry was conducted prior to and following completion of removal activities. Monitoring events were conducted in October 2003, March and June 2004, January, March, April, and August[13] 2005, March 2006, and April 2007 (Table I-12). Monitoring data for total PCBs and BEHP collected within the capped areas are shown on Map I-7, and data collected from the thin-layer placement area are presented on Map I-8. These data provide information on the quality of sediment that is currently accumulating in this portion of the Duwamish/Diagonal Way SCA. Long-term sediment monitoring of the removal area will continue until 2014.

Table I-12. Monitoring information for the Area A cap, Area B cap, and thin-layer placement area

Sampling Event	Date	Stations Monitored[a]	Detected Chemicals Exceeding SQS	Detected Chemicals Exceeding CSL	Notes
Duwamish/Diagonal perimeter monitoring – pre dredge	October 2003	3C, 4C, 5C, 6C, 7C	mercury, BEHP, 1,4-dichlorobenzene, total PCBs	1,4-dichlorobenzene, total PCBs	thin-layer cap stations monitored prior to initiation of dredging and capping activities
Duwamish/Diagonal March 2004 post-dredge perimeter sediment characterization	March 2004	3C, 4C, 5C, 6C, 7C	BEHP, BBP, total PCBs	BEHP, total PCBs	thin-layer cap stations monitored just after placement of Area A and B caps but prior to placement of thin-layer cap

[13] Only monitoring station 2B was sampled in August 2005.

Sampling Event	Date	Stations Monitored[a]	Detected Chemicals Exceeding SQS	Detected Chemicals Exceeding CSL	Notes
Duwamish/Diagonal June 2004 baseline cap monitoring – year 0 (post-cap placement)	June 2004[b]	1A, 2A, 4A, 5A, 1B, 2B, 3B	BEHP	None	Area A cap and Area B cap stations monitored after dredging and capping completed in these areas
Duwamish/Diagonal January-February 2005 post-dredge perimeter – before thin-layer cap placement	January 2005	3C, 4C, 5C, 6C, 7C, 14C, 15C	BEHP, total PCBs	total PCBs	thin-layer cap stations monitored prior to placement of a thin layer of clean material
Duwamish/Diagonal March 2005 post-dredge perimeter – after thin-layer cap placement	March 2005	3C, 4C, 5C, 6C, 7C, 14C, 15C	None	None	thin-layer cap stations monitored after placement of thin layer clean material
Duwamish/Diagonal April 2005 baseline cap monitoring – year 1	April 2005[c]	1A, 2A, 3A, 4A, 5A, 1B	fluoranthene, BEHP, BBP, dimethyl phthalate, benzyl alcohol, total PCBs	BEHP, benzyl alcohol	Area A cap and Area B cap stations monitored after dredging, capping, and thin-layer placement
Duwamish/Diagonal August 2005 baseline cap monitoring – year 1	August 2005	2B	None	None	one station on Area B cap monitored after dredging, capping, and thin-layer placement
Duwamish/Diagonal March 2006 cap monitoring – year 2, perimeter sediment characterization and enhanced natural recovery cap sediment characterization – year 1	March 2006	1A, 2A, 3A, 4A, 5A, 1B, 2B, 3B, 3C, 4C, 5C, 6C, 7C, 14C, 15C	BEHP, BBP, benzoic acid, total PCBs	BEHP, benzoic acid	Area A cap, Area B cap, and thin-layer cap stations monitored after dredging, capping, and thin-layer placement
Duwamish/Diagonal March 2007 cap monitoring – year 3	April 2007	1A, 2A, 3A, 4A, 5A, 1B, 2B, 3B, 3C, 4C, 5C, 6C, 7C, 14C, 15C	BEHP, BBP	BEHP	Area A Cap, Area B Cap, and thin-layer cap stations monitored after dredging, capping, and thin-layer placement

[a] Station locations that include an "A" are located within the Area A cap, locations that include a "B" are located within the Area B cap, and locations that include a "C" are located within the thin-layer cap area.

[b] Location 3A was not sampled in June 2004 because the substrate was cobble.

[c] Locations 2B and 3B were not sampled in April 2005 because the presence of barges would not allow access to the sampling locations.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
CSL – cleanup screening level
PCB – polychlorinated biphenyl
SCA – source control area
SQS – sediment quality standard

Dredging and capping were completed in cap Areas A and B in June 2004. Monitoring data collected in these areas from June 2004 to March 2006 showed that fluoranthene, BEHP, BBP, dimethyl phthalate, benzyl alcohol, benzoic acid, and total PCBs have been detected above SMS criteria in at least one round of monitoring (Table I-12). In the most recent monitoring round, conducted in April 2007, only BEHP and BBP were detected at concentrations that exceeded SMS criteria in these areas. Temporal trends in BEHP and total PCB concentrations in cap Areas A and B during the monitoring period are shown on Map I-7. BEHP concentrations have declined over the monitoring period in samples collected within the vicinity of the Diagonal Avenue S CSO/SD and Duwamish EOF outfalls (Map I-7).

A thin layer of clean sand material was placed south and west of cap Areas A and B in February 2005. No chemicals were detected in this area above SMS criteria in any of the monitoring samples collected in this area in March 2005, March 2006, and April 2007[14]. Concentrations of total PCBs and BEHP in this area declined after placement of the clean sand material in February 2005 (Map I-8).

Monitoring is ongoing in the dredged and capped areas of the Duwamish/Diagonal Way SCA. In addition, source-tracing efforts, other source control activities, and remedial actions are ongoing in the SCA. Ecology will continue to publish source control status updates for the Duwamish/Diagonal Way SCA and the greater LDW study area. For the most current information on the Duwamish/Diagonal Way SCA, visit Ecology's website.

I.4.2 SLIP 3 TO SEATTLE BOILER WORKS SOURCE CONTROL AREA (RM 2.0 E TO RM 2.2 E)

The Slip 3 to Seattle Boiler Works SCA[15] is one of 23 areas identified by Ecology along the LDW for source control evaluation. A data gaps report for the Slip 3 to Seattle Boiler Works SCA was prepared in 2008 (Ecology and Environment 2008a); the completion of a SCAP is currently scheduled for 2010. The data gaps report will be referred to as the "source document" throughout this section and on associated maps.

CSL exceedances in surface sediment in this SCA included benzyl alcohol and SQS exceedances included arsenic. These exceedances are based on the RI baseline surface sediment dataset and the 2007 SCA boundary, as discussed in the introduction to this appendix. Ecology has identified COCs for this SCA based on different criteria (Table I-3); therefore, the chemicals identified for summary in this appendix are different than the COCs identified by Ecology. Surface sediment chemistry information for this SCA is provided on Map I-9.

---

[14] Chemicals listed in Table I-12 as exceeding SMS criteria in the March 2006 and April 2007 monitoring events were detected at locations within cap Area A only.

[15] In other documents, this SCA is sometimes referred to as the RM 2.0 to RM 2.3 East SCA.

Commercial and industrial operations in the vicinity of the Slip 3 to Seattle Boiler Works SCA include cargo transport, barge berthing, general warehousing and cold storage (current and historical); oil storage and distribution (current); shipbuilding, truck storage and maintenance (current and historical); and auto repair (historical). Historically, residential areas were also located in the vicinity of the Slip 3 to Seattle Boiler Works SCA.

Several upland facilities were discussed in the source document associated with the Slip 3 to Seattle Boiler Works SCA. Adjacent facilities included Bunge Foods,[16] Glacier Marine Services, Seattle Distribution Center, SCS Refrigerated Services, Rainier Petroleum, and Muckleshoot Seafood Products (Map I-10). Upland properties included Cascade Columbia Distribution, Schultz Distributing, South Seattle Community College, Riverside Industrial Park, and the V. Van Dyke property (Ecology and Environment 2008a) (Map I-11). Table I-13 summarizes facility-specific information for the adjacent facilities. The upland facilities are not included in this summary (Table I-2) because of the lack of source-tracing data (see the introduction for more information on facility selection criteria). The data gaps report and SCAP should be reviewed for additional information on all facilities associated with this SCA.

[16] The Bunge Foods facility is also included in the Seattle Boiler Works to Slip 4 SCA; in the source documents for that SCA, the facility is referred to as the Guimont Parcel and Dawn Food Products.

Table I-13. Summary of facility information for the Slip 3 to Seattle Boiler Works SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/ Investigations
Bunge Foods[b]	William P. Guimont	distribution warehouse	food supplier, manufacturer of wooden igloos, shipyard, gasoline station	No environmental investigations were reported.	No remedial activities were reported.	No source control activities or investigations were reported.
Glacier Marine Services	Seatac Marine Properties	marine equipment shipping (assumed based on historical operations at Northland Services)	paint factory; industrial manufacturing; seafood products; shipbuilding, repair, and construction; marine shipping	Sampling of storm drain solids, sediment, and water has been conducted. A dive survey and site assessment were also conducted.	Three USTs were removed in 1993.	Hazardous waste compliance inspections were conducted in 1989 and 2002.
Seattle Distribution Center	CLPF-Seattle Distribution Center	warehouses for distribution of products	lumber facility, mill, ice manufacturing	No environmental investigations were reported.	No remedial activities were reported.	No source control activities or investigations were reported.
SCS Refrigerated Services	SCS Holdings	cold storage, refrigerated warehouse space (facility is currently for sale and the business is relocating)	residences, boat shop, concrete block factory, log facility, cold storage, ice manufacturing	Sediment sampling was conducted in 2006.	No remedial activities were reported.	A NPDES stormwater compliance inspection was conducted by Ecology in 2007.
Rainier Petroleum	Rainier Petroleum Corporation[c]	not reported	historical operations not reported	No environmental investigations were reported.	No remedial activities were reported.	No source control activities or investigations were reported.
Muckleshoot Seafood Products	Muckleshoot Tribe[c]	not reported	historical operations not reported. but facility previously owned by Silver Bay Logging Inc.	No environmental investigations were reported.	No remedial activities were reported.	No source control activities or investigations were reported.

Source: Ecology and Environment (2008a)

[a] Facilities listed are those identified as adjacent properties in the source document. None of the identified upland properties had source-tracing data and thus were not included in this table.

[b] The Bunge Foods property is also included in the Seattle Boiler Works to Slip 4 SCA; in the source documents for that SCA, the property is referred to as the Guimont Parcel and Dawn Food Products.

[c] Ownership information for these facilities was not reported in the source document; these entities were listed as the property taxpayers on the King County parcel viewer webpage (King County 2008b).

NPDES – National Pollutant Discharge Elimination System

SCA – source control area

UST – underground storage tank

Two outfalls were observed in the Slip 3 to Seattle Boiler Works SCA during the 2003 LDW outfall survey (Herrera 2004): the South Brighton Street CSO/SD, which was identified as a major outfall in the source document; and a permitted private storm drain owned by SCS Holdings (No. 2024), which is located at the head of Slip 3 (Map I-9).[17] Information on these outfalls is provided on Table I-14; additional details are provided in Appendix H.

Three additional outfalls (not identified in the 2003 LDW outfall survey) are discussed in information on SCS Holdings' National Pollutant Discharge Elimination System (NPDES) permit; it is unclear from the information provided whether these three outfalls discharge to the LDW or discharge to the municipal storm drain system (Ecology and Environment 2008a). The source document also refers to a South River Street SD and another permitted private SD, but these outfalls were also not found during the 2003 outfall survey (Herrera 2004). SPU later dye tested the S River St SD to confirm its location (Schmoyer 2009), which is shown on Map I-11.

[17] A seep was also identified during the LDW outfall survey (Herrera 2004) in the southeast corner of Slip 3. The seep was located in an area where an outfall was expected (but not found) and was assigned ID No. 2025. This seep location is mapped as an outfall and a seep (No. 2025) in the source document, as shown on Map I-11.

Table I-14. Summary of specific information for outfalls in the Slip 3 to Seattle Boiler Works SCA

Outfall	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
Outfalls Identified in the Data Gaps Report as Major Outfalls[a]					
South Brighton Street CSO/SD (No. 116)	Seattle Public Utilities	CSO/SD drains approximately 18 acres, including Glacier Marine Services, Shultz Distributing, and the southern portion of the Seattle Distribution Center. The CSO service area encompasses approximately 29 acres located on the east side of E Marginal Way S.	Stormwater from MP&E may have been discharged through South Brighton Street CSO/SD.	No environmental or source-tracing investigations were reported.	SPU has been monitoring overflow volumes and frequencies at this station since 2000. No overflows have been recorded.
South River Street SD[b]	Seattle Public Utilities	SD drains an area of about 7.6 acres located on north side of S River St between E Marginal Way W and the 1st Ave S bridge.	No historical operations were reported.	A source-tracing sample was collected in 1986 from South River Street, near the present-day Muckleshoot Seafood Products facility.	No remedial or source control activities were reported.
Other Outfalls[c]					
SCS Refrigerated Services Permitted Private SD outfall (No. 2024)[d]	SCS Holdings	Concrete outfall (12-in.) that drains SCS Refrigerated Services and the northern portion of the Seattle Distribution Center.	No historical operations were reported.	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.
Private SD[e]	not reported	not reported	not reported	not reported	not reported

Source: Ecology and Environment (2008a)

[a] Major outfalls listed are those discussed as individual source control entities in the source documents.

[b] The South River Street SD was not identified during the LDW outfall survey (Herrera 2004); therefore, it is not included on Map I-9 or Map I-10. Since completion of the outfall survey, SPU identified the location of the S River Street SD with dye testing. It is located at the end of S River Street under the 1st Avenue S bridge. The location of the outfall is identified on Map I-11.

[c] Map I-11 shows an outfall in the southeast corner of Slip 3 (No. 2025). This is the location where a seep was identified during the LDW outfall survey (Herrera 2004). An outfall was expected at this location but was not identified.

[d] According to the data gaps report (2008a), three outfalls are covered under the NPDES permit for SCS Refrigerated Services. The only outfall that was identified during the LDW outfall survey (Herrera 2004) at this facility was outfall No. 2024; the data gaps report states that the other two outfalls either discharge through outfall No. 2024 or discharge to the City of Seattle storm drain system.

[e] Based on information in the data gaps report (2008a), this outfall potentially discharges from the Glacier Marine Services facility. The outfall was not identified during the LDW outfall survey (Herrera 2004), and no additional information was provided for it in the data gaps report.

CSO – combined sewer outfall
ID – identification
MP&E – Marine Power and Equipment
SCA – source control area
SD – storm drain
SPU – Seattle Public Utilities

Few remedial activities and environmental investigations have been completed within the Slip 3 to Seattle Boiler Works SCA (Tables I-13 and I-14). Information about these activities has been summarized in the data gaps report (Ecology and Environment 2008a). The two chemicals detected above the SQS in surface sediment within the Slip 3 to Seattle Boiler Works SCA have also been detected in various other media, including soil, porewater, stormwater, and source-tracing samples (Table I-15). The availability of data (by media type) is also presented in the table on Map I-10 for each of the facilities and major outfalls associated with this SCA. In both Table I-15 and the table on Map I-10, an X indicates that the source documents reported data or indicated that data exist; therefore, an X does not necessarily mean that the actual data were presented in the source document. Data are only summarized in the media-specific and source-tracing tables if the data were reported in the source documents and if they met the criteria for data summation discussed in the introduction to this appendix (e.g., soil data were collected along the SCA shoreline; groundwater data were collected from shoreline facilities). The identification of a chemical in these media at facilities or within the drainage systems does not necessarily indicate that these potential sources contributed to sediment contamination in the past or that they will result in sediment contamination in the future.

Table I-15. Chemicals identified in various media in the Slip 3 to Seattle Boiler Works SCA

Chemical[a]	Soil	Groundwater[b]	Seep[c]	Porewater	Stormwater	Source-Tracing Samples	Sources
Arsenic	X			X	X	X	Ecology and Environment (2008a), Weston (1999)
Benzyl alcohol	X						Ecology and Environment (2008a)

Note: An X indicates that the source document reported that data are available for the identified media. The absence of an X in any cell does not necessarily mean that the chemical is absent in the upland media or in source-tracing samples; in some cases, the chemical may not have been analyzed for or, if analyzed, could have been present but at concentrations below the RL.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 3 to Seattle Boiler Works SCA. The chemical list is based on SMS exceedances in the RI baseline surface sediment dataset within the 2007 SCA boundary. Therefore, this list may differ from the list of exceedances in source documents.

[b] No groundwater data were identified in the source documents for any chemical.

[c] Two seep samples were collected along the Bunge Foods/Guimont Parcel shoreline as part of the LDW seep study (Windward 2006). The seep samples were collected as part of investigations to characterize the Great Western International facility (this facility is also referred to as the Fox Avenue Building and Fox Avenue Building No. 2, which are associated with the Seattle Boiler Works to Slip 4 SCA) and were analyzed for VOCs. Arsenic and benzyl alcohol were not analyzed in either of the seep samples; therefore, no seep data are provided in this section. Information on these seeps is provided in association with the Bunge Foods/Guimont Parcel and the Great Western International facilities in Table 9-15 of the main body of the RI.

LDW – Lower Duwamish Waterway
RI – remedial investigation
RL – reporting limit
SCA – source control area
SMS – Washington State Sediment Management Standards
SQS – sediment quality standard
VOC – volatile organic compound

Data in the media tables were included only if specific concentrations or a range of concentrations was included in these reports or if these data were presented in a section of the main body of the RI. The following is a summary of the upland data as they were presented in the source document for stormwater and source-tracing samples. Soil data are not presented in this section because no bank soil data were available for this SCA. No specific groundwater data were provided in the source document; however, data from one porewater sample were available for this SCA (Table I-16). Two seep samples were collected near the Bunge Foods/Guimont Parcel shoreline; however, neither was analyzed for arsenic or benzyl alcohol and so seep data are not presented in this section. Additional porewater information for Glacier Marine Services and seep information for Bunge Foods is also summarized in Table 9-15 in the main body of the RI. Data from the one stormwater sample collected within the Slip 3 to Seattle Boiler Works SCA were available in the source document and are summarized in Table I-17.

Table I-16. Summary of chemical concentrations detected in the porewater sample collected from the Slip 3 to Seattle Boiler Works SCA

Facility	Chemical[a, b]	Year Collected	Location	Concentration Information (µg/L)[c, d]	Source	Additional Information
Glacier Marine Services	arsenic	1998	offshore from facility within Slip 3	103 n = 1/1	Weston (1999)	Sample was collected near center of Slip 3 offshore from Glacier Marine Services.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 3 to Seattle Boiler Works SCA.

[b] Benzyl alcohol was either not analyzed or was not detected, or the data for this chemical were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. .

SCA – source control area

SQS – sediment quality standard

Table I-17. Summary of chemical concentrations detected in the stormwater sample from the Slip 3 to Seattle Boiler Works SCA

Facility	Chemical[a, b]	Year Collected	Location	Concentration Information (µg/L)[c, d]	Source	Additional Information
Glacier Marine Services	arsenic	1984	northwest portion of property	6.5 n = 1/1	Ecology and Environment (2008a)	Sample is a dock runoff water sample.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 3 to Seattle Boiler Works SCA.

[b] Benzyl alcohol was either not analyzed or was not detected, or the data for this chemical were not reported in the source documents in a format that would allow them to be summarized in this table. .

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed.

SCA – source control area

SQS – sediment quality standard

Source-tracing samples have been collected from Glacier Marine Services and from the South River Street SD; data from these samples were reported in the source document (Table I-18). The drainage basins for Slip 3 to Seattle Boiler Works SCA are presented on Map I-11. Additional details on source-tracing sampling programs conducted within the larger LDW drainage basin are presented in Section 9.4.4.7 of the main body of the RI.

Table I-18. Summary of chemical concentrations detected in source-tracing samples from the Slip 3 to Seattle Boiler Works SCA

Sample Source	Year Collected	Arsenic (mg/kg dw) [a, b, c, d]	Source	Additional Information
Storm Drain Solids				
Glacier Marine Services	1984	26.5 – 3,709 median = 215 n = 7/7	Ecology and Environment (2008a)	Samples were collected from the north and west sides of the facility when the site was occupied by MP&E.
Glacier Marine Services	1986	111.8 – 3,871[e] median = 2,043.5 n = 11/11	Ecology and Environment (2008a)	Samples were collected from the north and west sides of the facility when the site was occupied by MP&E.
South River Street SD	1986	183.3 n = 1/1	Ecology and Environment (2008a)	Sample was collected from South River Street, near the Muckleshoot Seafood Products facility.

Note: If multiple rounds of data were available for a single location, only the data collected during the most recent event were presented in order to represent the most current conditions possible.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 3 to Seattle Boiler Works SCA.

[b] Benzyl alcohol was either not analyzed or was not detected, or the data for this chemical were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (e.g., from µg/kg to mg/kg), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] The source document did not specify if the chemical concentrations were dry weight.

dw – dry weight

MP&E – Marine Power and Equipment

RM – river mile

SCA – source control area

SQS – sediment quality standard

Limited investigation work has been completed within the Slip 3 to Seattle Boiler Works SCA; however, source identification and control efforts are ongoing. Additional information on the Slip 3 to Seattle Boiler Works SCA is provided on Ecology's website.

I.4.3 SEATTLE BOILER WORKS TO SLIP 4 SOURCE CONTROL AREA (RM 2.2 E TO RM 2.9 E)

The Seattle Boiler Works to Slip 4 SCA is one of 23 areas identified by Ecology along the LDW for source control evaluation. As part of ongoing source control efforts for this SCA, a data gaps report was completed in May 2008 (SAIC 2008a). A draft SCAP is scheduled for release in December 2008. In addition to the data gaps report, the seep survey conducted for the RI (Windward 2004) was also reviewed. These documents are referred to collectively as the "source documents" throughout this section and on the associated maps.

Surface sediment samples collected from this SCA had CSL exceedances of total PCBs and mercury and SQS exceedances of total PCBs, mercury, and fluoranthene. These exceedances are based on the RI baseline surface sediment dataset and the 2007 SCA boundary, as discussed in the introduction to this appendix. Ecology has identified COCs for this SCA based on different criteria (Table I-3); therefore, the chemicals identified for summary in this appendix are different than the COCs identified by Ecology. Map I-12 provides a summary of the RI baseline surface sediment data for this SCA. This SCA does not include Slip 4, which is discussed in Section I.4.4.[18]

Commercial and industrial operations in the vicinity of the Seattle Boiler Works to Slip 4 SCA include warehousing (current), storage (current), shipping (current), fabrication of metal products (current); sale of recyclable metal (current); trucking (historical and current); processing of construction, demolition, and land-clearing debris (current); pipe-dipping (historical), pole dipping (historical), food supply (historical); wooden igloo manufacturing (historical); steel construction (historical); transportation of hazardous waste (historical); marine construction (historical); trailer manufacturing (historical); and metal salvage (historical). Facilities in the vicinity also included a pumping station (current), lumber mill (historical), shipyard (historical), gas station (historical), seafood company (historical), a dump truck company (historical), machine shops (historical), and a pipe company (historical).

Adjacent facilities in the SCA that were identified in the data gaps report included Crowley Marine Services, the Bunge Foods/Guimont Parcel (Dawn Food Products),[19]

---

[18] Information for Crowley Marine Services is included in this section as well as in Section I.4.4 (Slip 4 SCA). Presentation of the information was divided according to the location of the sample. Information on the direction of groundwater flow was not sufficient to determine which SCA receives groundwater discharge represented by monitoring wells on the Crowley property. Therefore, all groundwater data are discussed in Section I.4.4 (Slip 4 SCA) to keep the data together. One source-tracing sample was collected from a catch basin on the Crowley property. Data for this catch basin sample are included in the Slip 4 SCA because that drainage likely discharges to the Slip 4 SCA based on the location of the catch basin.

[19] The Guimont Parcel (Dawn Food Products) is also included in the Slip 3 to Seattle Boiler Works SCA; in the source documents for that SCA, the facility is referred to as Bunge Foods.

Puget Sound Truck Lines, Seattle Boiler Works, Seattle City Light Pumping Station, and Seattle Iron & Metals Corporation (Map I-13).

Facility-specific information for adjacent properties is summarized in Table I-19. In addition to the adjacent properties, the data gaps report also identified the following upland properties: Great Western International (Fox Avenue Building and Fox Avenue Building No. 2),[20] El Gallo D'Oro/James Dore, Markey Machinery Company, Nelson Trucking, Nitze-Stagen/Frye parcels, former Sternoff parcel, Trim Systems, Whitehead Company, Inc./former Tyee Industries, and Whitehead Company, Inc./former Perkins lot. With the exception of the former Sternoff parcel,[21] these upland properties are not included in this summary (Table I-2) because source-tracing data were not available in the source documents (see the introduction for more information on facility selection criteria). Groundwater information for the Great Western International facility (Fox Avenue Buildings) is summarized in Section 9.4.6 of the main body of the RI. The data gaps report and SCAP should be reviewed for additional information on all facilities associated with this SCA.

[20] Ecology has completed negotiations for the Agreed Order for the Fox Avenue site under MTCA.

[21] Stormwater from the former Sternoff parcel drains to the combined sewer system, not to the Seattle Boiler Works to Slip 4 SCA (SAIC 2008a).

Table I-19. Summary of facility information for the Seattle Boiler Works to Slip 4 SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/ Investigations
Crowley Marine Services	Crowley Marine Services	container storage, shipping, and barge berthing (tenant is Alaska Logistics)	manufacturing facilities, pipe-dipping, lumber mill, and pole-dipping	Several environmental investigations and site inspections have been conducted. They were related to tank leaks, site characterization and hazard assessment, and characterization in preparation for Slip 4 sediment removal action. There are plans for an RI/FS to be conducted on the property (Sutton 2008a).	Several USTs have been removed. An RI/FS will be conducted at the property under a MTCA order. The Agreed Order is being negotiated between Ecology and the identified PLPs (Sutton 2008b). After completion of the order, a work plan for the RI/FS will be developed.	Source-tracing investigations and business inspections have been conducted; however, site operations have changed since these investigations were conducted. Additional source control activities and investigations will be conducted at the facility as part of the RI/FS, as necessary (Sutton 2008b).
Guimont Parcel/ Bunge Foods (Dawn Food Products)[b]	William P. Guimont	distribution warehouse	food supplier, manufacturer of wooden igloos, shipyard, gasoline station	No environmental investigations were reported.	No remedial activities were reported.	No source control activities or investigations were reported.
Puget Sound Truck Lines	R&A Properties; Puget Sound Truck Lines	truckload carrier of general freight commodities and bulk wood residuals	pipe company	No environmental investigations were reported.	Soil cleanup activities related to a LUST were conducted in 1995.	SPU inspected the facility in 2007 (Schmoyer 2008e).
Seattle Boiler Works	Frederick J. Hopkins Family Trust	fabrication of metal products (e.g., storage tanks, pressure vessels, boilers, heat exchangers, columns, stacks, and tank heaters)	steel construction	No environmental investigations were reported.	No remedial activities were reported.	A stormwater compliance inspection was conducted by Ecology in 2007.
Seattle City Light	Seattle City Light	pumping station	not reported	No environmental investigations were reported.	No remedial activities were reported.	No source control activities or investigations were reported.

Table I-19, cont. Summary of facility information for the Seattle Boiler Works to Slip 4 SCA

FACILITY[a]	CURRENT OWNERSHIP	CURRENT OPERATIONS	HISTORICAL OPERATIONS	ENVIRONMENTAL INVESTIGATIONS	REMEDIAL ACTIVITIES	SOURCE CONTROL ACTIVITIES/ INVESTIGATIONS
Seattle Iron & Metals Corporation	Shalmar Group	recyclable metal wholesaler	seafood company, transportation of hazardous waste, marine construction, machine shops, pipe company, trucking company	Soil investigations have been conducted.	An independent remedial action (i.e., capping) was conducted prior to 1998 in response to soil and groundwater contamination. A restrictive covenant was placed on the property, and an NFA was issued.	Stormwater compliance inspections were conducted by Ecology. Ecology recently issued an order to improve an onsite stormwater treatment facility (Schmoyer 2008e).
Sternoff parcel (former)	Ellis Garage	processing of construction, demolition, and land-clearing debris	manufacturing of trailers for logging trucks, metal salvage yard, dump truck hauling	Groundwater and soil sampling was conducted in 1986. In 1986, Ecology performed inspections related to concerns over a potential cement batch plant and a water treatment system on the property. Another soil and groundwater investigation and an FS were also completed after 1986. Storm drains and floor drains were sampled during the FS. Groundwater and soil were sampled again in 1999. SPU conducted a dye test on the property in 2006.	A trash pile and underlying soils were removed in 1999.	Storm drain sediments were cleaned out in 1987. Catch basins have been cleaned in 2006.

Source: SAIC (2008a)

[a] Facilities listed are those identified as adjacent properties in the data gaps report (SAIC 2008a). The former Sternoff parcel (identified as an upland property in the source documents) is also included because source-tracing data were included in the source documents; however, most of the runoff from the parcel discharges to the combined sewer system, not to the Seattle Boiler Works to Slip 4 SCA (SAIC 2008a). A portion of the driveway entrance drains to the street; however, most of this runoff ponds in the right-of-way and does not reach the waterway because there is no formal drainage system in this area (Schmoyer 2009).

[b] The Guimont Parcel (Dawn Food Products) is also included in the Slip 3 to Seattle Boiler Works SCA; in the source documents for that SCA, the facility is referred to as Bunge Foods.

FS – feasibility study
LUST – leaking underground storage tank
MTCA – Model Toxics Control Act
NFA – no further action
PLP – potentially liable party
RI – remedial investigation
SCA – source control area
SPU – Seattle Public Utilities
UST – underground storage tank

Sixteen outfalls currently drain to the Seattle Boiler Works to Slip 4 SCA: two public outfalls and fourteen private storm drains. Both public storm drains (Nos. 2026 and 2035) are owned and operated by the City of Seattle. Six of the private storm drains are listed under Frederick Hopkins (see Appendix H). Five of the other private storm drains are permitted to Puget Sound Truck Lines (four are associated with R&A Properties; one is associated with S Othello Street). Two additional private storm drains are listed under Crowley Marine Services. The remaining private storm drain is likely permitted under Seattle Iron & Metal Works.

Three additional private outfalls on the Crowley Marine Services property, near the southern tip of the Seattle Boiler Works to Slip 4 SCA, discharge to Slip 4 and are discussed in Section I.4.4 (Slip 4 SCA). Another outfall (No. 2041) located on the Seattle City Light parcel was originally identified as the old cooling water intake for the Georgetown Steam Plant (GTSP) (SAIC 2008a) and listed as "not an outfall" (SAIC 2008a; Herrera 2004). More recent investigations have determined that it is a pipe of unknown origin (Schmoyer 2009). Information on the outfalls within the Seattle Boiler Works to Slip 4 SCA is summarized in Table I-20 and the locations of these outfalls are provided on Map I-12; see Appendix H for additional outfall information.

Table I-20. Summary of specific information for outfalls in the Seattle Boiler Works to Slip 4 SCA

Outfall	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
Outfalls Identified as Major Outfalls by Ecology[a]					
Public SD outfall at S Myrtle Street (No. 2026)	SPU	Outfall collects runoff from S Myrtle Street and properties located on the south side of S Myrtle Street (Schmoyer 2008e).	No historical operations were reported.	No environmental or source-tracing investigations were reported.	SPU collected samples for source-tracing in 2009 (Schmoyer 2008e).
Public SD outfall at S Garden Street (No. 2035)	SPU	Outfall receives effluent from the Seattle Iron and Metals onsite stormwater treatment system and collects runoff from S Garden Street and other parcels located along S Garden Street up to 8th Avenue S (Schmoyer 2008e).	No historical operations were reported.	No environmental or source-tracing investigations were reported.	SPU collected samples for source-tracing in 2009 (Schmoyer 2008e).
Other Outfalls					
Crowley Marine permitted private SD outfalls (Nos. 2042 and 5006)	Crowley Marine	No current operations were reported.	No historical operations were reported.	SPU collected one sediment sample from an onsite catch basin in 2004.	Stormwater and in-line solids sampling will be conducted as part of the RI/FS. Cleanout of onsite catch basins and SD lines will also be conducted as part of the RI/FS if necessary.
Frederick Hopkins private SD outfalls (Nos. 2027 to 2030, 2032, and 2033)	Frederick Hopkins	No current operations were reported.	No historical operations were reported.	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.
R&A Properties permitted private SD outfalls (Nos. 2036,[b] to 2040)	R&A Properties	No current operations were reported.	No historical operations were reported.	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.
Shalmar Group permitted private SD outfall (No. 2034)	Shalmar Group	No current operations were reported.	No historical operations were reported.	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.

Source: SAIC (2008a)

Table I-20, cont. Summary of specific information for outfalls in the Seattle Boiler Works to Slip 4 SCA

[a] No major outfalls were identified as individual source control entities in the source documents, but the S Myrtle Street and S Garden Street outfalls were identified as major outfalls by Ecology because they are publicly owned outfalls.

[b] The outfall survey completed by Herrera (2004) referred to this outfall as S Othello Street but with unknown ownership. The data gaps report (SAIC 2008a) identifies this outfall as belonging to Puget Sound Truck Lines, which leases the northern parcel from R&A Properties. Maps I-12 and I-13 label outfall 2036 as S Othello Street, as identified in the 2003 outfall survey (Herrera 2004) because this is the outfall information source used throughout the RI. The treatment of discrepancies between outfall configurations shown on the RI maps and the maps provided in source documents is discussed in the introduction to this appendix.

FS – feasibility study
RI – remedial investigation
SAIC – Science Applications International Corporation
SCA – source control area
SD – storm drain
SPU – Seattle Public Utilities

Several environmental investigations have been completed within the Seattle Boiler Works to Slip 4 SCA and the associated adjacent properties. These investigations have detected chemicals at concentrations above the SQS in surface sediment. Many of these chemicals have also been detected in various upland media, including soil, groundwater, seep, and source-tracing samples (Table I-21). The availability of data (by media type) is also presented in the table on Map I-13 for each of the facilities associated with this SCA. In both Table I-21 and the table on Map I-13, an X indicates that the source documents reported data or indicated that data exist; therefore, an X does not necessarily mean that the actual data were presented in the source document. Data are only summarized in media-specific and source-tracing tables if the data were reported in the source documents and if they met the criteria for data summation discussed in the introduction to this appendix (e.g., soil data were collected along the SCA shoreline; groundwater data were collected from shoreline facilities). The identification of a chemical in these media at facilities or within the drainage systems of the Seattle Boiler Works to Slip 4 SCA does not necessarily indicate that these potential sources contributed to sediment contamination in the past or will result in sediment contamination in the future.

Table I-21. Chemicals identified in various media in the Seattle Boiler Works to Slip 4 SCA

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater[c]	Source-Tracing Samples	Sources
Mercury	X	X	X			X	SAIC (2008a); Windward (2004)
Fluoranthene	X	X					SAIC (2008a)
Total PCBs	X	X				X	SAIC (2008a)

Note: An X indicates that the source documents reported that data are available for the identified media. The absence of an X in any cell does not necessarily mean that the chemical is absent in the upland media or in source-tracing samples; in some cases, the chemical may not have been analyzed for or, if analyzed, could have been present but at concentrations below the RL.

[a] Chemicals with at least one detected exceedance of an SQS in sediment within the Seattle Boiler Works to Slip 4 SCA. The chemical list is based on SMS exceedances in the RI baseline surface sediment dataset within the 2007 SCA boundary. Therefore, this list may differ from the list of exceedances in source documents.

[b] Porewater data were collected from this SCA as part of the LDW RI; however, these samples were analyzed only for VOCs.

[c] No stormwater data were reported in source documents for any chemical.

PCB – polychlorinated biphenyl
RI – remedial investigation
RL – reporting limit
SAIC – Science Applications International Corporation
SCA – source control area
SMS – Washington State Sediment Management Standards
SQS – sediment quality standard
VOC – volatile organic compound

Seep data collected as part of the LDW RI (Windward 2004) are presented in Table I-22. Map I-12 shows the locations of seeps sampled in this SCA. Porewater data collected as part of the LDW RI are presented in Table I-23; these samples were analyzed only for VOCs (Windward 2006a). Soil and groundwater data are not presented in this section because no bank soil were available for this SCA, the groundwater samples were not collected from shoreline facilities, or actual data for either media were not provided in the source documents. No stormwater data were reported in the source documents.

Table I-22. Summary of chemical concentrations detected in seep samples collected from the Seattle Boiler Works to Slip 4 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources	Additional Information
Crowley Marine Services	mercury	2004	0.00074 (dissolved) n = 1/1	near northern edge of parcel boundary	Windward (2004)	Samples were collected as part of the LDW RI.
Crowley Marine Services	mercury	2004	0.00518 (total) n = 1/1	near northern edge of parcel boundary	Windward (2004)	Samples were collected as part of the LDW RI.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Seattle Boiler Works to Slip 4 SCA.

[b] Fluoranthene and total PCBs were not detected in the seep sample.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed.

LDW – Lower Duwamish Waterway
PCB – polychlorinated biphenyl
RI – remedial investigation
SCA – source control area
SQS – sediment quality standard

Table I-23. Summary of chemical concentrations detected in porewater samples collected from the Seattle Boiler Works to Slip 4 SCA

Facility[a]	Chemical[b, c]	Year Collected	Concentration Information (µg/L)[d, e]	Location	Sources	Additional Information
GWI	1,1-dichloroethene	2005	0.3 - 4.9 n = 3/10	Myrtle Street embayment	(Windward 2006a)	Two of the 10 samples from GWI were field replicates collected at PE-08.
GWI	1,2-dichlorobenzene	2005	0.5 – 1.2 n = 3/10	Myrtle Street embayment	(Windward 2006a)	Two of the 10 samples from GWI were field replicates collected at PE-08.
GWI	1,2-dichloroethane	2005	7.4 - 15 n = 2/10	Myrtle Street embayment	(Windward 2006a)	Two of the 10 samples from GWI were field replicates collected at PE-08.
GWI	1,2-dichloropropane	2005	1.7 - 2.5 n = 2/10	Myrtle Street embayment	(Windward 2006a)	Two of the 10 samples from GWI were field replicates collected at PE-08.
GWI	1,4-dichlorobenzene	2005	0.3 - 0.3 n = 2/10	Myrtle Street embayment	(Windward 2006a)	Two of the 10 samples from GWI were field replicates collected at PE-08.
GWI	benzene	2005	9.4 n = 1/10	Myrtle Street embayment	(Windward 2006a)	Two of the 10 samples from GWI were field replicates collected at PE-08.
GWI	cis-1,2-dichloroethene	2005	0.5 - 2,900 n = 10/10	Myrtle Street embayment	(Windward 2006a)	Two of the 10 samples from GWI were field replicates collected at PE-08.
GWI	tetrachloroethene	2005	0.4 - 1.1 n = 2/10	Myrtle Street embayment	(Windward 2006a)	Two of the 10 samples from GWI were field replicates collected at PE-08.
GWI	toluene	2005	0.3 - 3.5 n = 5/10	Myrtle Street embayment	(Windward 2006a)	Two of the 10 samples from GWI were field replicates collected at PE-08.
GWI	trans-1,2-dichloroethene	2005	0.3 - 21 n = 7/10	Myrtle Street embayment	(Windward 2006a)	Two of the 10 samples from GWI were field replicates collected at PE-08.

Table I-23, cont. Summary of chemical concentrations detected in porewater samples collected from the Seattle Boiler Works to Slip 4 SCA

Facility[a]	Chemical[b, c]	Year Collected	Concentration Information (µg/L)[d, e]	Location	Sources	Additional Information
GWI	trichloroethene	2005	0.4 - 2.5 n = 4/10	Myrtle Street embayment	(Windward 2006a)	Two of the 10 samples from GWI were field replicates collected at PE-08.
GWI	vinyl chloride	2005	0.4 - 2,500 n = 10/10	Myrtle Street embayment	(Windward 2006a)	Two of the 10 samples from GWI were field replicates collected at PE-08.

[a] Porewater data were collected as part of the RI for the GWI facility. The GWI facility is not discussed in this section because it is not adjacent to the SCA, and no source-tracing data were available. Porewater data for the GWI facility were included in this section at EPA's request and because the samples were collected within the SCA.

[b] VOC data were summarized, as available, at EPA's request, and not because of SQS exceedances in surface sediment in the SCA.

[c] Mercury, fluoranthene and total PCBs were not analyzed in the porewater samples.

[d] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[e] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

EPA – US Environmental Protection Agency

GWI – Great Western International

RI – remedial investigation

SCA – source control area

SQS – sediment quality standard

VOC – volatile organic compound

Source-tracing data were reported for one of the facilities within the Seattle Boiler Works to Slip 4 SCA (SAIC 2008a); these data are summarized in Table I-24 and the associated storm drain system is shown on Map I-14. The drainage basin that discharges to the Seattle Boiler Works to Slip 4 SCA has not been fully delineated. Additional details about source-tracing sampling programs conducted in the larger LDW drainage basin are presented in Section 9.4.4.7 of the main body of the RI.

Table I-24. Summary of chemical concentrations detected in source-tracing samples collected from the Seattle Boiler Works to Slip 4 SCA

Sample Source	Year Collected	Concentration Information[a, b, c, d]		Source[e]	Additional Information
		Mercury (mg/kg dw)	Total PCBs (µg/kg dw)		
Storm Drain Solids Samples					
Former Sternoff Property	1990	0.9 – 4.35 median = 2.2 n = 7/7	2,200 – 163,000 median = 18,800 n = 7/7	SEACOR (1990), as cited in SAIC (2008a)	SPU conducted additional source tracing in 2008-2009 under grant with Ecology.
Floor Drain Solids Samples					
Former Sternoff Property	1990	4.41 n = 1/1	31,000 n = 1/1	SEACOR (1990), as cited in SAIC (2008a)	The floor drain sample was a composite of four samples.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 4 to Seattle Boiler Works SCA.

[b] Fluoranthene was either not analyzed or was not detected, or the data for this chemical were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/kg to µg/kg), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

dw – dry weight
PCB – polychlorinated biphenyl
SAIC – Science Applications International Corporation
SCA – source control area
SQS – sediment quality standard

Source control investigations have been conducted at some of the adjacent facilities (Table I-19) and investigations are expected to continue. Source control activities in the LDW are ongoing. Additional information on the Seattle Boiler Works to Slip 4 SCA is provided on Ecology's website.

I.4.4 Slip 4 Source Control Area (RM 2.8 E to RM 2.9 E, EAA 3)

The Slip 4 SCA was one of the seven candidate EAAs recommended to EPA and Ecology (Windward 2003c) and is a candidate for a non-time-critical removal action (NTCRA). Several documents have been prepared by Ecology, the SCWG, the City of Seattle, and King County in preparation of the NTCRA and to assess source control in

the Slip 4 drainage basin. These documents include two data gaps reports[22] (SAIC 2007e; SEA 2004), a draft engineering evaluation/cost analysis (EE/CA) (Integral 2006b), a 100% design analysis report (Integral 2007), a SCAP (Ecology 2006), a property review for Crowley Marine Services and First South Properties (SAIC 2006b), a technical memorandum on the status of Slip 4 source control (SAIC 2007a), and source control status update reports for the LDW that include information for the Slip 4 SCA (Ecology 2007f; Ecology and SAIC 2008). A preliminary engineering report (RoseWater 2006) and SEPA checklist prepared in preparation for the GTSP flume remediation and replacement project were reviewed for general information about the project. All documents above provided the information summarized in this section for the Slip 4 SCA. In addition, source-tracing data provided by the City of Seattle (Schmoyer 2008d), bank soil data collected by Ecology (Parametrix 2005), and seep data collected as part of the RI (Windward 2004) are also summarized in this section. These references will be referred to collectively as the "source documents" throughout this section and on the maps.

CSL exceedances in the surface sediment in this SCA have included total PCBs, BEHP, mercury, and four individual PAHs (Map I-15). SQS exceedances have included total PCBs, BEHP, BBP, mercury, total HPAHs, and nine individual PAHs. These exceedances are based on the RI baseline surface sediment dataset and the 2007 SCA boundary, as discussed in the introduction to this appendix. COCs were identified for this SCA based on a different dataset in the 2004 data gaps report (SEA 2004) (Table I-3). Based on available data, total PCB concentrations in Slip 4 surface sediment have consistently been highest at the head of the slip but have generally decreased with time (see Section 4.2.3.1 of the main body of the RI).

Commercial and industrial operations in the vicinity of the Slip 4 SCA include airplane manufacturing (historical manufacturing and current airplane finishing/testing), airport operations (historical and current), steam power generation (historical), container storage and shipping (historical and current), manufacturing of various metal products (historical), pole-dipping and pipe-dipping (historical), lumber milling and processing (historical), and lime and asphalt production (historical).

Adjacent and upland facilities associated with this SCA were identified in the SCAP (Ecology 2006). The adjacent properties included Boeing Plant 2, Crowley Marine Services, and First South Properties[23] (Table I-25 and Map I-16). The upland properties identified in the SCAP included the GTSP, King County International Airport (KCIA), and North Boeing Field (NBF) (Table I-21 and Map I-17).

---

[22] Ecology is developing a supplemental data gaps report for North Boeing Field and the GTSP (Good 2009).

[23] Information for Crowley Marine Services is also included in Section I.4.3 as this facility is also part of the Seattle Boiler Works to Slip 4 SCA. Presentation of the information (outfalls, concentrations in media) was divided based on the location of the sample, as available.

Table I-25. Summary of facility information for the Slip 4 SCA

FACILITY[a]	CURRENT OWNERSHIP	CURRENT OPERATIONS	HISTORICAL OPERATIONS	ENVIRONMENTAL INVESTIGATIONS	REMEDIAL ACTIVITIES	SOURCE CONTROL ACTIVITIES/INVESTIGATIONS
Boeing Plant 2 (northern portion of facility)[b]	The Boeing Company	vehicle maintenance, operations/ support of aerospace research, and development activities	manufacturing of aluminum alloy, steel alloy, and titanium alloy parts and electronics for airplanes	Soil and groundwater environmental investigations were conducted on the northwestern portion of Boeing Plant 2 in the 1990s.	Remedial activities were conducted during site redevelopment when Building 2-01 was demolished and Building 2-122 was constructed in the early 1990s.	Ecology inspected Building 2-122 in 2007.
Crowley Marine Services	Crowley Marine Services	container storage, shipping, and barge berthing (tenants are Alaska Logistics and UPRR)	manufacturing facilities, pipe-dipping, lumber mill, and pole-dipping	Several environmental investigations and site inspections have been conducted. They were related to tank leaks, site characterization and hazard assessment, and characterization in preparation for Slip 4 sediment removal action. An SHA was conducted by Ecology in 2008. There are plans for an RI/FS to be conducted on the property (Sutton 2008a). Both new and historical data (e.g., groundwater data) and other information will be gathered and reviewed as part of the RI/FS.	Several USTs have been removed. An RI/FS will be conducted at the property under a MTCA order. The Agreed Order is being negotiated between Ecology and the identified PLPs (Sutton 2008b). After completion of the order, a work plan for the RI/FS will be developed.	Source-tracing investigations and business inspections have been conducted; however, site operations have changed since these investigations were conducted. Additional source control activities and investigations will be conducted at the facility as part of the RI/FS, as necessary (Sutton 2008b).
First South Properties	First South Properties	storage of portable toilets, dumpsters, storage tanks, and containers (tenant is Emerald Services)	machinery and storage company, lime plant, asphalt plant, lumber industries, compost company, and marine leasing	Several environmental investigations related to tank leaks, site characterization, and remediation of historical soil and groundwater contamination have been conducted. Other investigations included characterization in preparation for Slip 4 sediment removal action.	Cleanup was conducted in the 1980s and 1990s in response to historical soil and groundwater contamination (petroleum and metals) associated with tank leaks. Soil removal was conducted as part of drainage system redevelopment.	Source-tracing investigations and business inspections have been conducted.

Table I-25, cont. Summary of facility information for the Slip 4 SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/Investigations
GTSP	City of Seattle	museum and equipment storage	power plant, machine shop, substation, and fire-fighting training	Several investigations involving soil and groundwater sampling related to tank leaks and site characterization, including investigation of a low-lying drainage area, have been conducted. The site will be further assessed under a MTCA Agreed Order as part of the RI/FS for the NBF/GTSP site.[c] A draft supplemental data gaps report has been prepared and is under review (Goldberg 2009).	PCB-contaminated soil from the low-lying drainage area was removed, and an interim remedial action was conducted to remove additional soil and to control erosion.	Source-tracing investigations have been conducted. Ecology is planning additional sampling at the facility, including stormwater sampling (Good 2009; Goldberg 2009).
KCIA (north drainage basin)	King County	commercial and recreational airport	commercial and recreational airport, military operations, and fire-fighting training; electronics manufacturing and equipment cleaning at the Electronics Manufacturing Facility[d]	Several investigations related to spill response, tank leaks, soil removals, and joint sealant material sampling have been completed. The site will be further assessed under MTCA as part of the RI/FS for the NBF/GTSP site.[c]	Soil and sediment removals associated with tank leaks, spills, and storm drain system cleanouts have been conducted.	Several source-tracing investigations and business inspections have been conducted. Flight lines and taxiways are swept on a frequent basis per Federal Aviation Administration requirements.
NBF[e]	King County owns the majority of the north drainage basin of KCIA but currently leases 117 ac to The Boeing Company; the City of Seattle and The Boeing Company also own some parcels	aircraft research and development, finishing and testing, and fueling/ defueling (tenant is Boeing)	aircraft research and development; painting, flight testing, aircraft delivery, fueling, and defueling; Army and National Guard air operations	Several environmental investigations have been conducted since the 1980s in an effort to identify the source of PCB contamination on the northern portion of the property. Recent investigations have been conducted to characterize joint caulk material on NBF and to characterize soil along the NBF/GTSP property line. The site is being further assessed under a MTCA Agreed Order as part of the RI/FS for the NBF/GTSP site.[c] A draft supplemental data gaps report has been prepared and is under review (Goldberg 2009).	Cleanup activities related to UST, oil/water separator, and contaminated soil removal have been conducted. Cleanup has also been conducted in response to spills and related to remediation of LNAPL from groundwater, and flight line area concrete joint sealant material removal.	Several source-tracing investigations have been conducted since the 1980s in an effort to identify the source of PCB contamination in the northern SD line. Source-tracing samples have also been collected on other portions of NBF. Portions of the SD system have been cleaned out on several occasions. Sections of the northern SD line were replaced or re-routed and soil sampling was conducted. Several catch basins and manholes were sealed or replaced. Source-tracing investigations are ongoing, and Ecology is planning additional sampling, including stormwater sampling, at the facility (Good 2009; Goldberg 2009).

Table I-25, cont. Summary of facility information for the Slip 4 SCA

Sources: Ecology (2006), Ecology and SAIC (2008), Integral (2006b), SAIC (2006b, 2007a, e), SEA (2004)

[a] Facilities listed are those identified as adjacent or upland properties in the data gaps report (SEA 2004) and the SCAP (Ecology 2006).

[b] Information included in this table pertains only to the 17.5-ac northwestern portion of Boeing Plant 2 that drains to Slip 4. Additional information on the rest of the Boeing Plant 2 property is discussed in the Boeing Plant 2/Jorgensen Forge SCA summary (Section I.4.5).

[c] The Boeing Company, King County, the City of Seattle, and Ecology have signed an administrative order to conduct an RI/FS at the NBF/GTSP site. Ecology will conduct the RI/FS.

[d] Information pertaining to the Electronics Manufacturing Facility is discussed in the Boeing Plant 2/Jorgensen Forge SCA section (Section I.4.5) because groundwater from the EMF flows toward the Boeing Plant 2/Jorgensen Forge SCA.

[e] Although NBF is part of KCIA, it is considered a separate facility for the purposes of this SCA summary. The location and extent of NBF, in relation to the larger KCIA facility, is shown on Map I-17.

Ecology – Washington State Department of Ecology
GTSP – Georgetown Steam Plant
KCIA – King County International Airport
MTCA – Model Toxics Control Act
LNAPL – light non-aqueous phase liquid
NBF – North Boeing Field
PLP – potentially liable party
PCB – polychlorinated biphenyl
RI/FS – remedial investigation/feasibility study
SAIC – Science Applications International Corporation
SCA – source control area
SCAP – source control action plan
SD – storm drain
SEA – Striplin Environmental Associates
SHA – site hazard assessment
UPRR – Union Pacific Railroad
UST – underground storage tank

Five major outfalls were identified in the source documents that discharge to the Slip 4 SCA. These outfalls discharge at the head of the Slip 4 SCA, and include the I-5 SD (No. 2046), the GTSP flume SD (No. 2047), the NBF SD (No. 2048), the KCIA SD No. 3/Pump Station 44 (PS44) emergency overflow (EOF) (No. 2049), and the E Marginal Way S EOF (No. 043) (Table I-26 and Map I-15). In total, storm drainage from approximately 490 ac of land discharges to Slip 4 (Map I-17). In addition, in the event of an EOF discharge, drainage from a combined sewer service area of approximately 6,200 ac could potentially discharge to Slip 4 (King County and SPU 2005).

Stormwater runoff also has the potential to discharge directly to Slip 4 from adjacent upland facilities. Eleven other outfalls identified during the 2003 outfall survey (Herrera 2004) are located within the Slip 4 SCA. Four of these are private storm drains located on Crowley Marine Services (Nos. 5007 to 5010), five are private storm drains located on First South Properties[24] (Nos. 2216, 2217, 2219, 2050, and 2051), and two are private storm drains located on the northern portion of Boeing Plant 2 (Nos. 2052 and 2053). Environmental investigations and remedial activities have been conducted in association with the outfalls in the Slip 4 SCA. Information on the outfalls within this SCA is summarized in Table I-26 and the locations of these outfalls are shown on Maps I-15 through I-17; additional outfall information is provided in Appendix H.

[24] Currently, one active private storm drain outfall remains on First South Properties (SAIC 2007a).The five outfalls formerly located on the property were replaced by a single outfall when the property was redeveloped in 2006. Maps I-15 through I-17 show the five outfalls formerly present on the property as identified in the 2003 outfall survey (Herrera 2004) because this is the outfall information source used throughout the RI. The treatment of discrepancies between outfall configurations shown on the RI maps and the maps provided in source documents is discussed in the introduction to this appendix.

Table I-26. Summary of specific information for outfalls in the Slip 4 SCA

Outfall	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
Outfalls Identified in the SCAP and Data Gaps Report as Major Outfalls[a]					
E Marginal Way EOF outfall (No. 043)	King County	Outfall is an EOF for the E Marginal Way pump station located on E Marginal Way S.	Served as an EOF for the EBI pump station located on E Marginal Way S (no recorded discharges have occurred since 1968). Prior to construction of the EBI, this outfall functioned as an EOF and overflow for pump station No. 10 (PS10) on the old Henderson-E Marginal Way sewer system. Prior to the construction of PS10, the outfall was used as a raw sewage outfall for the E. Marginal Trunk (Stern 2008).	Environmental investigations related to the E Marginal Way EOF were not reported.	No remedial or source control activities were reported.
GTSP flume outfall (No. 2047)	City of Seattle	Outfall discharges stormwater runoff from approximately 6 ac of surrounding land, including portions of the GTSP property, NBF, and the Aero Motel property; S Myrtle St and properties along S Myrtle St; open sections of the flume potentially receive overland runoff from adjacent properties including the Willow Street substation and the former Ellis substation.	Discharged cooling water from the GTSP condenser pit, received discharges southwest of the GTSP (via either permitted or illicit connections) of wastewater, cooling water, and stormwater from neighboring industrial properties including the GTSP, a power substation, a motel, and facilities on and adjacent to NBF.	Soil and sediment sampling has been conducted within the flume and at industrial facilities on and adjacent to NBF where some surface water runoff drains into the flume. Several historical investigations were conducted to identify illicit connections to the flume and potential sources of PCBs and to investigate spills into the flume. Site characterization and design studies for cleanup and removal of the flume have recently been completed.	Most connections to the flume have been terminated. Soil and sediment in the flume have been cleaned out several times. The City of Seattle is working to remove contaminated soil and sediment from the flume, decommission wooden portions of the flume, remove contaminated soil from Willow Street and Ellis substations, and replace the flume with a new underground SD system. Construction began in May 2009 and is scheduled for completion by December 2009 (Goldberg 2009).
I-5 SD outfall (No. 2046)	WSDOT	Outfall discharges stormwater from approximately 153 ac including 44 ac of residential land east of I-5, 1.5 mi of I-5, approximately 44 ac of industrial property west of I-5 and adjacent to Airport Way S, and 1 to 2 ac of the northern end of KCIA.	The outfall was constructed in 1965 in association with the construction of I-5. The outfall was formerly referred to as the S Albro St SD (Schmoyer 2008b).	Source-tracing investigations have been conducted by the City of Seattle within the drainage basin; however, none of the sampling locations were within the I-5 corridor.	The City will conduct routine catch basin cleaning as required under its NPDES permit. Additional catch basin and SD line cleaning will be conducted as necessary.

Table I-26, cont. Summary of specific information for outfalls in the Slip 4 SCA

Outfall	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
KCIA SD No. 3/PS44 EOF outfall (No. 2049)	City of Seattle and King County[b]	The system's drain line discharges through a pump station to Slip 4. Outfall discharges stormwater from approximately 290 ac of the northern end of KCIA and NBF and also functions as an EOF for City of Seattle PS44, which is on the sanitary sewer. The EOF functions only in the event of pump failure or an obstruction in the drain line (King County and SPU 2005).	No historical operations were reported; the EOF has not discharged since record-keeping began in the late 1990s.	Source-tracing investigations have been conducted by the City of Seattle, King County, and Boeing; these investigations are ongoing.	Some SD lines that drain to the KCIA SD No. 3/PS44 EOF system have been cleaned out. Catch basins and oil/water separators located within the northern drainage basin of KCIA are cleaned biannually.
NBF SD outfall (No. 2048)	City of Seattle	Outfall discharges stormwater from approximately 1 ac of the northern end of NBF.	Initially served as a combined sewer, which discharged directly to Slip 4, for portions of the Georgetown neighborhood and industrial facilities in the vicinity of what is now the northern end of KCIA and NBF. In 1926, the combined sewers in the Georgetown neighborhood were diverted to the Michigan Street sewer system (City of Seattle 1925); and, in 1976, a new sanitary sewer was installed, which routed wastewater from the northern end of KCIA and NBF to the sanitary sewer on E Marginal Way S. After 1976, this outfall functioned as a storm drain, collecting runoff from about 90 acres on NBF and also served as an EOF for PS44. Stormwater from these areas and the EOF was redirected to the KCIA SD No. 3/PS44 EOF outfall (No. 2049) during 1987 to make way for the construction of the Boeing Building 3-380.	No environmental investigations related to the NBF SD were reported.	No remedial or source control activities were reported.

Table I-26, cont. Summary of specific information for outfalls in the Slip 4 SCA

Outfall	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
Other Outfalls					
Crowley Marine Services Private SD outfalls (Nos. 5007 through 5010)	Crowley Marine Services	Private SD outfalls drain stormwater from a portion of the Crowley Marine Services property.	No historical operations were reported.	SPU collected one sediment sample from an onsite catch basin in 2004.	Stormwater and in-line solids sampling will be conducted as part of the RI/FS. Cleanout of onsite catch basins and SD lines will also be conducted as part of the RI/FS if necessary.
First South Properties Private SD outfalls (Nos. 2050, 2051, 2216, 2217, and 2219)[c]	First South Properties	These five outfalls and an unpaved drainage swale were replaced by a single outfall in 2006. Maps I-15 through I-17 display the five outfalls formerly present on the property (SAIC 2007a).	No historical operations were reported.	In 2005, SPU collected samples from two catch basins upstream and downstream of an oil/water separator located on the southwest corner of the property and from a small drainage ditch located on the northwest corner of the property.	Oil/water separators were replaced in 2006 and runoff from the site was diverted to a single outfall when the property was redeveloped in 2006 and 2007.
Boeing Plant 2 Private SD outfalls (Nos. 2052 and 2053)	The Boeing Company	Private SD outfalls drain stormwater from vehicle parking areas and roof drains; stormwater flows through bioswales prior to discharge to the LDW.	No historical operations were reported.	No environmental investigations were reported.	Ecology has plans to sample storm drain solids on the northern portion of Boeing Plant 2 as part of site inspection activities.

Sources: Ecology (2006), Ecology and SAIC (2008), RoseWater (2006), SAIC (2006b, 2007a, e), Schmoyer (2008d), SEA (2004), Seattle City Light (2008)

[a] Major outfalls listed are those discussed as individual source control entities in the SCAP (Ecology 2006) and data gaps report (SEA 2004).

[b] King County owns the SD system, and the City of Seattle operates the pump station and EOF.

[c] Currently, only one active private storm drain outfall remains on First South Properties.

EBI – Elliott Bay Interceptor
Ecology – Washington State Department of Ecology
EOF – emergency overflow
GTSP – Georgetown Steam Plant
I-5 – Interstate 5
KCIA – King County International Airport
LDW – Lower Duwamish Waterway
NBF – North Boeing Field
PCB – polychlorinated biphenyl
PS – pump station
SAIC – Science Applications International Corporation
SCA – source control area
SCAP – source control action plan
SD – storm drain
SEA – Striplin Environmental Associates
WSDOT – Washington State Department of Transportation

Several remedial activities and environmental investigations have been completed or are currently in progress within the Slip 4 SCA (Tables I-25 and I-26, Maps I-16 and I-17). Information about these activities has been summarized in the source documents. Several of the chemicals that have been detected above the SQS in Slip 4 surface sediment have also been detected in various upland media, including soil, groundwater, seep, and source-tracing samples (Table I-27). The availability of data (by media type) is also presented in the table on Map I-16 for each of the facilities and major outfalls associated with this SCA. In Table I-27, and in the table on Map I-16, an X indicates that the source documents reported data or indicated that data exist; therefore, an X does not necessarily mean that the actual data were presented in the source documents. Data are only summarized in the media-specific and source-tracing tables if the data were reported in the source documents and if they met the criteria for data summation discussed in the introduction to this appendix (e.g., soil data were collected along the SCA shoreline; groundwater data were collected from shoreline facilities). The identification of a chemical in these media at facilities or within the drainage systems of the Slip 4 SCA does not necessarily indicate that these potential sources contributed to sediment contamination in the past or will result in sediment contamination in the future.

Table I-27. Chemicals identified in various media in the Slip 4 SCA

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater[c]	Source-Tracing Samples	Sources
Mercury	X		X			X	Ecology (2006), King County and SPU (2005), SAIC (2007e), Schmoyer (2008d), Windward (2004)
Acenaphthene		X				X	SAIC (2006b), Schmoyer (2008d)
Benzo(a)anthracene	X	X				X	SAIC (2006b, 2007e), Schmoyer (2008d)
Benzo(a)pyrene	X	X				X	Ecology (2006), King County and SPU (2005), SAIC (2006b, 2007e), Schmoyer (2008d)
Benzofluoranthenes	X	X				X	SAIC (2006b, 2007e), Schmoyer (2008d)
Benzo(g,h,i)perylene	X					X	Ecology (2006), King County and SPU (2005), SAIC (2007e), Schmoyer (2008d)
Chrysene	X	X				X	SAIC (2006b, 2007e), Schmoyer (2008d)

Chemical[a]	Soil	Ground-water	Seep	Pore-water[b]	Storm-water[c]	Source-Tracing Samples	Sources
Dibenzo(a,h)anthracene	X					X	Ecology (2006), King County and SPU (2005), SAIC (2007e), Schmoyer (2008d)
Fluoranthene	X	X				X	SAIC (2006b), Schmoyer (2008d); SAIC (2007e)
Indeno(1,2,3-cd)pyrene	X					X	Ecology (2006), King County and SPU (2005), SAIC (SAIC 2007e), Schmoyer (2008d)
Total HPAHs						X	Schmoyer (2008d)
BBP						X	Schmoyer (2008d)
BEHP	X	X				X	Ecology (2006), King County and SPU (2005), SAIC (2007e), Schmoyer (2008d)
Total PCBs	X	X	X			X	Ecology (2006), King County and SPU (2005), SAIC (2007a, e), Schmoyer (2008d), Integral (2007)

Note: An X indicates that the source documents reported that data are available for the identified media. The absence of an X in any cell does not necessarily mean that the chemical is absent in the upland media or in source-tracing samples; in some cases, the chemical may not have been analyzed for or, if analyzed, could have been present but at concentrations below the RL.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 4 SCA. The chemical list is based on SMS exceedances in the RI baseline surface sediment dataset within the 2007 SCA boundary. Therefore, this list may differ from the list of exceedances in source documents.

[b] A porewater sample was collected from approximately the center of Slip 4 by EPA in 1998. The sample was analyzed for metals and trace elements. None of the chemicals with SQS exceedances in surface sediment in the SCA were detected in the porewater sample.

[c] Stormwater sampling has been conducted at NBF, according to the data gaps report (SAIC 2007e); however, none of the chemicals with SQS exceedances in surface sediment in the SCA have been analyzed in storm water because they are not required to be monitored under the general stormwater permit conditions.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
Ecology – Washington State Department of Ecology
EPA – Environmental Protection Agency
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
NBF – North Boeing Field
PCB – polychlorinated biphenyl
RI – remedial investigation
RL – reporting limit
SAIC – Science Applications International Corporation
SCA – source control area
SPU – Seattle Public Utilities
SMS – Washington State Sediment Management Standards
SQS – sediment quality standard

This section summarizes the upland data as they were presented in the source documents for bank soil, groundwater, seep water, and source-tracing samples. Data for one porewater sample collected in Slip 4 were identified. The sample was analyzed for metals; mercury was not detected in the porewater sample (SEA 2004), and

therefore, no data for porewater are presented in the media tables in this section. No stormwater data were presented in the source documents.

Soil sampling has been conducted at several of the facilities within the Slip 4 SCA. The facilities with available soil data are indicated in the table on Map I-16. Bank soil data collected along the Slip 4 shoreline are summarized in Table I-28. Bank soil samples were collected from the shoreline portions of the Boeing Plant 2, Crowley Marine Services, and First South Properties facilities. Most of the bank samples were collected from areas within the sediment removal action boundary for Slip 4. Soil data collected from upland areas are included in the source documents, such as the property review for Crowley Marine Services and First South Properties (SAIC 2006b). Groundwater data collected in close proximity to Slip 4 (from the shoreline properties owned by Crowley Marine Services and First South Properties) are summarized in Table I-29. Groundwater sampling was conducted on these properties in the late 1980s and early 1990s; all data presented in the property review for Crowley Marine Services and First South Properties (SAIC 2006b) are summarized in the table. Additional groundwater data, which included some results for VOCs in groundwater at the Crowley Marine Services property, were also provided in the data gaps report for the Seattle Boiler Works to Slip 4 SCA (SAIC 2008a). These VOC data are included in this section. Data were available for several seep samples collected within the Slip 4 SCA. Two of the seep samples had detected concentrations of chemicals that had exceeded the SQS in Slip 4 surface sediment; these data are presented in Table I-30.

Table I-28. Summary of chemical concentrations detected in bank soil in the Slip 4 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (mg/kg dw unless noted)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	total PCBs	2005	0.876 n = 1/1	northern portion of property	Parametrix (2005)	Sampling locations appear to be within the Slip 4 sediment removal action boundary.
Boeing Plant 2	total PCBs	2005	0.711 n = 1/1	along the northern portion of the property	Parametrix (2005)	Samples were subsurface soil borings collected from the bank; sampling locations appear to be within the Slip 4 sediment removal action boundary.
Crowley Marine Services	mercury	2004	0.06, 0.06 n = 2/2	near the head of the slip	SEA (2004) as cited in Integral (2006b)	Two samples were collected from the same location and had the same concentration.
Crowley Marine Services	total PCBs	2004	0.023 n = 1/1	near head of slip	SEA (2004) as cited in Integral (2006b)	Sampling locations appear to be within the Slip 4 sediment removal action boundary.
First South Properties	total PCBs	2005	1.08 – 8.49 mg/kg OC median = 6.20 mg/kg OC n = 3/4	along property shoreline	CH2M HILL (2005) as cited in Integral (2006b)	Sampling locations appear to be within the Slip 4 sediment removal action boundary.
First South Properties	total PCBs	2005	0.215 – 9.64 median = 0.617 n = 5/5	along property shoreline	Parametrix (2005)	Sampling locations appear to be within the Slip 4 sediment removal action boundary.
First South Properties	total PCBs	2005	0.146 – 9.54 median = 1.594 n = 5/5	along the property shoreline	Parametrix (2005)	Samples were subsurface soil borings collected from the bank; sampling locations appear to be within the Slip 4 sediment removal action boundary.
First South Properties	mercury	2004	0.05 – 0.38 median = 0.15 n = 7/7	along property shoreline	SEA (2004) as cited in Integral (2006b)	Sampling locations appear to be within the Slip 4 sediment removal action boundary.
First South Properties	total PCBs	2004	0.79 – 4.7 median = 1.3 n = 5/5	along property shoreline	SEA (2004) as cited in Integral (2006b)	Sampling locations appear to be within the Slip 4 sediment removal action boundary.
First South Properties and Boeing Plant 2	total PCBs	2005	0.14 – 0.44 median = 0.36 n = 3/3	First South Properties and Boeing Plant 2 property boundary	Bach (2005) as cited in Integral (2006b)	Sampling locations appear to be within the Slip 4 sediment removal action boundary.

Table I-28, cont. Summary of chemical concentrations detected in bank soil in the Slip 4 SCA

FACILITY	CHEMICAL[a, b]	YEAR COLLECTED	CONCENTRATION INFORMATION (mg/kg dw unless noted)[c, d]	LOCATION	SOURCES[e]	ADDITIONAL INFORMATION
First South Properties and Boeing Plant 2	total PCBs	2005	1.88 – 3.14 mg/kg OC median = 2.22 mg/kg OC n = 3/3	First South Properties and Boeing Plant 2 property boundary	CH2M HILL (2005), as cited in Integral (2006b)	Sampling locations appear to be within the Slip 4 sediment removal action boundary.
First South Properties and Boeing Plant 2	total PCBs	2004	7.8 n = 1/1	First South Properties and Boeing Plant 2 property boundary	SEA (2004) as cited in Integral (2006b)	Sampling locations appear to be within the Slip 4 sediment removal action boundary.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 4 SCA.

[b] BBP, BEHP, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzofluoranthenes, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and total HPAHs were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from µg/kg to mg/kg), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
dw – dry weight
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
OC – organic carbon
PCB – polychlorinated biphenyl
SCA – source control area
SQS – sediment quality standard

Table I-29. Summary of chemical concentrations detected in groundwater in the Slip 4 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Chemicals with Detected Concentrations Above SQS in Surface Sediment						
Crowley Marine Services	acenaphthene	1989 – 1990	3.1 – 250 median = 15.9 n = 4/12	multiple groundwater wells throughout the facility	Hart Crowser (1989a, b, 1990) and Landau (1990), as cited in SAIC (2006b)	Groundwater data were collected to characterize the property for potential real estate transactions and in relation to tank removals.
Crowley Marine Services	benzo(a)anthracene	1989 – 1990	0.5, 8.6 n = 2/12	multiple groundwater wells throughout the facility	Hart Crowser (1989a, b, 1990) and Landau (1990), as cited in SAIC (2006b)	Groundwater data were collected to characterize the property for potential real estate transactions and in relation to tank removals.
Crowley Marine Services	benzo(a)pyrene	1989 – 1990	1.6 n = 1/12	multiple groundwater wells throughout the facility	Hart Crowser (1989a, b, 1990) and Landau (1990), as cited in SAIC (2006b)	Groundwater data were collected to characterize the property for potential real estate transactions and in relation to tank removals.
Crowley Marine Services	benzofluoranthenes	1989 – 1990	0.7 – 5.6 median = 2.0 n = 3/12	multiple groundwater wells throughout the facility	Hart Crowser (1989a, b, 1990) and Landau (1990), as cited in SAIC (2006b)	Groundwater data were collected to characterize the property for potential real estate transactions and in relation to tank removals.
Crowley Marine Services	chrysene	1989 – 1990	0.5, 8.8 n = 2/12	multiple groundwater wells throughout the facility	Hart Crowser (1989a, b, 1990) and Landau (1990), as cited in SAIC (2006b)	Groundwater data were collected to characterize the property for potential real estate transactions and in relation to tank removals.
Crowley Marine Services	fluoranthene	1989 – 1990	5.2 – 11 median = 9.6 n = 3/12	multiple groundwater wells throughout the facility	Hart Crowser (1989a, b, 1990) and Landau (1990), as cited in SAIC (2006b)	Groundwater data were collected to characterize the property for potential real estate transactions and in relation to tank removals.
Crowley Marine Services	BEHP	1989 – 1990	0.047 – 29 median = 9.35 n =10/10	multiple groundwater wells throughout the facility	Hart Crowser (1989a, b, 1990) and Landau (1990), as cited in SAIC (2006b)	Groundwater data were collected to characterize the property for potential real estate transactions and in relation to tank removals.
First South Properties	acenaphthene	1990	0.12, 1.8 n = 2/4	four groundwater wells throughout the facility	Landau (1990) as cited in SAIC (2006b)	Groundwater data were collected to characterize the property for potential real estate transactions and in relation to tank removals.

Table I-29, cont. Summary of chemical concentrations detected in groundwater in the Slip 4 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
First South Properties	BEHP	1990	8.5 – 31 median = 25 n = 3/3	three groundwater wells throughout the facility	Landau (1990) as cited in SAIC (2006b)	Groundwater data were collected to characterize the property for potential real estate transactions and in relation to tank removals.
VOCs[f]						
Crowley Marine Services	acetone	1990	7.0 n = nr	one groundwater well located on the western portion of the facility	Landau (1990) as cited in SAIC (2008a)	Groundwater data were collected to characterize the property for a potential real estate transaction.
Crowley Marine Services	cis-1,2-dichloroethene	1990	1.5 n = nr	one groundwater well located on the southern portion of the facility	Landau (1990) as cited in SAIC (2008a)	Groundwater data were collected to characterize the property for a potential real estate transaction.
Crowley Marine Services	dichloromethane	1990	0.5 – 1.4 median = 0.9 n = nr	six groundwater wells throughout the facility	Landau (1990) as cited in SAIC (2008a)	Groundwater data were collected to characterize the property for a potential real estate transaction.

Note: Groundwater data for the shoreline properties (Crowley Marine Services and First South Properties) are presented as they were in the Slip 4 source documents and the data gaps report for the Seattle Boiler Works to Slip 4 SCA. The only available groundwater data for these two properties are from the late 1980s and early 1990s.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 4 SCA.

[b] PCBs, mercury, BBP, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and total HPAHs were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

[f] The VOC data for Crowley Marine Services were provided in the Seattle Boiler Works to Slip 4 SCA data gaps report (2008a). Only detected data were provided; sample counts were not reported. VOC data were summarized, as available, at EPA's request and not because of SQS exceedances in surface sediment in the SCA.

BEHP – bis(2-ethylhexyl) phthalate
BBP – butyl benzyl phthalate
EPA – US Environmental Protection Agency
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
nr – not reported
SAIC – Science Applications International Corporation
SCA – source control area
SQS – sediment quality standard
VOC – volatile organic compound

Table I-30. Summary of chemical concentrations detected in seeps in the Slip 4 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Crowley Marine Services	total PCBs	2006	0.02, 0.1 (dissolved) n = 2/6	along property shoreline	Integral (2006a) as cited in SAIC (2007a)	Seep sample was collected as part of Slip 4 sediment removal action design planning.
First South Properties	mercury	2004	0.00092 (dissolved) n = 1/1	along property shoreline	Windward (2004)	Seep sample was collected as part of the LDW RI.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 4 SCA.

[b] BBP, BEHP, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and total HPAHs were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples. Concentration ranges were calculated using only detected data. For this reason, some estimated ranges may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

BEHP – bis(2-ethylhexyl) phthalate
BBP – butyl benzyl phthalate
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LDW – Lower Duwamish Waterway
PCB – polychlorinated biphenyl
RI – remedial investigation
SAIC – Science Applications International Corporation
SCA – source control area
SQS – sediment quality standard

Source-tracing samples have been collected from several facilities and drainage systems associated with the Slip 4 SCA (see the table on Map I-16), and data from these samples are available in the source documents. Table I-31 presents source-tracing data collected within the Slip 4 SCA. Most source-tracing data were collected between 2000 and 2007 because many of the source-tracing programs within the LDW were initiated within this time period.[25] Data relevant to source-tracing efforts include: samples of catch basin solids, manhole and stormwater vault solids, solids from oil/water separators, joint caulking material used as sealant on paved areas, samples from sediment traps, in-line sediment samples, and samples from filter bags placed over catch basins or water flow intake points within storm drain systems. When multiple rounds of data were collected from the same sampling location, only the most recent round was selected for presentation in order to represent current conditions. Additional details on source-tracing sampling programs conducted within the Slip 4 SCA and the larger LDW drainage basin are presented in Section 9.4.4.7 of the main body of the RI. King County and SPU have inspected over 50 businesses in the Slip 4 basin (King County and SPU 2005) as part of their source control efforts within the basin. The business inspection program is discussed in Section 9.4.4.5 of the main body of the RI.

[25] Data from 2008 are not included in Table I-31. Many of the 2008 data are not yet validated or are otherwise not yet ready for use. Sediment trap data collected in March 2008 are presented on Map I-18. Additional rounds of data were collected prior to 2008 and in July 2008 from the sediment traps within the Slip 4 SCA drainage basin.

Table I-31. Summary of chemical concentrations detected in source-tracing samples in the Slip 4 SCA

Sample Source	Year Collected	Concentration Information[a, b, c]								Sources[e]	Additional Information
		Mercury (mg/kg dw)	Acenaphthene (µg/kg dw)	Benzo(a)-Anthracene (µg/kg dw)	Benzo(a)-pyrene (µg/kg dw)	Benzo-fluoranthenes (µg/kg dw)[d]	Benzo(g,h,i)-perylene (µg/kg dw)	Chrysene (µg/kg dw)	Dibenzo(a,h)-anthracene (µg/kg dw)		
Onsite Catch Basin Solids Samples											
GTSP flume	2004 - 2005	0.12, 0.32 n = 2/2	82 n = 1/2	1,400 n = 1/2	1,500 n = 1/2	360, 4,700 n = 2/2	530 n = 1/2	290, 1,800 n = 2/2	85 n = 1/2	Schmoyer (2008d)	Two onsite catch basin solids samples were collected from the GTSP flume basin.
I-5 SD	2004 and 2006	0.1 – 0.34 median = 0.3 n = 3/3	760 n = 1/3	110, 13,000 n = 2/3	120, 15,000 n = 2/3	380, 30,000 n = 2/3	7,300 n = 1/3	110 – 20,000 median = 170 n = 3/3	2,700 n = 1/3	Schmoyer (2008d)	Three onsite catch basin solids samples were collected from the I-5 SD basin.
KCIA SD No. 3/PS44 EOF	2004 - 2007	0.2 n = 1/1	nd	27,000 n = 1/1	32,000 n = 1/1	68,000 n = 1/1	16,000 n = 1/1	43,000 n = 1/1	5,400 n = 1/1	Schmoyer (2008d)	Multiple onsite catch basin solids samples were collected from the KCIA SD No. 3/PS44 EOF drainage basin. For all except one sample, only PCB data are available. The single sample for which data are available for other chemicals was collected in 2004.
Private SDs (Crowley Marine Services facility)	2004	0.08 n = 1/1	170 n = 1/1	610 n = 1/1	200 n = 1/1	800 n = 1/1	nd	1,000 n = 1/1	nd	Schmoyer (2008d)	An onsite catch basin solids sample was collected from the Crowley Marine Services facility.
Private SDs (First South Properties facility)	2005 - 2006	0.11, 0.2 n = 2/2	nd	130, 730 n = 2/2	200, 830 n = 2/2	500, 2,500 n = 2/2	230, 570 n = 2/2	290, 1,800 n = 2/2	150 n = 1/2	Schmoyer (2008d)	Two onsite catch basin solids samples were collected from the First South Properties facility.
ROW Catch Basin Solids Samples											
GTSP flume	2007	nr	nr	nr	nr	nr	nr	nr	nr	Schmoyer (2008d)	Seven ROW catch basin solids samples were collected from the GTSP flume drainage basin and analyzed for PCBs.
I-5 SD	2006 - 2007	nd	nd	36 n = 1/3	38 n = 1/3	32 – 100 median = 85 n = 3/3	32 n = 1/3	28 – 140 median = 49 n = 3/3	nd	Schmoyer (2008d)	Three right-of-way catch basin solids samples were collected from the I-5 SD basin.
In-Line Sediment Trap Samples											
I-5 SD	2007	nd	nr	nr	nr	nr	nr	nr	nr	Schmoyer (2008d)	A sediment trap sample was collected from the I-5 SD basin in May 2007. The sample was analyzed for metals and PCBs.
KCIA SD No. 3/PS44 EOF	2007	0.07 – 4.40 median = 0.45 n = 6/8	nd	440 – 1,500 median = 570 n = 3/3	390 – 1,200 median = 830 n = 3/3	2,600 – 6,900 median = 2,700 n = 3/3	120 n = 1/3	1,200 – 3,100 median = 1,200 n = 3/3	nd	Schmoyer (2008d)	Sediment trap samples were collected from nine locations within the KCIA SD No. 3/PS44 EOF drainage basin. Only PCB data were available for six of the samples.
Other In-line Samples (e.g., oil/water separators,[f] manholes, stormwater vaults,[g] flume samples)											
GTSP flume	2005 - 2006	0.08 – 1.70 median = 0.20 n = 11/16	10 – 660 median = 81 n = 6/16	38 – 7,900 median = 370 n = 15/16	56 – 8,600 median = 290 n = 15/16	162 – 20,000 median = 1,000 n = 15/16	20 – 2,500 median = 190 n = 15/16	91 – 8,400 median = 595 n = 16/16	7 – 1,000 median = 40 n = 10/16	Schmoyer (2008d)	Twenty-seven in-line sediment samples were collected from the GTSP flume. One sampling location was a manhole located at the downstream end of the flume. Not all samples had data available for all chemicals (for many, only PCB data were available).
I-5 SD	2005	nd	nd	nd	26 n = 1/1	34 n = 1/1	nd	31 n = 1/1	nd	Schmoyer (2008d)	One manhole solids sample was collected within the I-5 SD basin.

Table I-31, cont. Summary of chemical concentrations detected in source tracing samples in the Slip 4 SCA

Sample Source	Year Collected	Concentration Information[a, b, c]								Sources[e]	Additional Information
		Mercury (mg/kg dw)	Acenaphthene (µg/kg dw)	Benzo(a)-anthracene (µg/kg dw)	Benzo(a)-pyrene (µg/kg dw)	Benzo-fluoranthenes (µg/kg dw)[d]	Benzo(g,h,i)-perylene (µg/kg dw)	Chrysene (µg/kg dw)	Dibenzo(a,h)-anthracene (µg/kg dw)		
KCIA SD No. 3/PS44 EOF	1992 - 2007	0.07 – 0.70 median = 0.23 n = 14/15	800 – 1,000 median = 930 n = 3/15	280 – 35,500 median = 3,000 n = 15/15	300 – 50,000 median = 3,400 n = 15/15	760 – 142,000 median = 9,000 n = 15/15	170 – 44,800 median = 3,100 n = 15/15	400 – 70,100 median = 4,690 n = 15/15	184 – 12,900 median = 3,100 n = 9/15	Schmoyer (2008d)	Solids samples were collected from manholes, oil/water separators,[f] and stormwater vaults[g] located within the KCIA SD No. 3/PS44 EOF drainage basin. The majority of the samples were collected between 2005 and 2007; single sampling results from 1992 and 1998 were included because newer data were not available from the sampling locations where these samples were collected.
Filter Bag Samples[h]											
KCIA SD No. 3/PS44 EOF	2004	nr	nr	nr	nr	nr	nr	nr	nr	ARI (2005) as cited in SAIC SAIC (2007e)	Samples were collected from filter bags.[h] Source documents did not specify whether the reported PCB concentration was for mg/kg filter bag material or for the concentration of the retained solids concentration as back-calculated from the filter bag material concentration.
KCIA SD No. 3/PS44 EOF	2005	nr	nr	nr	nr	nr	nr	nr	nr	Boeing (2005) as cited in SAIC (2007e)	Samples were collected from filter bags[h] used to remove suspended solids from the storm drain system. The filter bag and its contents were analyzed together and the concentration on the retained solids was then back-calculated.

Table I-31, cont. Summary of chemical concentrations detected in source tracing samples in the Slip 4 SCA

Sample Source	Year Collected	Concentration Information[a, b, c]							Additional Information
		Fluoranthene (µg/kg dw)	Indeno(1,2,3-cd)-pyrene (µg/kg dw)	Total HPAH[i] (µg/kg dw)[i]	BBP (µg/kg dw)	BEHP (µg/kg dw)	Total PCBs[i] (µg/kg dw)	Sources[e]	
Onsite Catch Basin Solids Samples									
GTSP flume	2004 - 2005	410, 4,700 n = 2/2	710 n = 1/2	1,400, 18,000 n = 2/2	430 n = 1/2	77, 10,000 n = 2/2	180, 250 n = 2/2	Schmoyer (2008d)	Two onsite catch basin solids samples were collected from the GTSP flume basin.
I-5 SD	2004 and 2006	110 – 31,000 median = 240 n = 3/3	8,600 n = 1/3	380 – 150,000 median = 1,200 n = 3/3	120, 490 n = 2/3	430 – 8,800 median = 2,900 n = 3/3	189 – 470 median = 310 n = 3/3	Schmoyer (2008d)	Three onsite catch basin solids samples were collected from the I-5 SD basin.
KCIA SD No. 3/PS44 EOF	2004 - 2007	85,000 n = 1/1	19,000 n = 1/1	340,000 n = 1/1	nd	30,000 n = 1/1	66 – 320,000 median = 5,500 n = 43/44	Schmoyer (2008d)	Multiple onsite catch basin solids samples were collected from the KCIA SD No. 3/PS44 EOF drainage basin. For all except one sample, only PCB data are available. The one sample for which data are available for other chemicals was collected in 2004.
Private SDs (Crowley Marine Services facility)	2004	3,600 n = 1/1	nd	8,800 n = 1/1	1,300 n = 1/1	1,600 n = 1/1	nd	Schmoyer (2008d)	An onsite catch basin solids sample was collected from the Crowley Marine Services facility in 2004.
Private SDs (First South Properties facility)	2005 - 2006	310, 1,700 n = 2/2	96, 410 n = 2/2	2,200, 14,000 n = 2/2	1,000 n = 1/2	12,000, 120,000 n = 2/2	300, 620 n = 2/2	Schmoyer (2008d)	Two onsite catch basin solids samples were collected from the First South Properties facility.
ROW Catch Basin Solids Samples									
GTSP Flume	2007	nr	nr	nr	nr	nr	33 – 570 median = 65 n = 7/7	Schmoyer (2008d)	Seven ROW catch basin solids samples were collected from the GTSP flume drainage basin and analyzed for PCBs.
I-5 SD	2006 - 2007	44 – 200 median = 110 n = 3/3	24 n = 1/3	140, 640 median = 490 n = 3/3	150, 250 n = 2/3	300 – 2,000 median = 360 n = 3/3	19 – 189 median = 28 n = 3/3	Schmoyer (2008d)	Three ROW catch basin solids samples were collected from the I-5 SD basin.
In-line Sediment Trap Samples									
I-5 SD	2007	nr	nr	nr	nr	nr	nd	Schmoyer (2008d)	A sediment trap sample was collected from the I-5 SD basin in May 2007. The sample was analyzed for metals and PCBs.
KCIA SD No. 3/PS44 EOF	2007	2,200 – 5,800 median = 2,200 n = 3/3	170, 300 n = 2/3	8,100 – 21,500 median = 9,600 n = 3/3	390, 690 n = 2/3	2,900 – 13,000 median = 8,000 n = 3/3	78 – 62,000 median = 450 n = 8/9	Schmoyer (2008d)	Sediment trap samples were collected from nine locations within the KCIA SD No. 3/PS44 EOF drainage basin. Only PCB data were available for six of the samples.
Other In-line Samples (e.g., oil/water separators,[f] manholes, stormwater vaults,[g] flume samples)									
GTSP flume	2005 - 2006	130 – 18,000 median = 990 n = 16/16	20 – 3,000 median = 180 n = 15/16	610 – 84,000 median = 3,000 n = 16/16	86 – 160 median = 110 n = 5/12	120 – 3,800 median = 1,000 n = 12/12	38 – 92,000 median = 2,800 n = 26/27	Schmoyer (2008d)	Twenty-seven in-line sediment samples were collected from the GTSP flume. One sampling location was a manhole located at the downstream end of the flume. Not all samples had data available for all chemicals (for many, only PCB data were available).
I-5 SD	2005	44 n = 1/1	nd	185 n = 1/1	nd	180 n = 1/1	nd	Schmoyer (2008d)	One manhole solids sample was collected within the I-5 SD basin.
KCIA SD No. 3/PS44 EOF	1992 - 2007	750 – 132,000 median = 11,000 n = 15/15	180 – 42,500 median = 2,570 n = 15/15	9,380 – 630,000 median = 157,000 n = 15/15	62 – 4,090 median = 2,610 n = 9/15	430 – 232,000 median = 31,600 n = 15/15	111 – 426,000 median = 3,500 n = 45/48	Schmoyer (2008d)	Solids samples were collected from manholes, oil/water separators,[f] and stormwater vaults[g] located within the KCIA SD No. 3/PS44 EOF drainage basin. PCB data were the only data available for many of the samples. The majority of the samples were collected between 2005 and 2007; single sampling results from 1992 and 1998 were included because no newer data were available from the sampling locations where these samples were collected.
Filter Bag Samples[h]									
KCIA SD No. 3/PS44 EOF	2005	nr	nr	nr	nr	nr	510,000[j] median = nr n = nr/3	ARI (2005) as cited in SAIC (2007e)	Samples were collected from filter bags.[h] Source documents did not specify whether the reported PCB concentration was for mg/kg filter bag material or for the concentration of the retained solids concentration as back-calculated from the filter bag material concentration.

Table I-31, cont. Summary of chemical concentrations detected in source tracing samples in the Slip 4 SCA

Sample Source	Year Collected	Concentration Information[a, b, c]							Additional Information
		Fluoranthene (µg/kg dw)	Indeno(1,2,3-cd)-pyrene (µg/kg dw)	Total HPAH[i] (µg/kg dw)[j]	BBP (µg/kg dw)	BEHP (µg/kg dw)	Total PCBs[i] (µg/kg dw)	Sources[e]	
KCIA SD No. 3/PS44 EOF	2004	nr	nr	nr	nr	nr	67 – 300[j] median = 170[j] n = 3/3	Boeing (2005) as cited in SAIC (2007e)	Samples were collected from filter bags[h] used to remove suspended solids from the storm drain system. The filter bag and its contents were analyzed together and the concentration on the retained solids was then back-calculated.

Note: Data are not included for drainage structures that have been removed subsequent to sampling, such as data collected from the drainage swale formerly located on First South Properties. If multiple rounds of data were available for a single location, only the data collected during the most recent event were presented in order to represent the most current conditions possible.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 4 SCA.

[b] Significant figures are reported as available in source documentation; when converting units (e.g., from µg/kg to mg/kg), the number of significant figures was kept consistent with the number in the reported value.

[c] n is the ratio of the number of detects to the total number of samples analyzed. In some cases (those with an "nr"), the total number of samples analyzed was not indicated in the source documents. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[d] The concentrations provided for benzofluoranthenes are the sum of individual benzofluoranthene concentrations provided for each sample.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

[f] Oil/water separators remove suspended solids and oil from stormwater. Solids collected from these structures are expected to have high TOC concentrations; source-tracing samples collected from oil/water separators should not be considered representative of typical storm drain solids that could discharge to the LDW through storm drain outfalls.

[g] The majority of the stormwater vaults include oil/water separator infrastructure (Tiffany 2008b). See footnote f.

[h] Storm drain filter bags are used to filter suspended solids from stormwater; the filter bag and its contents were analyzed together after a known volume of stormwater had passed through the bags.

[i] Only detected concentrations were used in calculating total HPAHs and total PCBs.

[j] Concentrations presented in source documents were reported in mg/kg and are assumed to be in dw units.

ARI – Analytical Resources, Inc.
BEHP – bis(2-ethylhexyl) phthalate
BBP – butyl benzyl phthalate
dw – dry weight
EOF – emergency overflow
GTSP – Georgetown Steam Plant
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
I-5 – Interstate 5
KCIA – King County International Airport
LDW – Lower Duwamish Waterway
nd – not detected
NBF – North Boeing Field
nr – not reported
PCB – polychlorinated biphenyl
PS – pump station
ROW – right-of-way
SAIC – Science Applications International Corporation
SCA – source control area
SCAP – source control action plan
SD – storm drain
SPU – Seattle Public Utilities
SQS – sediment quality standard

The Slip 4 SCA is a candidate for early action sediment removal; a 100% design analysis report has been completed in preparation for the removal action (Integral 2007). Construction of the removal action will begin once Ecology has determined that sources are sufficiently controlled within the Slip 4 drainage basin to prevent the recontamination of sediment after the cleanup.

Source identification and control efforts are ongoing. Planned activities include continued source tracing at NBF, KCIA, Crowley Marine Services, Boeing Plant 2, and other locations within the Slip 4 drainage basin; cleanout of SD line structures in the I-5 SD system, at Boeing Plant 2, and at Crowley Marine Services; additional site inspections at upland facilities; remediation and replacement of the GTSP flume; and a groundwater investigation at the Crowley Marine Services facility (SAIC 2007a). For the most current information on the Slip 4 SCA, visit Ecology's website.

The Boeing Company, King County, and the City of Seattle have entered into an Agreed Order with Ecology for the purpose of completing an RI/FS and for potentially implementing remedial actions at North Boeing Field/GTSP. A supplemental data gaps report has been prepared as part of the RI/FS process and is under review (Goldberg 2009).

I.4.5 BOEING PLANT 2/JORGENSEN FORGE SOURCE CONTROL AREA (RM 2.9 E TO RM 3.7 E, EAA 4)

The Boeing Plant 2/Jorgensen Forge SCA is one of 23 areas identified by Ecology along the LDW for source control evaluation and one of the seven candidate EAAs recommended to EPA and Ecology (Windward 2003c). Since the late 1980s, various soil, groundwater, and sediment investigations have been conducted within the Boeing Plant 2/Jorgensen Forge SCA under both the Resource Conservation Recovery Act (RCRA) and the Model Toxics Control Act (MTCA). As part of ongoing source control efforts for this SCA, a data gaps report (Ecology and Environment 2007b) and a SCAP (Ecology 2007c) were completed in August 2007; future updates to the SCAP by Ecology are expected.

Extensive data gaps investigations have recently been completed of upland areas at Boeing Plant 2. Reports completed to date include the South Yard Area (Environmental Partners and Golder Associates 2007a) and 2-60 and 2-66 areas (Environmental Partners and Golder Associates 2007b, c) of Boeing Plant 2. In addition, the 2-40s area and the North Area have recently been sampled; a work plan for a data gaps investigation in the 2-31 area has been submitted to EPA. A draft work plan for the final area, the 2-10 area, is being prepared.

Beginning in 2001, quarterly shoreline groundwater monitoring of Boeing Plant 2 has been implemented; in 2008, this monitoring switched to a semi-annual basis (Environmental Partners 2008). In 2005, a stormwater source-tracing investigation was completed (Floyd|Snider 2005), which led to annual stormwater source control monitoring beginning in 2007 (Golder Associates 2007).

Information and data presented in tables in this section were based largely on the information and data presented in the data gaps report and SCAP. In addition to these documents, a seep survey (2004), a porewater study (Windward 2006a), and a groundwater pathways assessment (Windward 2003b) were conducted for the LDW, including the area of this SCA. Some of the data presented in the Ecology source documents were corrected and some data were added based on a QA/QC review (Colligan 2008). The corrections resulted either from cross-checking against the original source materials or querying the Boeing Plant 2 database. These documents are referred to collectively as the "source documents" throughout this section and on the associated maps. Data from Golder Associates (2007), Floyd|Snider (2005), Weston (1998), Pentec (2002), and Environmental Partners (2008) were collected or included at the request of a LDWG member.

CSL exceedances in surface sediment in this SCA included total PCBs, BBP, BEHP, cadmium, chromium, copper, lead, mercury, silver, zinc, and phenol. SQS exceedances were reported for individual PAHs, total HPAHs, and total LPAHs. These exceedances are based on the RI baseline surface sediment dataset and the 2007 SCA boundary, as discussed in the introduction to this appendix. Ecology has identified COCs for this SCA based on different criteria (Table I-3); therefore, the chemicals identified for summary in this appendix are different than the COCs identified by Ecology. Surface sediment chemistry information for the Boeing Plant 2/Jorgensen Forge SCA is provided on Maps I-19 through I-21. Dioxins and furans were detected above a TEQ of 100 ng/kg dw in a surface sediment sample within the SCA. No dioxin and furan data were available for upland facilities in the source documents.

Commercial and industrial operations in the vicinity of this SCA have included warehousing (current), vehicle fleet maintenance (current), aerospace research and development (current), forging (current and historical), general aviation (current and historical), airplane manufacturing (historical), heat treating and galvanizing (historical), and metals fabrication (historical) (Ecology and Environment 2007b). Raw materials such as metals (e.g., chrome, zinc, copper, cadmium, and silver), lead-based paints, solvents, petroleum products, and acids have also been used at nearby properties.

Ecology has identified Boeing Plant 2 and Jorgensen Forge as adjacent facilities associated with this SCA (Map I-22) (Ecology and Environment 2007b). Ecology also identified KCIA and E Marginal Way S as upland facilities (Ecology and Environment 2007b). Facility-specific information for adjacent properties is presented in Table I-32. KCIA is also summarized in Table I-32 because source-tracing data were reported in the source documents. E Marginal Way S is not included in the summary because source-tracing data were not available (see the introduction for more information on facility selection criteria). Groundwater information for Boeing Plant 2 is also included in Section 9.4.6 of the main body of the RI. The data gaps reports and SCAP present additional information on all facilities associated with this SCA.

Table I-32. Summary of facility information for the Boeing Plant 2/Jorgensen Forge SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Investigations/ Activities
Boeing Plant 2	The Boeing Company	warehousing, vehicle fleet maintenance, aerospace research and development	aircraft assembly and manufacturing of aluminum alloy, steel alloy, and titanium alloy parts for airplanes	Numerous soil and groundwater investigations have been completed since the late 1980s. Boeing has completed many unit-based investigations under RCRA, involving (but not limited to) TSDs, USTs, holding areas, oil/water separators, machine pits, sumps, cisterns, a reclamation yard, a retention tank, a dilute chrome tank, transformer vaults, a TCE degreaser, and paint booths. Boeing also completed several data gaps investigations and a PCB investigation on the southwest corner of the property. Quarterly monitoring of groundwater at monitoring wells along the Boeing Plant 2 shoreline has taken place since 2001.	Numerous cleanup activities and several interim closures of RCRA waste management units have been conducted. Interim corrective measures have included the installation of three sheet pile containment structures in 1993 and a groundwater convection well/vapor extraction system in 2004. Other remedial activities have included various soil excavations, decommissioning or removal of vaults or sumps, UST removals, and decommissioning of stormwater lines. Remedial actions associated with a chlorinated VOC plume are ongoing. The plume originates at the EMF site on the east side of KCIA and transits the 2-40s area. Information on these and other actions are provided on the EPA website.	Several source-tracing investigations and source control measures have been conducted within the storm drain system. Source-tracing samples included catch basin solids, pavement caulking, whole water, and suspended solids in stormwater (Golder Associates 2008d, c). Paved surfaces are mechanically swept on a routine basis (Ernst 2008).

Table I-32, cont. Summary of facility information for the Boeing Plant 2/Jorgensen Forge SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Investigations/ Activities
Jorgensen Forge	Jorgensen Forge	manufacturing and precision-machine forging from various materials, including carbon and low-alloy steels, duplex stainless grades, aluminum alloys, titanium alloys, and nickel-base alloys for commercial aircraft, aerospace, energy (i.e., oil exploration), power generation, automotive, and shipbuilding industries	fabrication of structural steel, tractors, and road equipment; forging; heat-treating and galvanizing; steel distribution; and cutting of prefabricated steel rods	Numerous soil and groundwater investigations have been completed since 1990. Several petroleum releases were identified and a pool of cutting oil was identified. An investigation following an Administrative Order on Consent was conducted between 2003 and 2006. The investigation involved soil borings, shoreline sediment sampling, catch basin sampling, an inactive outfall video reconnaissance survey, a site stormwater drainage survey, subsurface fill sampling, shoreline bank fill sampling, debris pile sampling, and sampling of outfall discharges. A MTCA Agreed Order has also been negotiated between Jorgensen Forge and Ecology to conduct a source control investigation at the facility.	In 1991, three USTs were removed, and an air sparging and vapor extraction remediation system was installed. From 1991 to 1996, interim remedial actions were completed on the property for soil and groundwater contaminated with petroleum hydrocarbons.	Two source-tracing investigations were completed in 2000 and 2005, and an additional source control investigation is in progress under the MTCA Agreed Order (Good 2009).
KCIA[b]	King County	general aviation airport	community aviation center, US Army operations, passenger and commercial traffic operations, general aviation	No environmental investigations were reported.	No remedial activities were reported.	Flight lines and taxi ways are mechanically swept on a frequent basis per Federal Aviation Administration requirements (2008a).

Sources: Ecology and Environment (2007b); Ecology (2007c)

[a] Facilities listed are those identified as adjacent properties in the data gaps report (Ecology and Environment 2007b). KCIA (identified as an upland property in the source documents) is also included because source-tracing data were included in the source documentation.

[b] KCIA information in this section pertains only to the area of KCIA that drains to the Boeing Plant 2/Jorgensen Forge SCA.

EMF – Electronics Manufacturing Facility
EPA – Environmental Protection Agency
KCIA – King County International Airport
MTCA – Model Toxics Control Act
PCB – polychlorinated biphenyl
RCRA – Resource Conservation and Recovery Act
SCA – source control area
TCE – trichloroethene
TSD – treatment, storage and disposal
UST – underground storage tank
VOC – volatile organic compound

Numerous active outfalls have been identified along the shoreline of the Boeing Plant 2/Jorgensen Forge SCA (Maps I-22 through I-24) (Herrera 2004; Windward 2006b). In addition to privately owned storm drains along Boeing Plant 2 and Jorgensen Forge, there is also a publicly owned storm drain (No. 3032) and one outfall (No. 2059) that includes drainage from KCIA and E Marginal Way. The public outfall (No. 3032) discharges storm water from 16th Avenue South and an adjacent section of Boeing Plant 2 in the vicinity of the 16th Avenue South Bridge (Map I-23). Note that the SCAP (Ecology 2007c) and data gaps report (Ecology and Environment 2007b) discuss Boeing Plant 2 Outfall A (twin outfalls Nos. 2052 and 2053). These outfalls are not located within the Boeing Plant 2/ Jorgensen Forge SCA boundary and are included in the Slip 4 SCA discussion (Section I.4.4).

Stormwater from all of these outfalls originates primarily from the two adjacent properties (Boeing Plant 2 and Jorgensen Forge). A portion of KCIA and a small portion of E Marginal Way S also drain to this SCA via the 24-in. diameter property line outfall (No. 2059). The total stormwater drainage basin from these four areas is approximately 132 ac (Ecology and Environment 2007b). Most of the stormwater from the adjacent upland areas is collected in storm drains that run through various catch basins (some of which also have oil/water separators, catch basin inserts, and/or advanced filtration systems) before discharging to the LDW. Some of the stormwater collected from upland areas in the vicinity of the SCA also enters systems that eventually discharge to the storm drain system. Information on the outfalls within the Boeing Plant 2/Jorgensen Forge SCA is included in Table I-33; the locations of these outfalls are provided on Maps I-19 through I-21. Drainage system lines on adjacent properties are shown on Maps I-25 through I-27.

Table I-33. Summary of specific information for outfalls in the Boeing Plant 2/Jorgensen Forge SCA

OUTFALL[a]	CURRENT OWNERSHIP	CURRENT OPERATIONS	HISTORICAL OPERATIONS	ENVIRONMENTAL AND SOURCE-TRACING INVESTIGATIONS	REMEDIAL AND SOURCE CONTROL ACTIVITIES
Boeing Plant 2 outfalls (Nos. 3022 through 3028, 3030, 3034, 3035, 3000 through 3019, 2054 through 2058, and Boeing 1 through 9)	The Boeing Company	Forty-four outfalls have been identified along the Boeing Plant 2 shoreline. Sixteen of these outfalls have been abandoned. Three have been designated as "not an outfall" because the locations were previously identified as an outfall in a 2003 survey but subsequent investigation determined they were not outfalls. Many of the outfalls drain rooftops and parking lots on Boeing property.	Stormwater lines (X and Y) used to service the 2-60s and 2-66 building areas. These lines have been fully decommissioned under EPA supervision.	A storm system survey was conducted in 2005. During this effort, source-tracing samples were collected within the drainage system. This effort was followed by more detailed sampling of specific storm drain lines. Beginning in 2007, monitoring of suspended solids in stormwater has also occurred at five separate storm lines (Golder Associates 2008d).	Source control activities have been conducted since the 1990s, including plugging or sealing manholes, addition of catch basin inserts and/or filter socks, jetting of lines,; and replacing drainage lines (Golder Associates 2008b). Two entire stormwater lines (X and Y) were decommissioned in 2006. An advanced filtration manhole was added to the storm drain system (Golder Associates 2008b). Catch basins and catch basin inserts and/or filtration devices and oil/water separators are inspected yearly. Accumulated solids in stormwater catch basins are cleaned out regularly and storm lines have been jetted (Golder Associates 2008a).
Jorgensen Forge outfalls (Nos. 2064 to 2072)	Jorgensen Forge	Nine outfalls have been identified along the Jorgensen Forge shoreline. Five of these outfalls have been abandoned. The remaining four active outfalls serve the paved areas on the property as well as the building roof drains. These outfalls also drain groundwater that accumulates in sumps and pits, and discharge non-contact cooling water from the cooling tower system.	Historically, all nine outfalls discharged to the LDW. These outfalls drained rooftops and other unknown sources.	A video survey of three of the five abandoned outfalls was conducted in 2004 to confirm that flow from these outfalls no longer discharges to the LDW. A comprehensive site stormwater drainage investigation study was conducted in 2004. This study confirmed that there was no discharge from any of the five abandoned outfalls. Source-tracing samples, including solids and water samples, have been collected within the drainage system.	Five outfalls were plugged with concrete in the mid-1980s. Oil-absorbent booms and filter fabrics have been installed in catch basins since 1998 and are replaced regularly. Catch basins are cleaned semi-annually. Samples collected included stormwater catch basin sediment samples, trench sediment samples (2005 only), and pavement caulk samples.

Table I-33, cont. Summary of specific information for outfalls in the Boeing Plant 2/Jorgensen Forge SCA

OUTFALL[a]	CURRENT OWNERSHIP	CURRENT OPERATIONS	HISTORICAL OPERATIONS	ENVIRONMENTAL AND SOURCE-TRACING INVESTIGATIONS	REMEDIAL AND SOURCE CONTROL ACTIVITIES
Public SD outfall (No. 3032)[b]	City of Seattle[c]	A public outfall exists along the Boeing Plant 2 shoreline. The SD drains Boeing property as well as public roadways.	No historical operations were reported.	Source-tracing samples were collected by Boeing in 2005 at a location prior to discharge into the public storm system. (Floyd|Snider 2005) SPU collected source-tracing samples from this system in 2008-2009.	Boeing's inputs to the public SD are being managed as part of Boeing Plant 2 source control efforts (Golder Associates 2008d).
Combined use outfall (No. 2059)	To be determined	One outfall located on Jorgensen Forge, parallel to the Boeing Plant 2 property line. The SD system on Jorgensen Forge also receives drainage originating from KCIA and E. Marginal Way.	Historical connections to Jorgensen Forge and Boeing Plant 2 were identified.	Solids were collected by Boeing in 2005 from manholes along this storm line. Catch basin and joint caulk samples were collected in 2001 and 2005.	Source control activities are in the process of being coordinated. King County Airport removes accumulated solids from catch basins semi-annually, and cleans oil/water separators annually.

Sources: Ecology and Environment (2007b); Ecology (2007c)

[a] No major outfalls were identified as individual source control entities in the data gaps report (Ecology and Environment 2007b) or the SCAP (Ecology 2007c).

[b] Two public outfalls were identified along the Boeing Plant 2 shoreline at the South Park bridge (Nos. 3031 and 3032) during the survey conducted by Herrera (2004). According to the City of Seattle's plans (Schmoyer 2008c), there is only one outfall that drains the Boeing property as well as portions of 16th Avenue S and E Marginal Way S. Outfall No. 3031 is not an actual outfall; it is most likely a broken section of the original outfall No. 3032 (Floyd|Snider 2006). Maps I-19 and I-23 show the two outfalls on the property because the 2003 outfall survey (Herrera 2004) is the outfall information source used throughout the RI. The treatment of discrepancies between outfall configurations shown on the RI maps and the maps provided in source documents is discussed further in the introduction to this appendix.

[c] Ownership information for outfall No. 3032 is unclear. The survey conducted by Herrera (2004) identified the City of Seattle and The Boeing Company as owners but subsequent investigation by Boeing identified SPU as the owner (Floyd|Snider 2006).

CMS – corrective measures study
EPA – Environmental Protection Agency
KCIA – King County International Airport
LDW – Lower Duwamish Waterway
SCA – source control area
SCAP – source control action plan
SD – storm drain
SPU – Seattle Public Utilities

Numerous remedial activities and environmental investigations have been completed or are currently in progress within the Boeing Plant 2/Jorgensen Forge SCA (Maps I-22 through I-24). These investigations have detected chemicals at concentrations above the SQS in Boeing Plant 2/Jorgensen Forge surface sediment. Many of these chemicals have also been detected in various other media, including soil, groundwater, seep, stormwater, and source-tracing samples (Table I-34). The availability of data (by media type) is also presented in the tables on Maps I-22 through I-24 for each of the facilities and major outfalls associated with this SCA. In Table I-34, and in the table on Maps I-22 through I-24, an X indicates that the source documents reported data or indicated that data exist; therefore, an X does not necessarily mean that the actual data were presented in the source document. Data are only summarized in media-specific and source-tracing tables if the data were reported in the source documents and if they met the criteria for data summation discussed in the introduction to this appendix (e.g., soil data were collected along the SCA shoreline; groundwater data were collected from shoreline facilities). The identification of a chemical in these media at facilities or within drainage systems of the Boeing Plant 2/Jorgensen Forge SCA does not necessarily indicate that these potential sources contributed to sediment contamination in the past or will result in sediment contamination in the future.

Table I-34. Chemicals identified in various media in the Boeing Plant 2/ Jorgensen Forge SCA

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater	Source-Tracing Samples	Source
Cadmium	X	X				X	Ecology and Environment (2007b), Floyd|Snider (2005), Golder Associates (2007)
Chromium	X	X				X	Ecology and Environment (2007b) Floyd|Snider (2005), Golder Associates (2007)
Copper	X	X	X		X	X	Ecology and Environment (2007b), Golder Associates (2007), Windward (2004), Weston (1998)
Lead	X	X	X		X	X	Ecology and Environment (2007b), Golder Associates (2007), Windward (2004), Floyd|Snider (2005), Colligan (2008)

Chemical[a]	Soil	Ground-water	Seep	Pore-water[b]	Storm-water	Source-Tracing Samples	Source
Mercury	X	X	X		X	X	Ecology and Environment (2007b), Golder Associates (2007), Weston (1998), Windward (2004), Colligan (2008)
Silver		X	X			X	Ecology and Environment (2007b), Windward (2004), Floyd|Snider (2005), Golder Associates (2007)
Zinc	X	X	X		X	X	Ecology and Environment (2007b), Golder Associates (2007), Windward (2004), Weston (1998)
Acenaphthene	X				X		Ecology and Environment (2007b), Golder Associates (2007)
Benzo(a)anthracene	X						Ecology and Environment (2007b)
Benzofluoranthenes	X						Ecology and Environment (2007b)
Benzo(g,h,i)perylene	X						Ecology and Environment (2007b)
Chrysene	X				X		Ecology and Environment (2007b), Golder Associates (2007)
Dibenzo(a,h)anthracene	X						Ecology and Environment (2007b)
Dibenzofuran	X						Ecology and Environment (2007b)
Fluoranthene	X				X		Ecology and Environment (2007b), Golder Associates (2007)
Fluorene					X		Golder Associates (2007)
Indeno(1,2,3-cd)pyrene	X						Ecology and Environment (2007b)
Phenanthrene	X				X		Ecology and Environment (2007b), Golder Associates (2007)
Total HPAHs[c]							
Total LPAHs[c]							

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater	Source-Tracing Samples	Source
BBP	X					X	Ecology and Environment (2007b)
BEHP	X				X	X	Ecology and Environment (2007b), Golder Associates (2007)
Phenol		X					Ecology and Environment (2007b)
Total PCBs	X	X				X	Ecology and Environment (2007b), Floyd|Snider (2005)
Dioxins and furans[c, d]							

Note: An X indicates that the source documents reported that data are available for the identified media. The absence of an X in any cell does not necessarily mean that the chemical is absent in the upland media or in source-tracing samples; in some cases, the chemical may not have been analyzed for or, if analyzed, could have been present but at concentrations below the RL.

[a] Chemicals included in this table are chemicals with at least one detected exceedance of an SQS in surface sediment within the Boeing Plant 2/Jorgensen Forge SCA. The chemical list is based on SMS exceedances in the RI baseline surface sediment dataset within the 2007 SCA boundary. Therefore, this list may differ from the list of exceedances in source documents.

[b] Porewater data were collected from this SCA as part of the LDW RI; however, these samples were analyzed only for VOCs.

[c] No total HPAH, total LPAH, or dioxin/furan data were identified in the source documents for soil, groundwater, seep, porewater, stormwater, or source-tracing samples.

[d] SMS criteria do not exist for dioxins and furans. They were included in this table because they are a risk driver chemical with highly elevated concentrations (i.e., TEQ > 100 ng/kg dw) in one surface sediment sample in this area.

BBP – butyl benzyl phthalate
BEHP –bis(2-ethylhexyl) phthalate
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LDW – Lower Duwamish Waterway
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PCBs – polychlorinated biphenyls
RI – remedial investigation
RL – reporting limit
SCA – source control area
SMS – Washington State Sediment Management Standards
SQS – sediment quality standard
TEQ – toxic equivalent
VOC – volatile organic compound

Upland data have been summarized in the source documents; this section summarizes the bank soil, groundwater, seep, stormwater, and source-tracing data presented. Porewater data collected as part of the LDW RI are also presented; these samples were analyzed only for VOCs (Windward 2006a).

If sufficient data were available in the source documents, ranges of detected concentrations, median concentrations, and sample counts (n) are provided accordingly. In some instances, the source documents acknowledge the existence of certain data but do not provide actual concentrations. Data were included only if specific concentrations or a range of concentrations was included in the source documents. Most of the data are presented as they were reported in the source documents.

Multiple soil investigations have been conducted at the Boeing Plant 2 and Jorgensen Forge facilities (Ecology 2007c; Ecology and Environment 2007b). Data are included in this section if the SCAP (Ecology 2007c) or data gaps report (Ecology and Environment 2007b) clearly reported that the sample was in close proximity to the shoreline.

Boeing conducts quarterly shoreline groundwater monitoring. Since multiple rounds of data were collected from the same sampling location, only the most recent round of data was selected for presentation in order to represent current conditions. The Groundwater Pathways Assessment (Windward 2003b) identified nine VOCs of concern for groundwater at the Boeing Plant 2/Jorgensen Forge site. The groundwater data presented in Windward (2003b) and the most recent quarterly monitoring report (Environmental Partners 2008) were also included for these VOCs. Some of the data presented in the SCAP and data gaps report were corrected based on a QA/QC of the data relative to those presented in the source documents. The corrections resulted from cross-checking against the original source materials or querying the Boeing Plant 2 database (Colligan 2008). Data from the 2-66 area were also added. A chlorinated VOC plume (originating at the Electronics Manufacturing Facility [EMF]) has been identified in groundwater underlying the 2-40s area. Remedial actions occurred between 2002 and 2005 and Boeing plans to continue remediation (Ecology and Environment 2007b).

The seep data presented in this section were collected as part of the LDW RI (Windward 2004) and Boeing Plant 2 RFI (Weston 1998); no seep data were presented in the SCAP (Ecology 2007c) or the data gaps report (Ecology and Environment 2007b). In addition, no porewater or stormwater data were identified in the SCAP (Ecology 2007c) or data gaps report (Ecology and Environment 2007b). Stormwater data collected by Golder Associates (2007) on behalf of The Boeing Company were summarized in this section. Tables I-35 through I-39 summarize bank soil, groundwater, seep, and stormwater data for the Boeing Plant 2/Jorgensen Forge SCA that were reported in the source documents.

Table I-35. Summary of chemical concentrations detected in bank soil in the Boeing Plant 2/Jorgensen Forge SCA

Facility	Chemical[a, b]	Year(s) Collected	Concentration Information (mg/kg dw)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	chromium	1995, 2001	15.5 – 792 median = 35.9 n = 11/11	southwest bank area	Pentec (2002)[f]	Sample was collected from bank or closest upland boring to bank.
Boeing Plant 2	copper	1995, 2001	12.8 – 28,100 median = 989 n = 21/21	southwest bank area	Pentec (2002)[f]	Sample was collected from fill material.
Boeing Plant 2	cadmium	1995, 2001	1.3 – 121 median =23.05 n = 18/21	southwest bank area	Pentec (2002)[f]	Sample was collected from fill material.
Boeing Plant 2	lead	1995, 2001	2.28 – 22,600 median = 471 n = 21/21	southwest bank area	Pentec (2002)[f]	Sample was collected from fill material.
Boeing Plant 2	silver	1995, 2001	0.8 – 39 median = 12.7 n = 11/11	southwest bank area	Pentec (2002)[f]	Sample was collected from fill material.
Boeing Plant 2	zinc	1995, 2001	32.1 – 16,600 median = 960 n = 28/28	southwest bank area	Pentec (2002)[f]	Sample was collected from fill material.
Boeing Plant 2	total PCBs	1995, 2001	0.045 – 160 median = 18 n = 31/33	southwest bank area	Pentec (2002)[f]	Sample was collected from fill material.
Jorgensen Forge	chromium	2004	350, 386 n = 2/2	along the shoreline bank face	Farallon and Anchor (2006), as cited in Ecology and Environment (2007b); Ecology (2007c)	Sample was collected from fill material.
Jorgensen Forge	copper	2004	72.4 – 561.0 median = nr n = nr	along the shoreline bank face	Farallon and Anchor (2006), as cited in Ecology and Environment (2007b); Ecology (2007c)	Sample was collected from fill material.

Table I-35, cont. Summary of chemical concentrations detected in bank soil in the Boeing Plant 2/Jorgensen Forge SCA

Facility	Chemical[a, b]	Year(s) Collected	Concentration Information (mg/kg dw)[c, d]	Location	Sources[e]	Additional Information
Jorgensen Forge	lead	2004	1,010 – 5,450 median = nr n = nr	along the shoreline bank face	Farallon and Anchor (2006), as cited in Ecology and Environment (2007b); Ecology (2007c)	Sample was collected from fill material.
Jorgensen Forge	zinc	2004	986 – 5,430 median = nr n = nr	along the shoreline bank face	Farallon and Anchor (2006), as cited in Ecology and Environment (2007b); Ecology (2007c)	Sample was collected from fill material.
Jorgensen Forge	total PCBs	2004	0.0255 – 4.54 median = nr n = nr	along the shoreline bank face	Farallon and Anchor (2006), as cited in Ecology and Environment (2007b); Ecology (2007c)	Sample was collected from fill material.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Boeing Plant 2/Jorgensen Forge SCA

[b] Mercury, acenaphthene, benzo(a)anthracene, benzo(g,h,i)perylene, benzofluoranthenes, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, total LPAHs, total HPAHs, BBP, BEHP, phenol, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from µg/kg to mg/kg) the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed "as cited in") were not reviewed to compile this table.

[f] Data and citation provided by The Boeing Company.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
dw – dry weight
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
nr – not reported
PCB – polychlorinated biphenyl
SCA – source control area
SQS – sediment quality standard

Table I-36. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Chemicals with Detections Above SQS in Surface Sediment						
Boeing Plant 2	cadmium	2006	0.3 – 127 (total) median = 1.8 n = 9/82	2-66 Area	Environmental Partners and Golder Associates (2007c)[f]	
Boeing Plant 2	cadmium	2006	0.2 – 128 (dissolved) median = 2 n = 11/125	2-66 Area		
Boeing Plant 2	cadmium	2005	2.0 (total) n = 1/31	South Yard Area	Environmental Partners and Golder Associates (2005), as cited in Ecology and Environment (2007b)	Data are from Table 1 in Ecology and the Environment (2007b). Samples were collected from monitoring wells.
Boeing Plant 2	cadmium	2005	n = 0/31 (dissolved)	South Yard Area		
Boeing Plant 2	cadmium	2007	154 (total) n = 1/24	shoreline monitoring wells	Environmental Partners (2008)	
Boeing Plant 2	cadmium	2007	2, 76 (dissolved) n = 2/24	shoreline monitoring wells	Environmental Partners (2008)	
Boeing Plant 2	chromium	2006	0.5 – 31 (total) median = 2 n = 34/82	2-66 Area	Environmental Partners and Golder Associates (2007c)[f]	
Boeing Plant 2	chromium	2006	0.5 – 6 (dissolved) median = 1.8 n = 38/125	2-66 Area		
Boeing Plant 2	chromium	2005	6 – 160 (total) median = 21 n = 5/31	South Yard Area	Environmental Partners and Golder Associates (2006b), as cited in Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b). Samples were collected from monitoring wells.
Boeing Plant 2	chromium	2005	6 – 11 (dissolved) median = 6 n = 3/31	South Yard Area		

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	chromium	2005	12 (chromium VI) (dissolved) n = 1/7	South Yard Area		
Boeing Plant 2	chromium	2005	8 (dissolved) n = 1/12	South Yard Area	Environmental Partners and Golder Associates (2006b), as cited in Ecology and Environment (2007b)	Samples were collected from 12 direct push probe locations (A-level aquifer); data are from Table 3 in Ecology and Environment (2007b).
Boeing Plant 2	chromium	2007	6 – 30 (total) median = 10 n = 7/24	shoreline monitoring wells	Environmental Partners (2008)	
Boeing Plant 2	chromium	2007	6 – 20 (dissolved) median = 10 n = 5/24	shoreline monitoring wells	Environmental Partners (2008)	
Boeing Plant 2	copper	2005	0.5 – 52.4 (total) median = 1.7 n = 13/31	South Yard Area	Environmental Partners and Golder Associates (2006b), as cited in Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b);. Samples were collected from monitoring wells. Source document did not specify whether the concentration was dissolved or total.
Boeing Plant 2	copper	2005	0.6 – 1.3 (dissolved) median = 0.8 n = 9/31	South Yard Area		
Boeing Plant 2	copper	2005	0.5 – 14.6 (total) median = 5.0 n = 17/29	2-60s Area	Environmental Partners and Golder Associates (2005), as cited in Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b). Some total results were discarded by Environmental Partners and Golder Associates because of high turbidity. Samples were collected from monitoring wells. Source document did not specify whether the concentration was dissolved or total.
Boeing Plant 2	copper	2005	0.6 – 13.8 (dissolved) median = 5.6 n = 15/29	2-60s Area		

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	copper	2005	0.6 – 74.6 (dissolved) median = 2.6 n = 34/44	2-60s Area	Environmental Partners and Golder Associates (2005), as cited in Ecology and Environment (2007b)	Samples were collected from 26 direct push probe locations (A-level aquifer) and 18 probe locations (B-level aquifer); data are from Table 3 in Ecology and Environment (2007b). Some total results were discarded by Environmental Partners and Golder Associates because of high turbidity. Source document did not specify whether the concentration was dissolved or total.
Boeing Plant 2	copper	1992 – 1994	3 – 5 median = nr n = nr	2-10 Area	Weston Solutions (2000), as cited in Ecology and Environment (2007b)	The number of samples analyzed was not reported in the data gaps report Ecology and Environment (2007b). Source document did not specify whether the concentration was dissolved or total.
Boeing Plant 2	copper	2007	0.6 – 31 (total) median = 3.8 n = 8/24	shoreline monitoring wells	Environmental Partners (2008)	
Boeing Plant 2	copper	2007	0.5 – 28 (dissolved) median = 3 n = 9/24	shoreline monitoring wells	Environmental Partners (2008)	
Boeing Plant 2	lead	2006	4.0 – 7.0 (total) median = 5 n = 4/82	2-66 Area	Environmental Partners and Golder Associates (2007c)[f]	
Boeing Plant 2	lead	2006	1.0 – 12.0 (dissolved) median = 3.5 n = 4/125	2-66 Area		
Boeing Plant 2	lead	2005	12 (total) n = 1/31	South Yard Area	Environmental Partners (2006), as cited in Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b). Samples were collected from monitoring wells.
Boeing Plant 2	lead	2005	n = 0/31 (dissolved)	South Yard Area		

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	lead	2005	3.0, 9.5 (total) n = 2/29	2-60s Area	Environmental Partners and Golder Associates (2005), as cited in Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b). Samples were collected from monitoring wells.
Boeing Plant 2	lead	2005	3, 3 (dissolved) n = 2/29	2-60s Area		
Boeing Plant 2	lead	2005	2.9 (dissolved) n = 1/44	2-60s Area	Environmental Partners and Golder Associates (2005), as cited in Ecology and Environment (2007b)	Samples were collected from 26 direct push probe locations (A-level aquifer) and 18 probe locations (B-level aquifer); data are from Table 3 in Ecology and Environment (2007b).
Boeing Plant 2	mercury	2006	0.0866, 0.0872 (total) n = 2/82	2-66 Area	Environmental Partners and Golder Associates (2007c)[f]	
Boeing Plant 2	mercury	2006	0.0392, 0.332 (dissolved) n = 2/132	2-66 Area		
Boeing Plant 2	mercury	2005	0.0332 (total) n = 1/31	South Yard Area	Environmental Partners (2006), as cited in Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b). Samples were collected from monitoring wells.
Boeing Plant 2	mercury	2005	0.0604 (dissolved) n = 1/31	South Yard Area		
Boeing Plant 2	mercury	2005	n = 0/30 (total)	2-60s Area	Environmental Partners and Golder Associates (2005), as cited n Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b). Samples were collected from monitoring wells.
Boeing Plant 2	mercury	2005	0.106 (dissolved) n = 1/44	2-60s Area	Environmental Partners and Golder Associates (2005), as cited in Ecology and Environment (2007b)	Samples were collected from 26 direct push probe locations (A-level aquifer) and 18 probe locations (B-level aquifer); data are from Table 3 in Ecology and Environment (2007b).

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	silver	2005	0.2 (total) n = 1/31	South Yard Area	Environmental Partners and Golder Associates (2005), as cited in Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b). Samples were collected from monitoring wells.
Boeing Plant 2	silver	2005	n = 0/31 (dissolved)	South Yard Area		
Boeing Plant 2	silver	2005	0. 2 – 56.9 (total) median = 0.3 n = 13/82	South Yard Area	Environmental Partners and Golder Associates (2007c)[f]	
Boeing Plant 2	silver	2005	0.2 – 55.4 (dissolved) median = 0.4 n = 9/125	South Yard Area		
Boeing Plant 2	silver	2007	25.2 (total) n = 1/24	shoreline monitoring wells	Environmental Partners (2008)	
Boeing Plant 2	silver	2007	0.2, 27 (dissolved) n = 2/24	shoreline monitoring wells	Environmental Partners (2008)	
Boeing Plant 2	zinc	2005	6.0 – 953.0 (total) median = 19 n = 7/31	South Yard Area	Environmental Partners (2006), as cited in Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b). Samples were collected from monitoring wells.
Boeing Plant 2	zinc	2005	16 – 717.0 (dissolved) median = 26 n = 4/31	South Yard Area		
Boeing Plant 2	zinc	2005	7 – 45 (dissolved) median = 15 n = 10/12	South Yard Area	Environmental Partners (2006), as cited in Ecology and Environment (2007b)	Samples were collected from 12 direct push probe locations (A-level aquifer); data are from Table 1 in Ecology and Environment (2007b).
Boeing Plant 2	zinc	2005	6.0 – 28.0 (total) median = 8 n = 14/29	2-60s Area	Environmental Partners and Golder Associates (2005), as cited in Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b). Samples were collected from monitoring wells.
Boeing Plant 2	zinc	2005	6.0 – 19 (dissolved) median = 8 n = 16/29	2-60s Area		

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	zinc	2005	6 – 158 (dissolved) median = 11 n = 35/44	2-60s Area	Environmental Partners and Golder Associates (2005), as cited in Ecology and Environment (2007b)	Samples were collected from 26 direct push probe locations (A-level aquifer) and 18 probe locations (B-level aquifer); data are from Table 3 in Ecology and Environment (2007b).
Boeing Plant 2	zinc	2007	75 - 3330 (total) median = 340 n = 3/24	shoreline monitoring wells	Environmental Partners (2008)	
Boeing Plant 2	zinc	2007	50 – 1720 (dissolved) median = 280 n = 3/24	shoreline monitoring wells	Environmental Partners (2008)	
Boeing Plant 2	BEHP	2005	1.6 – 3.4 median = 3.2 n = 3/20	2-60s Area	Environmental Partners and Golder Associates (2005), as cited in Ecology and Environment (2007b)	Samples were collected from 12 direct push probe locations (A-level aquifer) and 8 probe locations (B-level aquifer); data are from Table 3 in Ecology and Environment (2007b). Twenty samples were referred to in the data gaps report Ecology and Environment (2007b), but the data table provided in the report indicated that twenty-two samples were analyzed. Source document did not specify whether the concentration was dissolved or total.
Boeing Plant 2	phenol	2005	3.2 n = 1/13	South Yard Area	Environmental Partners (2006), as cited in Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b). Samples were collected from monitoring wells. Source document did not specify whether the concentration was dissolved or total.
Boeing Plant 2	total PCBs	2005	0.016 – 0.073 median = 0.035 n = 4/10	2-60s Area	Environmental Partners and Golder Associates (2005), as cited in Ecology and Environment (2007b)	Samples were collected from 8 direct push probe locations (A-level aquifer) and 2 probe locations (B-level aquifer); data are from Table 3 in Ecology and Environment (2007b). Source document did not specify whether the concentration was dissolved or total.

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	total PCBs	2007	0.015 n = 1/2	shoreline monitoring wells	Environmental Partners (2008)	Two wells were sampled in November 2007.
VOCs[g]						
Boeing Plant 2	1,1-dichloroethene	2006	< 0.2[h] – 100 median = nr n = 4/73	2-60s Area	Environmental Partners and Golder Associates (2006a), as cited in Ecology and Environment (2007b)	
Boeing Plant 2	1,1-dichloroethene	2005	< 0.2[h] – 1.9 median = nr n = nr/45	South Yard	Environmental Partners and Golder Associates (2006b), as cited in Ecology and Environment (2007b)	
Boeing Plant 2	1,1-dichloroethene	2005	0.3 n = 1/29	2-60s Area	Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	1,1-dichloroethene	2005	0.2 – 0.3 median = 0.3 n = 3/44	2-60s Area	Ecology and Environment (2007b)	Samples were collected from 26 direct push probe locations (A-level aquifer) and 18 probe locations (B-level aquifer); data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations.
Boeing Plant 2	1,1-dichloroethene	2005	0.2 – 1.9 median = 1.3 n = 3/32	South Yard Area	Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	1,1-dichloroethene	2005	0.4 n = 1/12	South Yard Area	Ecology and Environment (2007b)	Samples were collected from 12 direct push probe locations (A-level aquifer); data are from Table 1 in Ecology and Environment (2007b); only detected concentrations are presented.
Boeing Plant 2	1,1-dichloroethene	1990-1996	2.6 n = 1/nr	2-10 Area	Weston Solutions (2000) as cited in Ecology and Environment (2007b)	
Boeing Plant 2	benzene	2006	< 0.2[h] – 110 median = nr n = 10/73	2-60s Area	Environmental Partners and Golder Associates (2006a), as cited in Ecology and Environment (2007b)	
Boeing Plant 2	benzene	2006	2.6 n = 1/18	shoreline monitoring wells	Environmental Partners (2006), as cited in Ecology and Environment (2007b)	Eighteen of the twenty-eight monitoring wells were sampled.
Boeing Plant 2	benzene	2005	0.2 – 110 median = 3.75 n = 8/29	2-60s Area	Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	benzene	2005	0.3, 1.1 n = 2/44	2-60s Area	Ecology and Environment (2007b)	Samples were collected from 26 direct push probe locations (A-level aquifer) and 18 probe locations (B-level aquifer); data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations.
Boeing Plant 2	benzene	2005	0.3, 0.8 n = 2/12	South Yard Area	Ecology and Environment (2007b)	Samples were collected from 12 direct push probe locations (A-level aquifer); data are from Table 1 in Ecology and Environment (2007b); only detected concentrations are presented.

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	benzene	2005	0.3 – 5.3 median = 0.9 n = 6/32	South Yard Area	Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	cis-1,2-dichloroethene	2007	2 – 460 median = 3.4 n = 3/24	shoreline monitoring wells	Environmental Partners (2008)	Twenty-four monitoring wells were sampled in November 2007.
Boeing Plant 2	cis-1,2-dichloroethene	2005	0.2 – 37 median = 0.6 n = 15/29	2-60s Area	Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	cis-1,2-dichloroethene	2005	0.2 – 90 median = 0.8 n = 19/44	2-60s Area	Ecology and Environment (2007b)	Samples were collected from 26 direct push probe locations (A-level aquifer) and 18 probe locations (B-level aquifer); data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations.
Boeing Plant 2	cis-1,2-dichloroethene	2005	0.2 – 49 median = 2.3 n = 14/32	South Yard Area	Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	cis-1,2-dichloroethene	2005	0.3 – 83 median = 1.35 n = 9/12	South Yard Area	Ecology and Environment (2007b)	Samples were collected from 12 direct push probe locations (A-level aquifer); data are from Table 1 in Ecology and Environment (2007b); only detected concentrations are presented.
Boeing Plant 2	ethylbenzene	2006	< 0.2[h] – 900 median = nr n = 4/73	2-60s Area	Environmental Partners and Golder Associates (2006a), as cited in Ecology and Environment (2007b)	

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	ethylbenzene	2005	0.5 – 875 median = 765 n = 4/29	2-60s Area	Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	ethylbenzene	2005	0.2 – 1 median = 0.6 n = 2/32	South Yard Area	Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	tetrachloro-ethene	2006	< 0.2[h] – 15 median = nr n = 11/73	2-60s Area	Environmental Partners and Golder Associates (2006a), as cited in Ecology and Environment (2007b)	
Boeing Plant 2	tetrachloro-ethene	2005	0.2 – 6.3 median = 0.95 n = 6/44	2-60s Area	Ecology and Environment (2007b)	Samples were collected from 26 direct push probe locations (A-level aquifer) and 18 probe locations (B-level aquifer); data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations.
Boeing Plant 2	tetrachloro-ethene	2005	0.85 – 6.8 median = 1.55 n = 5/29	2-60s Area	Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	tetrachloro-ethene	2005	0.2 – 3.8 median = 1.2 n = 3/32	South Yard Area	Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	toluene	2007	1.1 n = 1/24	shoreline monitoring wells	Environmental Partners (2008)	Twenty-four shoreline wells along Plant 2 were sampled in November 2007.

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	toluene	2005	0.2 – 67 median = 26 n = 4/29	2-60s area	Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	toluene	2005	0.2 – 18 median = 0.6 n = 3/32	South Yard Area	Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	trichloroethene	2007	1.4 – 16 median = 2.3 n = 4/24	shoreline monitoring wells	Environmental Partners (2008)	Twenty-four shoreline wells along Plant 2 were sampled in November 2007.
Boeing Plant 2	trichloroethene	2006	< 0.2[h] – 250 median = nr n = 32/73	2-60s Area	Environmental Partners and Golder Associates (2006a), as cited in Ecology and Environment (2007b)	
Boeing Plant 2	trichloroethene	2005	< 0.2[h] – 110 median = nr n = nr/45	South Yard Area	EPI and Golder Associates (2006b), as cited in Ecology and Environment (2007b)	
Boeing Plant 2	trichloroethene	2005	0.65 – 29 median = 7.7 n = 11/29	2-60s Area	Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	trichloroethene	2005	0.2 – 250 median = 1.5 n = 21/44	2-60s Area	Ecology and Environment (2007b)	Samples were collected from 26 direct push probe locations (A-level aquifer) and 18 probe locations (B-level aquifer); data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations.

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	trichloroethene	2005	0.3 – 110 median = 2.5 n = 12/32	South Yard Area	Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	trichloroethene	2005	15 n = 1/12	South Yard Area	Ecology and Environment (2007b)	Samples were collected from 12 direct push probe locations (A-level aquifer); data are from Table 1 in Ecology and Environment (2007b); only detected concentrations are presented.
Boeing Plant 2	vinyl chloride	2007	21, 130 n = 2/24	shoreline monitoring wells	Environmental Partners (2008)	Twenty-four shoreline wells along Plant 2 were sampled in November 2007.
Boeing Plant 2	vinyl chloride	2006	< 0.2[h] – 15 median = nr n = 28/73	2-60s Area	EPI and Golder Associates(2006a), as cited in Ecology and Environment (2007b)	
Boeing Plant 2	vinyl chloride	2005	< 0.2[h] – 31 median = nr n = nr/45	South Yard Area	EPI and Golder Associates (2006b), as cited in Ecology and Environment (2007b)	
Boeing Plant 2	vinyl chloride	2005	0.3 – 3.9 median = 0.9 n = 11/29	2-60s Area	Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	vinyl chloride	2005	0.2 – 14 median = 0.7 n = 17/44	2-60s Area	Ecology and Environment (2007b)	Samples were collected from 26 direct push probe locations (A-level aquifer) and 18 probe locations (B-level aquifer); data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations.

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Plant 2	vinyl chloride	2005	1.2 – 14 median = 5.2 n = 15/32	South Yard Area	Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	vinyl chloride	2005	0.6 – 31 median = 6.25 n = 8/12	South Yard Area	Ecology and Environment (2007b)	Samples were collected from 12 direct push probe locations (A-level aquifer); data are from Table 1 in Ecology and Environment (2007b); only detected concentrations are presented.
Boeing Plant 2	xylene (m,p-)	2007	1.1 n = 1/24	shoreline monitoring wells	Environmental Partners (2008)	Twenty-four shoreline wells along Plant 2 were sampled in November 2007.
Boeing Plant 2	xylene (m,p-)	2005	0.5 – 1950 median = 250 n = 4/29	2-60s Area	Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	xylene (o-)	2005	0.4 – 430 median = 28.5 n = 4/29	2-60s Area	Ecology and Environment (2007b)	Data are from Table 3 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	xylene (m,p-)	2005	3.8 n = 1/32	South Yard Area	Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.
Boeing Plant 2	xylene (o-)	2005	1.8 n = 1/32	South Yard Area	Ecology and Environment (2007b)	Data are from Table 1 in Ecology and Environment (2007b); the range and median presented here include only detected concentrations. Samples were collected from monitoring wells.

Table I-36, cont. Summary of chemical concentrations detected in groundwater in the Boeing Plant 2/ Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Jorgensen Forge	cis-1,2-dichloroethene	2007	14 n = 1/4	Shoreline monitoring wells	Environmental Partners (2008)[f]	Four wells along the Jorgensen shoreline near Plant 2 were sampled by Boeing.
Jorgensen Forge	benzene	2007	6.2 n = 1/4	Shoreline monitoring wells	Environmental Partners (2008)	Wells along the Jorgensen shoreline near Plant 2 were sampled by Boeing.
Jorgensen Forge	vinyl chloride	2007	7.9, 500 n = 2/4	Shoreline monitoring wells	Environmental Partners (2008)	Wells along the Jorgensen shoreline near Plant 2 were sampled by Boeing.

Note: If duplicate samples were presented in data tables in the source documents, an average was calculated and included in the presented range, median, and sample count. Dilutions were not included unless it was clear that they superseded another sample (i.e., E or ES qualified). Samples that were reanalyzed were not included in this table.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Boeing Plant 2/Jorgensen Forge SCA.

[b] Acenaphthene, benzo(a)anthracene, benzo(g,h,i)perylene, benzofluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, ideno(1,2,3-cd)pyrene, phenanthrene, total LPAHs, total HPAHs, BBP, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

[f] Data and citation provided by The Boeing Company.

[g] VOC data were summarized, as available, at EPA's request and not because of SQS exceedances in surface sediment in the SCA. The Groundwater Pathways Assessment (Windward 2003b) and the Early Action Area 4 data gaps report (Ecology and Environment 2007b) identified VOCs of concern for groundwater at the Boeing Plant 2/Jorgensen Forge site. Data for these VOCs were included in this table. VOCs identified in the Early Action Area 4 data gaps report for the Boeing Plant 2/Jorgensen Forge properties were based on a comparison to the surface water screening levels or as indicated in the data gaps report text (Ecology and Environment 2007b).

[h] The range reported in the source document presented a minimum that was a non-detect concentration, the minimum detected concentration was not reported.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
EPA – US Environmental Protection Agency
EPI – Environmental Partners Inc.
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LDW – Lower Duwamish Waterway
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
nr – not reported
NTU – nephelometric turbidity unit
PCB – polychlorinated biphenyl
SCA – source control area
SCAP – source control action plan
SQS – sediment quality standard
VOC – volatile organic compound

Table I-37. Summary of chemical concentrations detected in seeps in the Boeing Plant 2/Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources	Additional Information
Boeing Plant 2	chromium	1995	6 – 49 (total) median = 14 n = 6/17	various seeps along Boeing Plant 2 shoreline	Weston (1998)	
Boeing Plant 2	copper	1995	8 (dissolved) n = 1/10	various seeps along Boeing Plant 2 shoreline	Weston (1998)	
Boeing Plant 2	copper	1995	2 – 60 (total) median = 15 n = 11/17	various seeps along Boeing Plant 2 shoreline	Weston (1998)	
Boeing Plant 2	lead	1995	1 – 104 (total) median = 5.5 n = 14/17	various seeps along Boeing Plant 2 shoreline	Weston (1998)	
Boeing Plant 2	mercury	1995	0.2 – 0.2 (total) median = 0.2 n = 3/17	various seeps along Boeing Plant 2 shoreline	Weston (1998)	
Boeing Plant 2	zinc	1995	30 – 90 (dissolved) median = 35 n = 3/10	various seeps along Boeing Plant 2 shoreline	Weston (1998)	
Boeing Plant 2	zinc	1995	6 – 200 (total) median = 50 n = 14/17	various seeps along Boeing Plant 2 shoreline	Weston (1998)	
Boeing Plant 2	fluoranthene	1995	1.3 (total) n = 1/17	various seeps along Boeing Plant 2 shoreline	Weston (1998)	
Boeing Plant 2	phenanthrene	1995	1.0 (total) n = 1/17	various seeps along Boeing Plant 2 shoreline	Weston (1998)	
Boeing Plant 2	total PCBs	1995	0.93 – 4.6 (total) median = 1.75 n = 4/17	various seeps along Boeing Plant 2 shoreline	Weston (1998)	
Jorgensen Forge	copper	2004	10.2 (total) n = 1/1	southern end of property at approximately RM 3.7	Windward (2004)	Samples were collected as part of the LDW RI.
Jorgensen Forge	copper	2004	8.16 (dissolved) n = 1/1	southern end of property at approximately RM 3.7	Windward (2004)	Samples were collected as part of the LDW RI.

Table I-37, cont. Summary of chemical concentrations detected in seeps in the Boeing Plant 2/Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources	Additional Information
Jorgensen Forge	lead	2004	1.44 (total) n = 1/1	southern end of property at approximately RM 3.7	Windward (2004)	Samples were collected as part of the LDW RI.
Jorgensen Forge	lead	2004	0.096 (dissolved) n = 1/1	southern end of property at approximately RM 3.7	Windward (2004)	Samples were collected as part of the LDW RI.
Jorgensen Forge	mercury	2004	0.00061 (total) n = 1/1	southern end of property at approximately RM 3.7	Windward (2004)	Samples were collected as part of the LDW RI.
Jorgensen Forge	mercury	2004	0.00062 (dissolved) n = 1/1	southern end of property at approximately RM 3.7	Windward (2004)	Samples were collected as part of the LDW RI.
Jorgensen Forge	silver	2004	0.086 (total) n = 1/1	southern end of property at approximately RM 3.7	Windward (2004)	Samples were collected as part of the LDW RI.
Jorgensen Forge	silver	2004	0.112 (dissolved) n = 1/1	southern end of property at approximately RM 3.7	Windward (2004)	Samples were collected as part of the LDW RI.
Jorgensen Forge	zinc	2004	10.8 (total) n = 1/1	southern end of property at approximately RM 3.7	Windward (2004)	Samples were collected as part of the LDW RI.
Jorgensen Forge	zinc	2004	8.08 (dissolved) n = 1/1	southern end of property at approximately RM 3.7	Windward (2004)	Samples were collected as part of the LDW RI.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Boeing Plant 2/Jorgensen Forge SCA.

[b] Cadmium, acenaphthene, benzo(a)anthracene, benzofluoranthenes, benzo(g,h,i)perylene, benzofluoranthenes, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, ideno(1,2,3-cd)pyrene, phenanthrene, total LPAHs, total HPAHs BBP, BEHP, phenol, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LDW – Lower Duwamish Waterway
LDWG – Lower Duwamish Waterway Group
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PCBs – polychlorinated biphenyls
RFI – RCRA facility investigation
RI – remedial investigation
RM – river mile
SCA – source control area
SQS – sediment quality standard

Table I-38. Summary of chemical concentrations detected in porewater in the Boeing Plant 2/Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources	Additional Information
Boeing Plant 2 Jorgensen Forge	cis-1,2-dichloroethene	2005	0.2 – 1.7 n = 7/10	near the Jorgensen Forge/ Boeing Plant 2 boundary	Windward (2006a)	Two of the 10 samples from Boeing Plant 2 were field replicates collected at PE-10.
Boeing Plant 2/ Jorgensen Forge	trichloroethene	2005	0.2 – 0.2 n = 2/10	near the Jorgensen Forge/ Boeing Plant 2 boundary	Windward (2006a)	Two of the 10 samples from Boeing Plant 2 were field replicates collected at PE-10.
Boeing Plant 2/ Jorgensen Forge	vinyl chloride	2005	1.1 – 13 n = 2/10	near the Jorgensen Forge/ Boeing Plant 2 boundary	Windward (2006a)	Two of the 10 samples from Boeing Plant 2 were field replicates collected at PE-10.

[a] VOC data were summarized, as available, at EPA's request and not because of SQS exceedances in surface sediment in the SCA.

[b] Cadmium, chromium, copper, lead, mercury, silver, zinc, acenaphthene, benzo(a)anthracene, benzofluornthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, Ideno(1,2,3-cd)pyrene, phenanthrene, total HPAH, total LPAH, BBP, BEHP, phenol, total PCBs, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges were calculated using only detected data. For this reason, some estimated ranges may be higher than actual concentrations.

BBP – butyl benzyl phthalate

BEHP – bis(2-ethylhexyl) phthalate

EPA – US Environmental Protection Agency

HPAH – high-molecular-weight polycyclic aromatic hydrocarbon

LPAH – low-molecular-weight polycyclic aromatic hydrocarbon

SCA – source control area

PCB – polychlorinated biphenyl

Table I-39. Summary of chemical concentrations detected in stormwater in the Boeing Plant 2/Jorgensen Forge SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources	Additional Information
Boeing Plant 2	copper	2007	3 n = 1/1	Outfall A	Golder Associates (2007)	Samples were filtered for coarse materials (5-µm filter).
Boeing Plant 2	copper	2007	9 n = 1/1	Outfall A	Golder Associates (2007)	Sample was not filtered.
Boeing Plant 2	copper	2007	4 n = 1/1	Outfall B	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	copper	2007	5 n = 1/1	Outfall B	Golder Associates (2007)	Samples were filtered for coarse materials (5-µm filter).
Boeing Plant 2	copper	2007	5 n = 1/1	Outfall B	Golder Associates (2007)	Sample was not filtered.
Boeing Plant 2	copper	2007	10 n = 1/1	Outfall J	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	copper	2006	15 n=1/1	Outfall V	Golder Associates (2007)	Sample was filtered .
Boeing Plant 2	copper	2007	5 n = 1/1	Outfall Z	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	copper	2007	9 n = 1/1	Outfall Z	Golder Associates (2007)	Samples were filtered for coarse materials (5-µm filter).
Boeing Plant 2	copper	2007	12 n = 1/1	Outfall Z	Golder Associates (2007)	Sample was not filtered.
Boeing Plant 2	lead	2007	1 n = 1/1	Outfall A	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	lead	2007	5 n = 1/1	Outfall A	Golder Associates (2007)	Samples were filtered for coarse materials (5-µm filter)
Boeing Plant 2	lead	2007	9 n = 1/1	Outfall A	Golder Associates (2007)	Sample was not filtered.
Boeing Plant 2	lead	2007	3 n = 1/1	Outfall B	Golder Associates (2007)	Samples were filtered for coarse materials (5-µm filter)
Boeing Plant 2	lead	2007	4 n = 1/1	Outfall B	Golder Associates (2007)	Sample was not filtered.
Boeing Plant 2	lead	2007	2 n = 1/1	Outfall Z	Golder Associates (2007)	Samples were filtered for coarse materials (5-µm filter).

Table I-39, cont. Summary of chemical concentrations detected in stormwater in the Boeing Plant 2/Jorgensen Forge SCA

FACILITY	CHEMICAL[a, b]	YEAR COLLECTED	CONCENTRATION INFORMATION (µg/L)[c, d]	LOCATION	SOURCES	ADDITIONAL INFORMATION
Boeing Plant 2	lead	2007	5 n = 1/1	Outfall Z	Golder Associates (2007)	Sample was not filtered.
Boeing Plant 2	mercury	2006	0.0245 n = 1/1	Outfall V	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	zinc	2007	110 n = 1/1	Outfall A	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	zinc	2007	220 n = 1/1	Outfall A	Golder Associates (2007)	Samples were filtered for coarse materials (5-µm filter).
Boeing Plant 2	zinc	2007	300 n = 1/1	Outfall A	Golder Associates (2007)	Sample was not filtered.
Boeing Plant 2	zinc	2007	178 n = 1/1	Outfall B	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	zinc	2007	204 J n = 1/1	Outfall B	Golder Associates (2007)	Samples were filtered for coarse materials (5-µm filter).
Boeing Plant 2	zinc	2007	200 J n = 1/1	Outfall B	Golder Associates (2007)	Sample was not filtered.
Boeing Plant 2	zinc	2007	24 n = 1/1	Outfall I	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	zinc	2006	81 n = 1/1	Outfall J	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	zinc	2007	98 n = 1/1	Outfall J	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	zinc	2007	74 n = 1/1	Outfall L	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	zinc	2007	91 n = 1/1	Outfall V	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	zinc	2007	45 n = 1/1	Outfall Z	Golder Associates (2007)	Sample was filtered.
Boeing Plant 2	zinc	2007	59 n = 1/1	Outfall Z	Golder Associates (2007)	Samples were filtered for coarse materials (5-µm filter).
Boeing Plant 2	zinc	2007	76 n = 1/1	Outfall Z	Golder Associates (2007)	Sample was not filtered.
Boeing Plant 2	acenaphthene	2007	0.53 n = 1/1	Outfall G	Golder Associates (2007)	

Table I-39, cont. Summary of chemical concentrations detected in stormwater in the Boeing Plant 2/Jorgensen Forge SCA

FACILITY	CHEMICAL[a, b]	YEAR COLLECTED	CONCENTRATION INFORMATION (µg/L)[c, d]	LOCATION	SOURCES	ADDITIONAL INFORMATION
Boeing Plant 2	chrysene	2007	0.13 n = 1/1	Outfall G	Golder Associates (2007)	
Boeing Plant 2	dibenzofuran	2007	0.54 n = 1/1	Outfall G	Golder Associates (2007)	
Boeing Plant 2	fluoranthene	2007	1.6 n = 1/1	Outfall G	Golder Associates (2007)	
Boeing Plant 2	fluorene	2007	1.3, 1.5 n = 2/2	Outfall G	Golder Associates (2007)	Samples were collected using different methods.
Boeing Plant 2	phenanthrene	2007	4.8, 5.6 n = 2/2	Outfall G	Golder Associates (2007)	Samples were collected using different methods.
Boeing Plant 2	BEHP	2007	1.5 n = 1/2	Outfall J	Golder Associates (2007)	

Note: If duplicate samples were presented in data tables in the source documents, an average was calculated and presented in this table

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Boeing Plant 2/Jorgensen Forge SCA.

[b] Cadmium, chromium, silver, benzo(a)anthracene, benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, ideno(1,2,3-cd)pyrene, phenanthrene, total LPAHs, total HPAHs, BBP, phenol, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L) the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges were calculated using only detected data. For this reason, some estimated ranges may be higher than actual concentrations.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
SCA – source control area
SQS – sediment quality standard

Source-tracing data have been collected from several of the facilities and drainage systems within the Boeing Plant 2/Jorgensen Forge SCA. Data reported in the SCAP (Ecology 2007c), data gaps report (Ecology and Environment 2007b), and two stormwater documents (Floyd|Snider 2005) and (Golder Associates 2007) were reviewed.

Table I-40 presents source-tracing data collected since 2004 within the Boeing Plant 2/Jorgensen Forge SCA. When multiple rounds of data were collected from the same sampling location, only the most recent round was selected for presentation in order to represent current conditions. Data collected prior to 2004 are included in Table I-40 only if newer data from the same sampling locations were not available. Data relevant to source-tracing efforts include various sample types, including catch basin samples, manhole samples, joint caulking samples, and in-line sediment trap or sediment filtered from stormwater samples. Maps I-25 through I-27 show the locations of stormwater drainage lines on the Boeing Plant 2 and Jorgensen Forge facilities. Additional details on source-tracing sampling programs conducted in the Boeing Plant 2/Jorgensen Forge SCA and the associated drainage basins are presented in Section 9.4.4.7 of the main body of the RI.

Table I-40. Summary of chemical concentrations detected in source-tracing samples in the Boeing Plant 2/Jorgensen Forge SCA

Sample Source	Year Collected	Concentration Information (mg/kg dw)[a, b, c, d]							Concentration Information (µg/kg dw)[a, b, c, d]	Sources[e]	Additional Information[f]
		Cadmium	Chromium	Copper	Lead	Mercury	Silver	Zinc	Total PCBs		
Catch Basin Solids Samples											
Boeing Plant 2	2005	2.1, 14.8 n = 2/2	47, 80 n = 2/2	nr	127, 293 n = 2/2	0.20 n = 2/2	nd	nr	260 n = 1/2	Floyd|Snider (2005)	Catch basin solids samples were collected from Line A.
Boeing Plant 2	2005	11.5 n = 1/1	216 n = 1/1	nr	1,390 n = 1/1	0.42 n = 1/1	nd	nr	940 n = 1/1	Floyd|Snider (2005)	Catch basin solids samples were collected from Line B.
Boeing Plant 2	2005	4, 11.9 n = 2/2	154, 214 n = 2/2	nr	302, 3610 n = 2/2	0.50, 1.39 n = 2/2	nd	nr	360 – 3,100 median = 1,005 n = 6/6	Floyd|Snider (2005)	Catch basin solids from Line I. Catch basins along Line I were cleaned out in 2006.
Boeing Plant 2	2005	2.8, 6.7 n = 2/2	76, 135 n = 2/2	nr	184, 429 n =2/2	0.23, 1.00 n = 2/2	51 n = 1/2	nr	290– 850 n = 2/2	Floyd|Snider (2005)	Catch basin solids samples were collected from Line J.
Boeing Plant 2	2005	0.6 n = 1/1	37 n = 1/1	nr	52 n = 1/1	1.88 n = 1/1	0.6 n = 1/1	nr	130 n = 1/1	Floyd|Snider (2005)	Catch basin solids samples were collected from Line V.
Boeing Plant 2	2005	10 – 46 median = 13 n = 9/9	203 – 1,390 median = 344 n = 9/9	nr	416 – 15,300 Median = 1,640 n = 9/9	0.6 – 49 median = 1.23 n = 9/9	1.4 – 21.2 median = 3.7 n = 9/9	nr	3,930 – 2,600,000 median = 28,500 n = 14/14	Floyd|Snider (2005)	Catch basin solids from Line X. Samples were collected before cleanout; line was decommissioned in 2006.
Boeing Plant 2	2005	5.7 – 33.2 median = 11 n = 7/7	192 – 6100 median = 672 n = 7/7	nr	453 – 47,200 median = 3040 n = 7/7	0.3 – 14 median = 1 n = 7/7	1 – 19 median = 2.9 n = 7/7	nr	8,800 –134,000 median = 35,000 n = 7/7	Floyd|Snider (2005)	Catch basin solids from Line Y. Samples were collected before cleanout; line was decommissioned in 2006.
Boeing Plant 2	2005	0.4 n = 1/1	22 n = 1/1	nr	14 n = 1/1	nd	nd	nr	116 n = 1/1	Floyd|Snider (2005)	Catch basin solids samples were collected from Line Z.
Jorgensen Forge	2004	nr	nr	nr	nr	nr	nr	nr	129 – 302 median = nr n = 4/nr	Farallon and Anchor (2006), as cited in Ecology and Environment (2007b)	Catch basin solids from western, central, and eastern portions of property
KCIA	2001	0.411 – 21.9 median = nr n = 4/nr	nr	nr	33.4 – 294 median = nr n = 4/nr	nr	nr	nr	nr	IT Corporation (2001), as cited in Ecology and Environment (2007b), Colligan (2008)	Catch basin samples were collected from the Boeing Plant 2/Jorgensen Forge SCA drainage area.
Manhole Samples											
Boeing Plant 2	2005	nr	nr	nr	nr	nr	nr	nr	7,400 – 350,000 median = nr n = 4/nr	Floyd|Snider and Weston Solutions (2005), as cited in Colligan (2008)	Manhole solids samples from abandoned 12-in. stormwater line pipe traversing Jorgensen that originates on Boeing Plant 2. This is an inactive storm drain, but as a temporary measure, Boeing plugged the abandoned outlet to the waterway at the most downgradient manhole along this line prior to a full cleaning of this line.
Jorgensen Forge	2005	nr	nr	nr	nr	nr	nr	nr	68,000 – 10,000,000 median = 214,500 n = 8/8	Ecology and Environment (2007b)	Manhole solids samples collected along the active 24-in.-diameter stormwater line pipe traversing Jorgensen Forge.
In-line Sediment Samples											
Boeing Plant 2	2007	10 [b]	131 [b]	196 [b]	540 [b]	nd	2 [b]	1,280 [b]	2,407 n = nr	Golder Associates (2007)	Sample collected from filtered stormwater passing through the farthest down-gradient catch basin of Outfall B. The suspended solids and the entire filter bag were extracted together and the suspended solids concentration was then back-calculated based on weight of sediment collected.
Boeing Plant 2	2007	nr	nr	nr	nr	nr	nr	nr	5,429 n = nr	Golder Associates (2007)	Sample collected from filtered stormwater in the farthest-down-gradient catch basin of Outfall I. The suspended solids and a portion of the filter bag were extracted together and the suspended solids concentration was then back-calculated based on weight of sediment collected

Table I-40, cont. Summary of chemical concentrations detected in source tracing samples in the Boeing Plant 2/Jorgensen Forge SCA

Sample Source	Year Collected	Concentration Information (mg/kg dw)[a, b, c, d]							Concentration Information (µg/kg dw)[a, b, c, d]	Sources[e]	Additional Information[f]
		Cadmium	Chromium	Copper	Lead	Mercury	Silver	Zinc	Total PCBs		
Boeing Plant 2	2006	nr	nr	nr	nr	nr	nr	nr	6,444 n = nr	Golder Associates (2007)	Sample collected from filtered stormwater passing through a catch basin in Outfall J prior to discharge into the public roadway drainage system. The suspended solids and the entire filter bag were extracted together and the suspended solids concentration was then back-calculated based on weight of sediment collected.
Jorgensen Forge	2005	nr	nr	nr	nr	nr	nr	nr	6,500, 1,100,000 n = 2/2	Farallon and Anchor (2006), as cited in Ecology and Environment (2007b)	Black silty sand collected within 12-in. side sewer pipe extending from Jorgensen Forge. This side sewer pipe connects to the 24-in. line pipe. Samples were collected by cutting pipe and collecting the black silty sand. SPU installed a sediment trap in the 24" SD between Boeing Plant 2 and Jorgensen in 2008 under grant with Ecology. Trap sample was retrieved in 2009.
KCIA	2005	nr	nr	nr	nr	nr	nr	nr	2,670 n = nr	Renaud (2007), as cited in Ecology and Environment (2007b)	Catch basin sample was collected from trench 2 near the FAA tower. SPU installed a sediment trap in the KCIA SD in 2008 under grant with Ecology. Trap sample was retrieved in 2009.
Caulking Material Samples											
Boeing Plant 2	2005	nr	nr	nr	nr	nr	nr	nr	1,810 – 740,000 median = 10,550 n = 6/8	Floyd|Snider (2005)	Caulk material samples were collected along storm line X.
Boeing Plant 2	2005	n	nr	nr	nr	nr	nr	nr	1,590 – 40,500,000 median = 8,600 n = 9/9	Floyd|Snider (2005)	Caulk material samples were collected along storm line Y.
Boeing Plant 2	2006	nr	nr	nr	nr	nr	nr	nr	740,000 (joint caulking) 350,000 (floor sealant) (maximum) n = nr	Environmental Partners and Golder Associates (2007b), as cited in Ecology and Environment (2007b)	Floor caulking and sealant samples are from building slab and roadways along Line X. Both concentrations are maximum concentrations.
Boeing Plant 2	2006	nr	nr	nr	nr	nr	nr	nr	40,500,000 (joint caulking) 54,000 (floor sealant) n = nr	Environmental Partners and Golder Associates (2007b), as cited in Ecology and Environment (2007b)	Floor caulking and sealant samples are from building slab and roadways along Line Y. Only maximum concentrations are presented because the minimum detected concentrations were not reported in the data gaps report.
KCIA	2005	nr	nr	nr	nr	nr	nr	nr	1,690 n = nr	Renaud (2007), as cited in Ecology and Environment (2007b)	Joint caulking sample was collected near the FAA tower.

Note: If multiple rounds of data were available for a single location, only the data collected during the most recent event were presented in order to represent the most current conditions possible. Data are not included for drainage structures that have been removed subsequent to sampling. Also, data for Outfall A have been excluded from this table because Outfall A discharges to the north in Slip 4, which is not included in the Boeing Plant 2/Jorgensen Forge SCA boundary.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Boeing Plant 2/Jorgensen Forge SCA.

[b] Acenaphthene, benzo(a)anthracene, benzofluoranthenes, benzo(g,h,i)perylene, benzofluoranthenes, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, ideno(1,2,3-cd)pyrene, phenanthrene, total LPAHs, total HPAHs, BBP, BEHP, phenol, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/kg to µg/kg), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

[f] A map of Boeing outfalls and associated storm drain lines can be found in Golder Associates (2007). The 12- and 24- in. storm drain lines each have connecting side sewer lines. The 12- and 24-in. storm drain lines running along the Jorgensen Forge boundary are identified in the table as line pipes as opposed to side sewer pipes.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
dw – dry weight
FAA – Federal Aviation Administration
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
KCIA – King County International Airport
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
nd – not detected
nr – not reported
PCB – polychlorinated biphenyl
SCA – source control area
SCAP – source control action plan
SQS – sediment quality standard

Additional information on the Boeing Plant 2 site is available on EPA's RCRA website for Boeing Plant 2 (EPA 2008). Additional information on the Jorgensen Forge site is available at EPA's Superfund website for Jorgensen Forge. These websites will be updated as new information becomes available. For additional details and the most up-to-date information pertaining to source control efforts within the Boeing Plant 2/Jorgensen Forge SCA, see Ecology's website.

I.4.6 BOEING ISAACSON/CENTRAL KCIA SOURCE CONTROL AREA (RM 3.7 E TO RM 3.9 E, EAA 6)

The Boeing Isaacson/Central KCIA SCA is one of 23 areas identified by Ecology along the LDW for source evaluation. This SCA was also one of the seven candidate EAAs recommended to EPA and Ecology for early cleanup based on surface sediment chemistry data (Windward 2003c). As part of the ongoing source control efforts for the LDW, Ecology prepared a data gaps report for Boeing Isaacson/ Central KCIA SCA in May 2008 (SAIC 2008b).[26] A draft SCAP has also been prepared for this SCA (Ecology 2008a). Source-tracing data provided by the City of Seattle was also reviewed (Schmoyer 2008d). These three documents are collectively referred to as the "source documents" in this section. The Boeing Isaacson/Central KCIA SCA is presented on Map I-28.

CSL exceedances in the surface sediment in this SCA have included several individual PAHs, BEHP, and benzoic acid (Map I-28). SQS exceedances have included arsenic, total PCBs, dibenzofuran, and BBP. These exceedances are based on the RI baseline surface sediment dataset and the 2007 SCA boundary, as discussed in the introduction to this appendix. Ecology has identified COCs for this SCA based on different criteria (Table I-3); therefore, the chemicals identified for summary in this appendix are different than the COCs identified by Ecology.

Commercial and industrial operations in the vicinity of the Boeing Isaacson/Central KCIA SCA include agricultural operations (historical); lumber milling and treatment (historical); steel fabrication and zinc galvanizing (historical); aircraft parts assembly (historical); airport operations, including transport of passengers and goods, aircraft maintenance, deicing, and fueling (historical and current); and storage of vehicles and aircraft parts/equipment (current).

Adjacent facilities identified in source documents included the Boeing Isaacson and Boeing Thompson properties (Map I-28).[27] The central drainage basin of KCIA was

---

[26] The Boeing Isaacson/Central KCIA SCA is also referred to as RM 3.7- 3.9 E and EAA 6 in the draft SCAP (Ecology 2008a) and in the data gaps report (SAIC 2008b).

[27] Although it is identified as an adjacent facility in the source documents, it should be noted that the Boeing Isaacson property is not actually immediately adjacent to the LDW; there is a narrow strip of land owned by the Port of Seattle, extending toward the LDW from inshore of the top of the bank.

identified as an upland facility. Several environmental investigations and remedial activities have been conducted at these facilities within this SCA (Table I-41, Map I-29).

Table I-41. Summary of facility information for the Boeing Isaacson/Central KCIA SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/ Investigations
Boeing Isaacson	The Boeing Company	no current operations	used as pasture land and hop fields, brewery, race track residential land, lumber milling and treatment, steel fabrication, zinc galvanization, parts storage, office space[b]	Numerous soil and groundwater investigations have been conducted since the 1980s; most have focused on arsenic. Several groundwater monitoring events have been conducted since 1991. There are plans for an RI/FS to be conducted on the property (Good 2009). Additional site characterization will be conducted as part of the RI/FS.	Numerous remedial activities were conducted throughout the 1980s and 1990s, including soil removal and on-site soil treatment and capping. In 2006, a sump and adjacent soil were removed from the northeast corner of the property. An RI/FS will be conducted at the property under a MTCA order (Good 2009). The Agreed Order is being negotiated between Ecology and The Boeing Company, and a scope of work is being developed.	No source control activities were reported. SD system inspections will be conducted, and source-tracing samples will be collected from catch basins on the property. Additional source control investigations may be conducted at the facility as part of the RI/FS, if necessary (Good 2009). The responsibility for conducting source control investigations (i.e., the roles of Ecology and The Boeing Company) are still under negotiation.
Boeing Thompson	The Boeing Company	storage of vehicles and aircraft parts/ equipment, preparation of the site for reuse or resale	lumber milling, aircraft assembly (including priming, painting, copper plating, sealing and bonding, and fuel systems testing)	Site inspections have been conducted by Ecology. Soil and groundwater investigations, primarily focused on arsenic, have been conducted since the 1990s. There are plans for an RI/FS to be conducted on the property (Good 2009). Additional site characterization will be conducted as part of the RI/FS.	Two USTs were removed in the 1990s and one was closed in place in 2003. An RI/FS will be conducted at the property under a MTCA order (Good 2009). The Agreed Order is being negotiated between Ecology and The Boeing Company, and a scope of work is being developed.	Source control activities related to NPDES permit compliance have been conducted. Source control and stormwater compliance inspections will be conducted, and source-tracing sampling is planned; however, responsibility for conducting these source control investigations (i.e., the roles of Ecology and The Boeing Company) are still under negotiation. Additional source control investigations and activities may be conducted at the facility as part of the RI/FS, if necessary (Good 2009).

Table I-41, cont. Summary of facility information for the Boeing Isaacson/Central KCIA SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/ Investigations
KCIA (central drainage basin)	King County	aircraft maintenance, fueling, and deicing, air cargo transport, X-ray and other equipment testing, hangar space, flight schools, and aircraft maintenance technical training	operated as an airport since 1928	Site inspections have been conducted by SPU and Ecology at several of the tenant facilities. Soil and groundwater sampling was conducted at the Hangar Holdings tenant facility.	Soil and groundwater investigations and remediation have been conducted at a former tenant facility (Federal Express) in association with a LUST. Multiple USTs and petroleum-contaminated soil were removed from another tenant facility (Hangar Holdings); Ecology will confirm that cleanup actions at these facilities are complete. USTs have been removed and a voluntary cleanup action has been conducted at a third tenant facility (Clay Lacy).	Corrective actions identified as needed during business inspections have been implemented at most facilities within the drainage basin. Source control practices related to NPDES permit compliance are in place at several of the tenant facilities. Catch basins and oil/water separators are cleaned biannually. Flight lines and taxiways are swept on a frequent basis per Federal Aviation Administration requirements. Source-tracing investigations, including sampling of joint caulking material, and SD system inspections are planned.

Sources: Ecology (2008a), SAIC (2008b), Schmoyer (2008d)

[a] Facilities listed are those identified as adjacent properties in the source documents. KCIA (identified as an upland property in the source documents) is also included because source-tracing data were included in the source documentation.

[b] The Ecology source documents report that historically this area was used as hop fields, a brewery, and a race track; however, Boeing records do not indicate any such prior uses.

Ecology – Washington State Department of Ecology
FS – feasibility study
KCIA – King County International Airport
LUST – leaking underground storage tank
MTCA – Model Toxics Control Act
NBF – North Boeing Field
NPDES – National Pollutant Discharge Elimination System
RI – remedial investigation
SAIC – Science Applications International Corp.
SCA – source control area
SPU – Seattle Public Utilities
UST – underground storage tank

There are three outfalls that discharge within the Boeing Isaacson/Central KCIA SCA and one pipe of unknown origin. The KCIA SD No.2/Pump Station 78 (PS78) EOF[28] (No. 2062), which was identified as a major outfall in the source documents, is a public outfall that discharges stormwater from 237 ac of the central portion of KCIA and from one catch basin on the northwest portion of the Boeing Thompson facility (Ecology 2008a). The KCIA SD No.2/PS78 EOF outfall also serves as an EOF for the city's pump station No. 78. In the event of an EOF, discharge from the sanitary sewer could enter the Boeing Isaacson/Central KCIA SCA. SPU has inspected many of the tenants that operate on the central portion of KCIA and collected source-tracing samples as part of their source control efforts within the basin (SAIC 2008b). The business inspection program is discussed in Section 9.4.4.5 of the main body of the RI.

Two private storm drains that are located on the Boeing Thompson property (Nos. 2061 and 2077) discharge to this SCA. A pipe of unknown origin (No. 2063) is also located along the Boeing Isaacson property shoreline; the purpose of this pipe is not known. Information on the outfalls within the Boeing Isaacson/Central KCIA SCA is summarized in Table I-42; the locations of these outfalls are provided on Maps I-28 and I-29.

[28] The pump station with which this outfall is associated was referred to as Pump Station 45 in the data gaps report (SAIC 2008b); however, based on updated information from SPU, the pump station designation has been changed to Pump Station 78.

Table I-42. Summary of specific information for each outfall in the Boeing Isaacson/Central KCIA SCA

Outfall	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
Outfalls Identified in the Draft SCAP and Data Gaps Report as Major Outfalls[a]					
KCIA SD No.2/PS78 EOF outfall (No. 2062)	City of Seattle and King County[b]	Outfall discharges stormwater from 237 ac of the central portion of KCIA, including areas used for aircraft fueling and maintenance, and from one catch basin in the northwest portion of the Boeing Thompson facility. It also serves as an EOF for the City's sanitary sewer Pump Station No. 78.	The outfall formerly discharged from the head of Slip 5, but the location of the outfall was extended to the LDW in the late-1960s after Slip 5 was filled. It was relocated again to its current location in 1990. The EOF has not discharged since at least 2000 when record-keeping began.	One catch basin sample (collected from the Ameriflight tenant facility) and one ROW catch basin sample (collected from Airport Way S) have been collected from the central portion of KCIA. Additional source-tracing investigations and inspections of the SD system are planned.	The Ameriflight catch basin was cleaned in 2004 or 2005. Catch basins are cleaned out on a regular basis at another tenant facility (Galvin Flying Services). Ecology is planning to conduct source control inspections at facilities within the drainage basin.
Other Outfalls					
Boeing Thompson private SD outfalls (Nos. 2061 and 2077)	The Boeing Company	Outfalls discharge stormwater from the Boeing Isaacson and Thompson facilities.	Historical operations were not reported.	Source-tracing activities are planned.	Source control practices related to NPDES permit compliance are in place.
Boeing Isaacson[c] pipe of unresolved origin and/or use (No. 2063)	not reported	Current operations were not reported.	Historical operations were not reported.	The status of this pipe is being investigated.	No information on remedial or source control activities was reported.

Sources: Ecology (2008a), SAIC (2008b), Schmoyer (2008d)

[a] Major outfalls listed are those discussed as individual source control entities in the data gaps report (SAIC 2008b) and the draft SCAP (Ecology 2008a).

[b] King County owns the SD system; the City of Seattle operates the pump station and EOF.

[c] The pipe is located along the Boeing Isaacson shoreline, but is not necessarily owned by The Boeing Company; no information on the ownership or use of this pipe is available.

Ecology – Washington State Department of Ecology
EOF – emergency overflow
KCIA – King County International Airport
NPDES – National Pollutant Discharge Elimination System
PS – pump station
ROW – right-of-way
SCA – source control area
SAIC – Science Applications International Corp.
SCAP – source control action plan
SD – storm drain
SPU – Seattle Public Utilities

Several remedial activities and environmental investigations have been completed or are currently in progress within the Boeing Isaacson/Central KCIA SCA (Tables I-41 and I-42 and Map I-29). Information about these activities has been summarized in the data gaps report (SAIC 2008b) and draft SCAP (Ecology 2008a). Several of the chemicals that have been detected above the SQS in surface sediment in the SCA have also been detected in various upland media, including soil, groundwater, seep water, and source-tracing solids (Table I-43). The availability of data (by media type) is also presented in the table on Map I-29 for each of the facilities associated with this SCA and for the KCIA SD No.2/PS78 EOF. In both Table I-43 and the table on Map I-29, an X indicates that the source documents reported data or indicated that data exist; therefore, an X does not necessarily mean that the actual data were presented in the source documents. Data are only summarized in media-specific and source-tracing tables if the data were reported in the source documents and if they met the criteria for data summation discussed in the introduction to this appendix (e.g., soil data were collected along the SCA shoreline; groundwater data were collected from shoreline facilities). The identification of a chemical in these media at facilities or within the drainage systems of the Boeing Isaacson/Central KCIA SCA does not necessarily indicate that these potential sources contributed to sediment contamination in the past or will result in sediment contamination in the future.

Table I-43. Chemicals identified in various media in the Boeing Isaacson/Central KCIA SCA

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater[c]	Source-Tracing Samples	Sources
Arsenic	X	X	X		X		SAIC (2008b), Ecology (2008a)
BEHP						X	Schmoyer (2008d)
BBP						X	Schmoyer (2008d)
Acenaphthene						X	Schmoyer (2008d)
Benzo(a)anthracene						X	Schmoyer (2008d)
Benzo(a)pyrene						X	Schmoyer (2008d)
Benzofluoranthenes						X	Schmoyer (2008d)
Benzo(g,h,i)perylene						X	Schmoyer (2008d)
Chrysene						X	Schmoyer (2008d)
Dibenzo(a,h)anthracene						X	Schmoyer (2008d)
Dibenzofuran[d]							
Fluoranthene						X	Schmoyer (2008d)
Fluorene						X	Schmoyer (2008d)
Indeno(1,2,3-cd)pyrene						X	Schmoyer (2008d)
Phenanthrene						X	Schmoyer (2008d)
Total HPAHs						X	Schmoyer (2008d)

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater[c]	Source-Tracing Samples	Sources
Total LPAHs						X	Schmoyer (2008d)
Benzoic acid[d]							
Total PCBs	X					X	Schmoyer (2008d), Ecology (2008a)

Note: An X indicates that the source documents reported that data are available for the identified media. The absence of an X in any cell does not necessarily mean that the chemical is absent in the upland media or in source-tracing samples; in some cases, the chemical may not have been analyzed for or, if analyzed, could have been present but at concentrations below the RL.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Boeing Isaacson/Central KCIA SCA. The chemical list is based on SMS exceedances in the RI baseline surface sediment dataset within the 2007 SCA boundary. Therefore, this list may differ from the list of exceedances in source documents.

[b] No porewater data were identified in the source documents for any chemical.

[c] The presence of stormwater data collected in 1983 from the Boeing Isaacson facility was reported in the draft SCAP (Ecology 2008a); however, actual data were not presented in the source documents.

[d] No soil, groundwater, seep, porewater, stormwater, or source-tracing data were identified in the source documents for this chemical.

BBP –butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
Ecology – Washington State Department of Ecology
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
KCIA – King County International Airport
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
RI – remedial investigation
RL – reporting limit
SAIC – Science Applications International Corp.
SCA – source control area
SCAP – source control action plan
SMS – Washington State Sediment Management Standards
SQS – sediment quality standard

This section summarizes the upland data for groundwater, seep, and source-tracing samples provided in the source documents. No porewater data were reported. Soil data are not presented because the data in the source documents were not collected along the bank or actual data were not provided in the source documents. Stormwater data from 1983 are discussed in the draft SCAP (Ecology 2008a); however, actual data were not presented in the source documents.

If sufficient data were presented in the source documents, ranges of detected concentrations, median concentrations, and sample counts (n) are provided accordingly. In some instances, the source documents acknowledged the existence of certain data without providing actual concentrations. Data were included in this section only if specific concentrations or a range of concentrations were included in the source documents.

Table I-44 summarizes the groundwater data collected in close proximity to the SCA sediment boundary (from the shoreline properties Boeing Isaacson and Boeing Thompson) that were presented in the data gaps report (SAIC 2008b). Historical groundwater data collected in the 1980s, 1990s, and in 2000 were also available for these facilities; data collected in 2006 and 2007 were presented because they are the most representative of current conditions. Groundwater data for VOCs were not

reported for the shoreline properties. Groundwater information for Boeing Isaacson and Boeing Thompson is also included in Section 9.4.6 of the main body of the RI.

Table I-45 summarizes seep data collected in 2000 during a hydrogeologic investigation of the Boeing Isaacson property that were presented in the data gaps report (SAIC 2008b).

Table I-44. Summary of chemical concentrations detected in groundwater from the Boeing Isaacson/Central KCIA SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Isaacson	arsenic	2007	0.9 – 3,600 (dissolved) median = 140 n = 3/3	two wells located near the shoreline and one well located along E Marginal Way S	Ecology (2007a) and McCrone (2008), as cited in SAIC (2008b)	The source documents presented the highest detected concentration reported when multiple samples were collected from the same sampling location in a given month.
Boeing Thompson	arsenic	2007	28[f] – 720 (dissolved) n = 2/2	two wells located near the shoreline	Ecology (2007a) and McCrone (2008), as cited in SAIC (2008b)	The source documents presented the highest detected concentration reported when multiple samples were collected from the same sampling location in a given month.
Boeing Thompson	arsenic	2006	10.2, 181 (total) n = 2/2	two wells located near the shoreline	Ecology (2007) and McCrone (2008), as cited in SAIC (2008b)	The source documents presented the highest detected concentration reported when multiple samples were collected from the same sampling location in a given month.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Boeing Isaacson/Central KCIA SCA.

[b] Total PCBs, BBP, BEHP, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, total HPAHs, total LPAHs, benzoic acid and dibenzofuran were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

[f] One sample was analyzed by two different methods (Method 6010B and Method 200.8); the result of one analysis was non-detect while the result of the other analysis was 28 µg/L. The detected result has been included in the range, median, and n calculations for this facility.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
Ecology – Washington State Department of Ecology
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
KCIA – King County International Airport
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
SAIC – Science Applications International Corporation
SCA – source control area
SQS – sediment quality standard

Table I-45. Summary of chemical concentrations detected in seeps from the Boeing Isaacson/Central KCIA SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (in µg/L)[c, d]	Location	Sources[e]	Additional Information
Boeing Isaacson	arsenic	2000	7 (dissolved) n = 1/1	near the Boeing Thompson and Boeing Isaacson property boundary	ERM (2000), as cited in SAIC (2008b)	The seep sample was collected as part of a hydrogeologic investigation of the Boeing Isaacson property.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Boeing Isaacson/Central KCIA SCA.

[b] Total PCBs, BBP, BEHP, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, total HPAHs, total LPAHs, benzoic acid, and dibenzofuran were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L) the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
ERM – Environmental Resources Management
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
KCIA – King County International Airport
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
SAIC – Science Applications International Corporation
SCA – source control area
SQS – sediment quality standard

Two source-tracing samples were collected within the Central KCIA drainage basin between 2004 and 2006[29] (Schmoyer 2008d). One source-tracing sample was collected from an onsite catch basin at a KCIA tenant facility, and one sample was collected from a right-of-way catch basin along Airport Way S (Map I-29). Data from these samples are presented in Table I-46. Drainage lines on the facilities associated with this SCA are shown on Maps I-29 and I-30. Additional information on source-tracing sampling programs is presented in Section 9.4.4.7 of the main body of the RI.

[29] A sediment trap sampling location is also located within the central KCIA drainage basin near E Marginal Way S (Map I-29). Data were not available from this trap prior to the end of 2007, and therefore, data for the sediment trap are not presented in Table I-46.

Table I-46. Summary of chemical concentrations detected in source-tracing samples from the Boeing Isaacson/Central KCIA SCA

Sample Source	Year Collected	Concentration Information (µg/kg dw)[a, b, c, d] Acenaphthene	Benzo(a)anthracene	Benzo(a)pyrene	Benzofluoranthenes	Benzo(g,h,i)perylene	Chrysene	Dibenzo(a,h)anthracene	Sources	Additional Information
Onsite Catch Basin Solids Samples										
KCIA SD No. 2/PS78 EOF	2004	850 n = 1/1	12,000 n = 1/1	14,000 n = 1/1	33,800 n = 1/1	7,200 n = 1/1	21,000 n = 1/1	1,400 n = 1/1	Schmoyer (2008d)	One onsite catch basin sample was collected within the KCIA SD No.2/PS78 EOF drainage basin.
ROW Catch Basin Solids Samples										
KCIA SD No. 2/PS78 EOF	2006	nd	1,900 n = 1/1	nd	1,900 n = 1/1	nd	2,200 n = 1/1	nd	Schmoyer (2008d)	One ROW catch basin sample was collected from the KCIA SD No.2/PS78 EOF drainage basin; the catch basin is located within the Airport Way S ROW. SPU installed a sediment trap in KCIA SD#2 in 2008 under a grant with Ecology. Trap sample was retrieved in 2009.

Sample Source	Year Collected	Concentration Information (µg/kg dw)[a, b, c, d] Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Total HPAHs	Total LPAHs	BEHP	BBP	Total PCBs	Source[a]	Additional Information
Onsite Catch Basin Solids Samples												
KCIA SD No.2/PS78 EOF	2004	33,000 n = 1/1	1,000 n = 1/1	9,200 n = 1/1	19,000 n = 1/1	155,600 n = 1/1	23,900 n = 1/1	5,500 n = 1/1	5,100 n = 1/1	6,600 n = 1/1	Schmoyer (2008d)	One onsite catch basin sample was collected within the KCIA SD No. 2/PS78 EOF drainage basin.
ROW Catch Basin Solids Samples												
KCIA SD No.2/PS78 EOF	2006	3,600 n = 1/1	nd	nd	1,900 n = 1/1	13,000 n = 1/1	1,900 n = 1/1	nd	nd	nd	Schmoyer (2008d)	One ROW catch basin sample was collected from the KCIA SD No. 2/PS78 EOF drainage basin; the catch basin is located within the Airport Way S ROW.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Boeing Isaacson/Central KCIA SCA.
[b] Benzoic acid and dibenzofuran were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.
[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/kg to µg/kg), the number of significant figures was kept consistent with the number in the reported value.
[d] n is the ratio of the number of detects to the total number of samples analyzed.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
EOF – emergency overflow
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
KCIA – King County International Airport
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
nd – not detected
PCB – polychlorinated biphenyl
PS – pump station
ROW – right-of-way
SCA – source control area
SD – storm drain
SQS – sediment quality standard

Numerous investigations have been completed within the Boeing Isaacson/Central KCIA SCA since the 1980s; environmental investigations are expected to continue. Source control activities in the LDW are ongoing. For the most current information on the Boeing Isaacson/Central KCIA SCA, visit Ecology's website.

I.4.7 SLIP 6 SOURCE CONTROL AREA (RM 3.9 E TO RM 4.3 E)

The Slip 6 SCA is one of the 23 SCAs selected by Ecology for source control evaluations. As part of ongoing source control efforts for the Slip 6 SCA, a data gaps report (Ecology and Environment 2008b) was completed in February 2008, and a SCAP (Ecology and Ecology and Environment 2008) was completed in September 2008. In addition, source-tracing data provided by the City of Seattle (Schmoyer 2008d) and groundwater information evaluated in the Phase 1 RI (Windward 2003b) were also reviewed. These references will be referred to collectively as the "source documents" throughout this section and on the maps.

CSL exceedances in the surface sediment in this SCA included benzoic acid, phenol, total PCBs, lead, and mercury. SQS exceedances were reported for BBP, BEHP, eight individual PAHs, and total HPAHs (Map I-31). These exceedances are based on the RI baseline surface sediment dataset and the 2007 SCA boundary, as discussed in the introduction to this appendix. Ecology has identified COCs for this SCA based on different criteria (Table I-3); therefore, the chemicals identified for summary in this appendix are different than the COCs identified by Ecology.

Commercial and industrial operations in the vicinity of the Slip 6 SCA include wrecked vehicle storage (current); airport operations (historical and current); missile and airplane manufacturing, research, and development (historical and current); cargo handling and storage (historical); vehicle manufacturing and storage (historical); lumber milling (historical); resin, glue, and chemical manufacturing (historical); welding supply (historical); meat-packing operations (historical); sawmill operations (historical); stockyard operations (historical); warehousing (historical); parking (historical); auto wrecking (historical); propane distribution (historical); agriculture (historical); and granary operations (historical). Historically, a grocery store, tavern, gas station, winery, and a construction yard were also located in the vicinity of this SCA.

Six properties were identified as associated with the Slip 6 SCA in the source documents. Adjacent properties included the Boeing Developmental Center (BDC), the former Kenworth Truck Company/PACCAR (PACCAR) facility, and the former Rhône-Poulenc facility (two contiguous parcels) (Map I-32). Upland properties with drainage to the Slip 6 SCA included the south-central portion of the KCIA and two Museum of Flight properties. Table I-47 summarizes facility-specific information for the facilities determined to be adjacent to the Slip 6 SCA. The south-central portion of the KCIA is also included because source-tracing information was presented in the source documents.

Table I-47. Summary of facility information for the Slip 6 SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/ Investigations
BDC (northern drainage area)	The Boeing Company	missile and airplane research, development, and manufacturing	agriculture, welding supply, meat-packing plant, sawmill, stockyard, grocery store, warehousing, tavern, gas station, winery, parking lot, construction yard, auto wrecking, propane distribution, granary, and aircraft and missile manufacturing	No environmental investigations were reported. An evaluation of USTs in the drainage area is planned.	No remedial activities were reported.	NPDES permit and SWPPP monitoring requirements have been established for this property. An evaluation of the drainage system and the current SWPPP is planned.
PACCAR/ Kenworth Trucking (Former)	Merrill Creek Holdings	wrecked vehicle storage	truck and heavy equipment manufacturing, truck and airplane assembly, auto body manufacturing	An environmental site assessment was conducted in 1987. An interim VOC investigation was conducted in 1998. An ambient indoor air investigation was conducted in 2002. Phase I and II data gaps investigations were conducted in 2002 and 2004, respectively. A sediment evaluation was conducted under an Agreed Order with Ecology in 2006. Wet and dry season groundwater studies were conducted in 2006 and 2007, respectively. Studies of tidal influences were conducted in 1998, 2002, and 2006. Focused soil and groundwater investigations have been conducted. Planned investigations include a soil and groundwater investigation of the southern shoreline and northwest corner, additional sediment coring, and a review of the current O&M plan.	Closure and removal of USTs took place between 1986 and 2004. Groundwater extraction took place between 1993 and 1995. Petroleum contaminated soils have been excavated and removed. Oxygen-releasing compound was applied to soils and groundwater between 2003 and 2004. Pilot testing and installation of AS/SVE system to treat VOCs took place from 2003 to the present.	No source control activities or investigations were reported.

Table I-47, cont. Summary of facility information for the Slip 6 SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/ Investigations
Rhône-Poulenc (Former) (west parcel)	Container Properties	wrecked vehicle storage	World War II internment camp; glue, paint, and resin manufacturing; wood preservative handling; vanillin production; container storage	A site screening investigation was conducted in 1986. A RCRA facility assessment was conducted in 1990. An independent site assessment was conducted in 1991. A RCRA facility investigation was conducted in 1995. Investigations in support of interim measure design and focused investigations have been conducted. Quarterly monitoring of groundwater is ongoing. Planned investigations include a shoreline bank contamination investigation, and review of the O&M plan.	An SVE system operated between 2000 and 2001. A hydraulic control interim measure was implemented in 2003. A PCB removal action and hazardous waste storage area cleanup were conducted in 2006. A northwest corner soil removal action and west parcel redevelopment took place in 2007.	No source control activities or investigations were reported.
Rhône-Poulenc (Former) (east parcel)	Museum of Flight	not reported	World War II internment camp; glue, paint, and resin manufacturing; wood preservative handling; vanillin production; container storage	A site screening investigation was conducted in 1986. A RCRA facility assessment was conducted in 1990. An independent site assessment was conducted in 1991. A RCRA facility investigation was conducted in 1995. Geoprobe and east parcel soil characterization investigations were conducted in 2001 and 2006, respectively. Planned investigations include a review of the O&M plan.	A PCB removal action took place in 1995. A transformer area cleanup and east parcel voluntary interim measure were conducted in 2006.	Stormwater and storm sewer system was evaluated in 1998, and stormwater system was redeveloped in 2007. A review of the stormwater system is planned.
KCIA (south central basin)	King County	air terminal and hangars	air terminal and hangars, agriculture	No environmental investigations were reported.	No remedial activities were reported.	An evaluation of joint caulk material for PCBs is planned.

Sources: Ecology and Environment (2008b), Ecology and Ecology and Environment (2008), Schmoyer (Schmoyer 2008d)

[a] Facilities listed are those determined to be adjacent to the Slip 6 SCA. The south-central portion of the KCIA is also included because source-tracing data were reported in the source documentation.

AS/SVE – air sparging/soil vapor extraction
BDC – Boeing Developmental Center
KCIA – King County International Airport
NPDES – National Pollutant Discharge Elimination System
O&M – operation and maintenance
O/W – oil/water
PCB – polychlorinated biphenyl
RCRA – Resource Conservation and Recovery Act
SCA – source control area
SWPPP – stormwater pollution prevention plan
UST – underground storage tank
VOC – volatile organic compound

Eight outfalls that discharge to the Slip 6 SCA are identified on Map I-31; these include a KCIA stormwater outfall (No. 2080), four PACCAR private stormwater outfalls (Nos. 2073, 2074, 2075, and 2076), one Rhône-Poulenc private stormwater outfall (No. 2078), and two BDC private stormwater outfalls (Nos. 2081 and 2082). Of the four permitted private PACCAR outfalls, two are on the northern shoreline (Nos. 2075 and 2076), one is on the middle shoreline (No. 2074), and one is on the southern shoreline (No. 2073). Source documents indicate that the middle outfall was closed in 2004 and only one of the outfalls (No. 2076) on the northern shoreline of PACCAR is still in operation.[30]

Although a private stormwater outfall (No. 2078) from Rhône-Poulenc is shown to discharge into Slip 6 on Map I-31, source documents indicate that both the east and west parcels of Rhône-Poulenc drain directly into the KCIA drainage system with discharge to the LDW via outfall No. 2080. In total, storm drainage from approximately 150 ac of land discharges to Slip 6 (Map I-33). Information on the outfalls within the Slip 6 SCA is summarized in Table I-48; additional information is provided in Appendix H.

[30] Maps I-31 and I-32 show outfalls as identified in the 2003 outfall survey (Herrera 2004) because this is the outfall information source used throughout the RI. The treatment of discrepancies between outfall configurations shown on the RI maps and the maps provided in source documents is discussed in the introduction to this appendix.

Table I-48. Summary of specific information for each outfall in the Slip 6 SCA

Outfall[a]	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
BDC permitted private SD outfalls (Nos. 2081 and 2082)	The Boeing Company	Two outfalls drain approximately 18 ac of the northern portion of the BDC property and possibly 5.5 ac of Museum of Flight property (former BDC property).	There is no information suggesting the existence of any outfalls from the BDC prior to the two current outfalls.	No environmental or source-tracing investigations were reported.	In-line O/W separators are directly upstream of both outfalls. BDC property operates under an NPDES permit, and a SWPPP has been developed.
KCIA SD outfall (No. 2080)	King County	One outfall discharges stormwater from approximately 70 ac of KCIA property, 20 ac of former Rhône-Poulenc property, and 11.44 ac of Museum of Flight east property.	This outfall discharged stormwater from the KCIA and the Rhône-Poulenc site.	Source-tracing samples were collected from this storm drain as part of the Elliott Bay Action Program in the 1980s (Tetra Tech 1988); the source documents do not present those data. One catch basin solids sample was collected in September 2004. Additional stormwater and solids source-tracing investigation and upland site inspections are planned.	Airport catch basins are cleaned semi-annually; airport O/W separators are cleaned annually.
PACCAR/Kenworth Truck Company permitted private SD outfalls (Nos. 2073, 2074, 2075, and 2076)[b]	Merrill Creek Holdings	Two outfalls drain approximately 24.3 ac of the former PACCAR property.	Four stormwater outfalls drained the PACCAR property.	Stormwater catch basins and drain lines were sampled during Phase I and Phase II data gaps investigations. A north storm drain investigation was conducted in 2006. Stormwater monitoring under a NPDES permit/SWPPP is ongoing.	Stormwater catch basins and drain lines were cleaned out during the Phase I and Phase II data gaps investigations. Closure of the middle outfall and complete stormwater system cleaning was completed in 2004.The north storm drain was repaired in 2006. Stormwater quality improvements were done in 2008.
Rhône-Poulenc private SD outfall (No. 2078)[c]	Container Properties	One outfall may drain a portion of the Rhône-Poulenc property.	Several outfalls drained the Rhône-Poulenc property.	The stormwater and storm sewer system was evaluated in 1998. A review of the stormwater system is planned.	The stormwater system was replaced by a collection and treatment system in 2007.

Sources: Ecology and Environment (2008b), Ecology and Ecology and Environment (2008), Schmoyer (2008d)

[a] No major outfalls were identified as individual source control entities in the source documents.

[b] The source documents indicated that the middle outfall (No. 2074) was closed in 2004 and only one of the outfalls (No. 2076) on the northern shoreline of PACCAR is still in operation.

[c] The source documents indicated that both the east and west parcels of Rhône-Poulenc drain directly into the KCIA drainage system with discharge to the LDW via outfall No. 2080.

BDC – Boeing Developmental Center
KCIA – King County International Airport
NPDES – National Pollutant Discharge Elimination System
O/W – oil/water
SCA – source control area
SWPPP – stormwater pollution prevention plan

Several remedial activities and environmental investigations have been completed or are currently in progress within the Slip 6 SCA (Tables I-47 and I-48). Information about these activities were summarized in the source documents. Several of the chemicals that have been detected above the SQS in the Slip 6 SCA surface sediment have also been detected in various upland media, including soil, groundwater, seep, porewater, stormwater, and source-tracing samples (Table I-49). The availability of data (by media type) for each of the facilities associated with the Slip 6 SCA is also presented in the table on Map I-32. An X in Table I-49 and the table on Map I-32 indicates that the source documents reported data or indicated that data exist; therefore, an X does not necessarily mean that the actual data were presented in the source document. Data are only summarized in media-specific and source-tracing tables if the data were reported in the source documents and if they met the criteria for data summation discussed in the introduction to this appendix (e.g., soil data were collected along the SCA shoreline; groundwater data were collected from shoreline facilities). The identification of a chemical in these media at facilities or within the drainage systems does not necessarily indicate that these potential sources contributed to sediment contamination in the past or that they will result in sediment contamination in the future.

Table I-49. Chemicals identified in various media in the Slip 6 SCA

Chemical[a]	Soil	Groundwater	Seep	Porewater	Stormwater	Source-Tracing Samples	Sources
Lead	X	X	X		X	X	Ecology and Environment (2008b), Schmoyer (2008a),
Mercury	X	X	X	X	X	X	Ecology and Environment (2008b), Schmoyer (2008a), EPA (2005)
Acenaphthene		X	X			X	Ecology and Environment (2008b), Schmoyer (2008d)
Benzo(g,h,i) perylene			X			X	Ecology and Environment (2008b)
Dibenzo(a,h) anthracene						X	Ecology and Environment (2008b)
Dibenzofuran		X					Ecology and Environment (2008b)
Fluoranthene		X	X	X		X	Ecology and Environment (2008b), EPA (2005)
Fluorene		X	X			X	Ecology and Environment (2008b)
Indeno(1,2,3-cd) pyrene			X			X	Ecology and Environment (2008b)

Chemical[a]	Soil	Groundwater	Seep	Porewater	Stormwater	Source-Tracing Samples	Sources
Phenanthrene		X	X			X	Ecology and Environment (2008b)
Total HPAHs		X	X	X		X	Ecology and Environment (2008b), EPA (2005)
BBP						X	Ecology and Environment (2008b), Schmoyer (2008d)
BEHP		X	X	X	X	X	Ecology and Environment (2008b), Schmoyer (2008d), EPA (2005)
Benzoic acid						X	Ecology and Environment (2008b)
Phenol[b]							
Total PCBs	X	X			X	X	Ecology and Environment (2008b)
Dioxins and furans[c]						X	Ecology and Environment (2008b)

Note: An X indicates that the source documents reported that data are available for the identified media. The absence of an X in any cell does not necessarily mean that the chemical is absent in the upland media or in source-tracing samples; in some cases, the chemical may not have been analyzed for or, if analyzed, could have been present but at concentrations below the RL.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 6 SCA. The chemical list is based on SMS exceedances in the RI baseline surface sediment dataset within the 2007 SCA boundary. Therefore, this list may differ from the list of exceedances in source documents.

[b] No soil, groundwater, seep, porewater, stormwater, or source-tracing data were identified in the source documents for this chemical.

[c] SMS criteria do not exist for dioxins and furans. They were included in this table because they are a risk driver chemical with highly elevated concentrations (i.e., TEQ > 100 ng/kg dw) in surface sediment in this area.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
HPAH – high-molecular-weight polycyclic aromatic hydrocarbons
PCB – polychlorinated biphenyls
RI – remedial investigation
RL – reporting limit
SCA – source control area
SMS – Washington State Sediment Management Standards
SQS – sediment quality standard
TEQ – toxicity equivalent

This section summarizes data as presented in the source documents for groundwater, seep, porewater, stormwater, and source-tracing samples. Soil data are not presented because the data in the source documents were not collected along the bank. In addition to the groundwater data included in this section, groundwater information for the Boeing Developmental Center, PACCAR, and the former Rhône-Poulenc facility is also included in Section 9.4.6 of the main body of the RI.

If sufficient data were available in the Slip 6 source documents, ranges of detected concentrations, median concentrations, and sample counts (n) are provided in the tables. In some instances, the source documents acknowledged the existence of certain

data without providing actual concentrations. Data were included only if specific concentrations or a range of concentrations were available in the source documents.

Groundwater data presented in the source documents for adjacent or upland properties associated with the Slip 6 SCA are summarized in Table I-50. Rhône-Poulenc is the only property adjacent to the Slip 6 SCA with detected concentrations of at least one chemical listed in Table I-49 in groundwater. In addition to groundwater information for those chemicals detected above the SQS in surface sediment in this SCA, Table I-50 also includes VOC groundwater data for PACCAR and Rhône-Poulenc provided in the source documents. Data are presented in Table I-50 for VOCs that were identified for these properties in the groundwater pathways analysis completed as part of the Phase 1 LDW RI (Windward 2003a).

Table I-50. Summary of chemical concentrations detected in groundwater for the Slip 6 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Chemicals with Detections Above SQS in Surface Sediment						
Rhône-Poulenc	lead	2002	1 – 12 (total) median = 3 n = 6/9	nearshore	GeoEngineers (2002), as cited in Windward (2003b)	Samples were collected before HCIM implementation.
Rhône-Poulenc	mercury	2002 – 2006	0.1 – 0.5 (total) median = 0.1 n = 13/174	outside HCIM barrier wall	Geomatrix (2007), as cited in Ecology and Environment (2008b)	Samples were collected after HCIM implementation.
Rhône-Poulenc	mercury	2002	1, 1 (total) n = 2/9	nearshore	GeoEngineers(2002), as cited in Windward (2003b)	Samples were collected before HCIM implementation.
VOCs[f]						
PACCAR	1,1 dichloroethene	2002 – 2007	0.3 – 1.26 median = 0.6 n = 6/105	nearshore	Kennedy/Jenks (2007), as cited in Ecology and Environment (2008b)	Samples are from AS/SVE system monitoring.
PACCAR	1,1 dichloroethene	1996	1.2, 38 n = 2/2	north fire aisle	Kennedy/Jenks (1996), as cited in Windward (2003b)	The reported samples are from the two wells closest to the waterway.
PACCAR	cis-1,2-dichloroethene	2002 – 2007	0.3 – 57 median = 7.67 n = 43/105	nearshore	Kennedy/Jenks (2007), as cited in Ecology and Environment (2008b)	Samples are from AS/SVE system monitoring.
PACCAR	cis-1,2-dichloroethene	1996	43, 110 n = 2/2	north fire aisle	Kennedy/Jenks (1996), as cited in Windward (2003b)	The reported samples are from the two wells closest to the waterway.
PACCAR	methylene chloride	2002 – 2007	3.6, 4.1 n = 2/105	nearshore	Kennedy/Jenks (2007), as cited in Ecology and Environment (2008b)	Samples are from AS/SVE system monitoring.
PACCAR	tetrachloroethene	1996	1.8 n = 1/2	north fire aisle	Kennedy/Jenks (1996), as cited in Windward (2003b)	The reported samples are from the two wells closest to the waterway.
PACCAR	trichloroethene	2002 – 2007	0.4 – 47 median = 4.3 n = 33/105	nearshore	Kennedy/Jenks (2007), as cited in Ecology and Environment (2008b)	Samples are from AS/SVE system monitoring.
PACCAR	trichloroethene	1996	1.3, 160 n = 2/2	north fire aisle	Kennedy/Jenks (1996), as cited in Windward (2003b)	The reported samples are from the two wells closest to the waterway.

Table I-50, cont. Summary of chemical concentrations detected in groundwater for the Slip 6 SCA

FACILITY	CHEMICAL[a, b]	YEAR COLLECTED	CONCENTRATION INFORMATION (µg/L)[c, d]	LOCATION	SOURCES[e]	ADDITIONAL INFORMATION
PACCAR	vinyl chloride	2002 – 2007	0.5 – 51 median = 4.65 n = 34/105	nearshore	Kennedy/Jenks (2007), as cited in Ecology and Environment (2008b)	Samples are from AS/SVE system monitoring.
PACCAR	vinyl chloride	1996	30, 190 n = 2/2	north fire aisle	Kennedy/Jenks (1996), as cited in Windward (2003b)	The reported samples are from the two wells closest to the waterway.
Rhône-Poulenc	toluene	2007	1,300 n = 1/nr	southwest corner of former maintenance building area	EPA (2006), as cited in Ecology and Environment (2008b)	Sample collected after the removal action.
Rhône-Poulenc	toluene	2006	90,000 n = 1/nr	southwest corner of former maintenance building area	EPA (2006), as cited in Ecology and Environment (2008b)	Reported value is the maximum. Sample collected before the removal action.
Rhône-Poulenc	toluene	2002 – 2006	0.38 – 260 median = 42 n = 53/174	outside HCIM barrier wall	Geomatrix (2007), as cited in Ecology and Environment (2008b)	Samples include quarterly monitoring since September 2002.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 6 SCA.

[b] Mercury, BBP, BEHP, acenaphthene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, benzoic acid, phenol, total PCBs and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[d] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

[f] VOC data were summarized, as available, at EPA's request and not because of SQS exceedances in surface sediment in the SCA.

AS/SVE – air sparging/soil vapor extraction
BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
HCIM – hydraulic control interim measure
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
nr – not reported
PCB – polychlorinated biphenyl
SCA – source control area
SQS – sediment quality standard
UST – underground storage tank
VOC – volatile organic compound

Data are also available for several seep and porewater samples collected within the Slip 6 SCA. Source documents indicated that seven seep samples were collected from the Rhône-Poulenc shoreline in 1996, and several seep samples were collected from the PACCAR shoreline in 2002. Data from seep samples are presented in Table I-51. Porewater data were collected as part of the Rhône-Poulenc sediment and porewater investigation (EPA 2005) (Table I-52). Table I-53 presents the data for chemicals detected in stormwater samples collected from drainage basin associated with the Slip 6 SCA. Data from PACCAR drainage systems included data collected since 2004, after the entire storm drainage system was cleaned out and the middle outfall was closed (2008b). No stormwater data were presented for Rhône-Poulenc, BDC, or the KCIA properties in the source documents.

Table I-51. Summary of chemical concentrations detected in seeps in the Slip 6 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
PACCAR	lead	2002	16 (total) n = 1/nr	southern shoreline	Kennedy/Jenks (2002) , as cited in Ecology and Environment (2008b)	Value is the maximum detected concentration.
Rhône-Poulenc	lead	1996	44 (total) n = 1/7	southwest shoreline	Rhône-Poulenc (1996), as cited in Windward (2003b)	Samples were collected prior to HCIM implementation.
Rhône-Poulenc	mercury	1996	0.65 (total) n = 1/7	Slip 6 shoreline	Rhône-Poulenc (1996), as cited in Windward (2003b)	Samples were collected prior to HCIM implementation.
Rhône-Poulenc	BEHP	1996	14, 27 (total) n = 2/7	shoreline	Rhône-Poulenc (1996), as cited in Windward (2003b)	Samples were collected prior to HCIM implementation.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 6 SCA.

[b] BBP, acenaphthene, benzo(g,h,i)perylene , dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, benzoic acid, phenol, total PCBs, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges were calculated using only detected data. For this reason, some estimated ranges may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
HCIM – hydraulic control interim measure
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
nr – not reported
PCB – polychlorinated biphenyl
SCA – source control area
SQS – sediment quality standard

Table I-52. Summary of chemical concentrations detected in porewater in the Slip 6 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources	Additional Information
Rhône-Poulenc	mercury	2004	0.0016 – 0.408 n = 10/15	along the Rhône-Poulenc shoreline	EPA (2005)	Samples were collected with a mini-peizometer and seepage meter.
Rhône-Poulenc	fluoranthene	2004	0.26 n = 1/9	along the Rhône-Poulenc shoreline	EPA (2005)	Samples were collected with a mini-peizometer and seepage meter.
Rhône-Poulenc	total HPAH	2004	0.69 n = 1/9	along the Rhône-Poulenc shoreline	EPA (2005)	Samples were collected with a mini-peizometer and seepage meter.
Rhône-Poulenc	BEHP	2004	2 – 390 n = 5/9	along the Rhône-Poulenc shoreline	EPA (2005)	Samples were collected with a mini-peizometer and seepage meter.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 6 SCA.

[b] Lead, BBP, acenaphthene, benzo(g,h,i)perylene , dibenzo(a,h)anthracene, dibenzofuran, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, benzoic acid, phenol, total PCBs, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the Rhône-Poulenc (Rhodia) sediment and porewater investigation data report (EPA 2005) in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges were calculated using only detected data. For this reason, some estimated ranges may be higher than actual concentrations.

BBP – butyl benzyl phthalate

BEHP – bis(2-ethylhexyl) phthalate

EPA – US Environmental Protection Agency

HPAH – high-molecular-weight polycyclic aromatic hydrocarbon

PCB – polychlorinated biphenyl

SCA – source control area

SQS – sediment quality standard

Table I-53. Summary of chemical concentrations detected in stormwater samples from the Slip 6 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
PACCAR	lead	2006 – 2007	1 – 21 median = 3.5 n = 4/4	north storm drain system	Anchor (2003b), as cited in Ecology and Environment (2007b, 2008)	Samples were collected after the 2004 system cleanout. Samples were not filtered.
PACCAR	lead	2006 – 2007	3 – 96 median = 26 n = 3/4	south storm drain system	Anchor (2008b), as cited in Ecology and Environment (2007b, 2008)	Samples were collected after the 2004 system cleanout. Samples were not filtered.
PACCAR	mercury	2006 – 2007	0.0566 n = 1/4	north storm drain system	Anchor (2008b), as cited in Ecology and Environment (2007b, 2008)	Samples were collected after the 2004 system cleanout. Samples were not filtered.
PACCAR	mercury	2006 – 2007	0.0512 n = 1/4	south storm drain system	Anchor (2008b), as cited in Ecology and Environment (2007b, 2008)	Samples were collected after the 2004 system cleanout. Samples were not filtered.
PACCAR	BEHP	2006 – 2007	3.2, 14 n = 2/4	south storm drain system	Anchor (2008b), as cited in Ecology and Environment (2007b, 2008)	Samples were collected after the 2004 system cleanout.
PACCAR	total PCBs	2006 – 2007	0.012, 0.018 n = 2/4	north storm drain system	Anchor (2008b), as cited in Ecology and Environment (2007b, 2008)	Samples were collected after the 2004 system cleanout.
PACCAR	total PCBs	2006 – 2007	0.055, 0.11 n = 2/4	south storm drain system	Anchor (2008b), as cited in Ecology and Environment (2007b, 2008)	Samples were collected after the 2004 system cleanout.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 6 SCA.

[b] BBP, acenaphthene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, total HPAH, benzoic acid, phenol, and dioxins/furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
SCA – source control area
SQS – sediment quality standard

Source-tracing samples have been collected at the former PACCAR facility and the KCIA drainage systems associated with the Slip 6 SCA. Data from these samples were reported in the source documents. Table I-54 presents the source-tracing data collected from drainages associated with the Slip 6 SCA. The drainage basin and storm drain system features within the Slip 6 SCA are included on Maps I-32 and I-33. Data from the PACCAR drainage systems include data collected starting in 2004, after the entire storm drainage system was cleaned out and the middle outfall was closed (Ecology and Environment 2008b). No source-tracing data were reported in the source documents for the Rhône-Poulenc drainage system since the complete system was redeveloped in 2007 (Ecology and Environment 2008b). No data were available in the source documents for Rhône-Poulenc prior to the system redevelopment. No source-tracing data were reported for the BDC drainage system associated with the Slip 6 SCA. Additional details on source-tracing sampling programs conducted within the Slip 6 SCA are presented in Section 9.4.4.7.

Table I-54. Summary of chemical concentrations detected in source-tracing samples collected from the Slip 6 SCA

Sample Source	Year Collected	Concentration Information (mg/kg dw)[a, b, c, d]		Concentration Information (µg/kg dw)[a, b, c, d]					Sources	Additional Information
		Lead	Mercury	Acenaphthene	Benzo(g,h,i)perylene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene		
Catch Basin Solids Samples										
PACCAR south storm drain system	2006 – 2007	128, 660 n = 2/2	0.09, 0.3 n = 2/2	nd	320, 910 n = 2/2	160 n = 1/2	1,600, 7,100 n = 2/2	93 n = 1/2	Ecology and Environment (2008b)	Samples were collected after system cleanout in 2004.
PACCAR north storm drain system	2006 – 2007	175, 764 n = 2/2	0.08, 0.9 n = 2/2	nd	2,100 n = 1/2	84, 320 n = 2/2	380, 9,500 n = 2/2	220 n = 1/2	Ecology and Environment (2008b)	Samples were collected after system cleanout in 2004.
KCIA SD No.1	2004	232 n = 1/1	0.17 n = 1/1	1,400 n = 1/1	nd	nd	nd	nd	Schmoyer (2008d)	Sample was collected by SPU as part of LDW source control program. SPU installed a sediment trap in KCIA SD#1 in 2008 under a grant with Ecology. Trap sample was retrieved in 2009.

Sample Source	Year Collected	Concentration Information (µg/kg dw)[a, b, c, d]							Sources	Additional Information
		Indeno(1,2,3-cd)pyrene	Phenanthrene	Total HPAHs	BBP	BEHP	Benzoic Acid	Total PCBs		
Catch Basin Solids Samples										
PACCAR south storm drain system	2006 – 2007	280, 750 n = 2/2	810, 2,300 n = 2/2	7,836, 26,760 n = 2/2	280, 5,100 n = 2/2	4,500, 46,000 n = 2/2	4,200 n = 1/2	160, 313 n = 2/4	Ecology and Environment (2008b)	Samples were collected after system cleanout in 2004.
PACCAR north storm drain system	2006 – 2007	1,500 n = 1/2	780, 3,000 n = 2/2	1,300, 36,020 n = 2/2	1,100, 1,300 n = 2/2	10,000, 62,000 n = 2/2	3,700 n = 1/2	950 n = 1/2	Ecology and Environment (2008b)	Samples were collected after system cleanout in 2004.
KCIA SD #1	2004	nd	nd	nd	2,600 n = 1/1	41,000 n = 1/1	nd	nd	Schmoyer (2008d)	Sample was collected as part of a larger source-tracing project by King County.

Note: Data are not included for drainage structures that have been removed subsequent to sampling. If multiple rounds of data were available for a single location, only the data collected during the most recent event were presented in order to represent the most current conditions possible.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Slip 6 SCA.

[b] Acenaphthene, dibenzofuran, phenol, and dioxins/furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/kg to µg/kg), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges were calculated using only detected data. For this reason, some estimated ranges may be higher than actual concentrations.

BBP –butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
dw – dry weight
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
KCIA – King County International Airport
nd – not detected
PCB – polychlorinated biphenyl
SQS – sediment quality standard
SCA – source control area

Source identification and control efforts are ongoing for the Slip 6 SCA. Additional information for the Slip 6 SCA is provided on Ecology's website.

I.4.8 NORFOLK CSO/SD SOURCE CONTROL AREA (RM 4.9 E TO RM 5.0 E, EAA 7)

The area just offshore of the Norfolk CSO/SD[31] outfall was originally identified as a priority cleanup area by the Elliott Bay/Duwamish Restoration Program (EBDRP) in 1991 because of sediment contamination associated with the Norfolk CSO/SD discharge (King County 1999). Subsequently, the area was identified through the RI process as a candidate EAA (EAA 7) because of contaminated surface sediment (Windward 2003c). As part of ongoing source control efforts for this SCA, a data gaps report (Ecology and Environment 2007a) and a SCAP (Ecology 2007d) were completed in September 2007. Source-tracing data provided by the City of Seattle were also reviewed (Schmoyer 2008d). These three documents are collectively referred to as the "source documents" in this section.

In 1994, King County investigated sediment contamination near the Norfolk CSO/SD outfall and determined that contaminated sediments should be dredged and the area capped with clean sediment (Map I-34). Dredging began in February 1999, and backfilling within the dredged area was completed by March 1999. Sediment from the Upper Turning Basin was used to backfill the dredged area. A project closure report was prepared in 1999 (King County 1999).

In 2003, Boeing used a specialized vacuum excavator to remove approximately 60 cy of PCB-contaminated sediment near Boeing outfall DC2, sometimes referred to as the south storm drain outfall (No. 2093 on Map I-34). The purpose of excavation was to remove PCB-contaminated sediment near outfall DC2. Neither of these actions was intended to address all of the sediment contamination within this SCA.

CSL exceedances in surface sediment in this SCA included total PCBs, BEHP, and 1,4-dichlorobenzene. SQS exceedances were reported for total PCBs, BEHP, BBP, 1,4-dichlorobenzene, and fluoranthene (Map I-34). These exceedances are based on data included in the baseline dataset[32] for sampling locations within the 2007 SCA boundary (as discussed in the introduction to this appendix), and they form the basis for the discussion and data compilation in this section. Ecology has identified COCs for this SCA based on different criteria (Table I-3); therefore, the chemicals identified for summary in this appendix are different than the COCs identified by Ecology. For

---

[31] A City pump station EOF also discharges through this outfall.

[32] Surface sediment samples in the baseline dataset include: 1) post-dredge samples collected within the 1999 Norfolk dredged area; 2) pre-removal samples collected within the 2003 Boeing removal area; 3) samples collected prior to the 1999 dredge event from locations outside of the dredged area; and 4) samples collected after the 2003 dredge from locations outside of the removal area.

the most part, the SMS exceedances in the RI baseline dataset were outside of the removal areas. Within the Norfolk CSO/SD removal area, concentrations of total PCBs and BBP exceeded the SQS in 2002 and 2001, respectively. PCBs and BBP concentrations in surface sediment samples did not exceed the SQS in subsequent sampling conducted in 2006.

Commercial and industrial operations in the vicinity of the Norfolk CSO/SD SCA have included aircraft and aerospace research (historical and current); flight line support aircraft storage, flight preparation, general servicing, and maintenance and repair (current); general aviation airport operations (current); wholesale foods and merchandise (current); auto wrecking (historical and current); vehicle parts salvage and sale, crushing of cars and parts (current); farming (historical); commercial operations (historical); warehousing (historical); propane distribution (historical); commercial trucking (historical); and airplane and missile manufacturing (historical). Historically, a grocery store, tavern, gas station, winery, granary, and a construction yard were also located in the vicinity of this SCA.

Ecology (2007b) has identified BDC, the Boeing Military Flight Center (MFC), and the southern drainage basin of KCIA as adjacent properties associated with this SCA (Map I-34) (Ecology 2007c). The Norfolk CSO/SD SCA also receives stormwater runoff from a large drainage basin that includes industrial and residential areas (Map I-35). Upland properties identified in the source documents included Associated Grocers, Inc., Northwest Auto Wrecking, Affordable Auto Wrecking, and an Arco gas station. Table I-55 summarizes facility-specific information for adjacent facilities associated within the Norfolk CSO/SD SCA. The Arco Gas Station is also summarized in Table I-55 because source-tracing data were reported in the source documents. Associated Grocers, Inc., Northwest Auto Wrecking, and Affordable Auto Wrecking[33] are not included in this summary because source-tracing data for these facilities were not identified (see the introduction for more information on facility selection criteria). The data gaps report and SCAP should be reviewed for additional information on all of the facilities associated with this SCA.

[33] Runoff from most of the Affordable Auto Wrecking property has been diverted to the combined sewer on MLK Way. This site no longer drains to the Norfolk outfall (Schmoyer 2009).

Table I-55. Summary of facility information for the Norfolk CSO/SD SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/Investigations
Arco Gas Station	John Eastey	former gas station	gas station	Groundwater sampling was conducted in 2004, 2005, and 2006.	Soil contamination has been remediated. Between 1991 and 1992, 26 USTs were removed from the facility.	No source control activities or investigations were reported.
Boeing Developmental Center[b]	The Boeing Company	aircraft and aerospace research and development	farmland, commercial operations, grocery store, gasoline station, tavern, warehouse, winery, auto wrecking, construction yard, propane distributor, commercial trucking, granary, airplane and missile manufacturing	EPA conducted a RCRA facility assessment of the BDC in 1994.	PCB-contaminated sediment near the south storm drain was removed and the area was then backfilled with clean sediment. Storm drain lines have been investigated and cleaned, and an end-of-pipe sediment trap for the south storm drain line has been installed (Project Performance Corporation 2002, 2003; Ecology 2007c).	Boeing has implemented multiple source investigations and control activities. A SWPPP was prepared to identify and assist in the prevention of releases from potential sources of stormwater pollution (Project Performance Corporation 2001, 2003; Landau 2004; Ecology 2007c)
Boeing Military Flight Center	The Boeing Company	flight line support, aircraft storage, flight preparation, general servicing, maintenance and repair	No historical operations were reported.	In 2005, Boeing conducted an investigation of joint caulking material to determine the extent of PCB contamination on the property.	Joint caulking removal activities took place in 2005 and 2006.	A SWPPP was prepared to identify and prevent releases from potential sources of stormwater pollution.
KCIA (southern drainage basin)	King County	general aviation airport	general aviation and military airport	No environmental investigations were reported.	No remedial activities were reported.	No source control activities or investigations were reported.

Source: Ecology and Environment (2007a), Ecology (2007b)

[a] Facilities listed are those identified in the data gaps report(Ecology and Environment 2007a) and the SCAP (Ecology 2007c). Arco Gas Station (identified as an upland property in the source documents) is also included because source-tracing data were included in the source documentation.

[b] Much of the information presented in the data gaps report(Ecology and Environment 2007a) and the SCAP (Ecology 2007c) for the BDC is for RCRA units that are north of the area that drains to the Norfolk CSO/SD SCA.

BDC – Boeing Developmental Center
CSO – combined sewer overflow
ESA – Environmental site assessment
KCIA – King County International Airport
PCB – polychlorinated biphenyl
SCA – source control area
SCAP – source control action plan
SD – storm drain
SWPPP – storm water pollution prevention plan
UST – underground storage tank
VCP – voluntary cleanup program

The source documents identified the Norfolk CSO/SD (No. 2095) as a major outfall for this SCA. The Norfolk CSO/SD is owned by King County and the City of Seattle with contributions from King County, the City of Seattle, the City of Tukwila, and The Boeing Company. It is the only public outfall discharging to this SCA (Ecology 2007c); it serves as an outfall for the municipal storm drain system, which is operated by both the City of Seattle and the City of Tukwila. The Norfolk SD drainage basin collects stormwater from approximately 769 ac (including about 100 ac of the I-5 corridor) and the outfall also serves as a CSO for an area of 4,900 ac (Maps I-35 and I-36). Land use in the Norfolk SD drainage basin is primarily industrial. The Norfolk outfall also serves as an emergency overflow for City of Seattle pump station No.17 (Schmoyer 2008d).

In addition, four other outfalls discharge into the SCA: Boeing DC16 (BDC-5), Boeing DC3 (No. 2096), Boeing DC2 (No. 2093), and a pipe of unresolved origin and/or use (No. 2094) located just south of outfall No. 2093. The first three of these outfalls are permitted under the BDC. The source documents list two other outfalls as discharging to the Norfolk SCA (Nos. 2092 and 2097), but these outfalls are located to the north of the SCA boundary and thus are not included in this section. The Boeing outfalls primarily drain rooftops and paved areas near buildings on the BDC. A single catch basin at the BDC is also connected to the Norfolk CSO/SD. Stormwater drainage features are shown on Maps I-35 and I-36. Information on the outfalls within the Norfolk SCA is included in Table I-56 and the locations of these outfalls are shown on Map I-34; additional outfall information is provided in Appendix H.

Table I-56. Summary of specific information for each outfall in the Norfolk SCA

Outfall	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
Outfalls Identified in the SCAP and DGR as Major Outfalls[a]					
Norfolk CSO/SD outfall[b] (No. 2095)	King County, City of Seattle	This outfall serves as a CSO for King County, as an emergency overflow for City of Seattle pump station No.17 (Schmoyer 2008e), and as a storm drain outfall for the municipal storm drain system. The stormwater basin is approximately 769 ac, and the combined sewer service area is approximately 4,900 ac. Both untreated (Norfolk) and treated (Henderson/MLK) CSOs discharge at this outfall. The outfall also receives stormwater discharges from Boeing properties and areas within the City of Tukwila.	Outfall served as a CSO, EOF, and SD for King County and the City of Seattle. CSOs were untreated prior to the construction of a CSO treatment facility (Henderson).	In-line sediment samples were collected by SPU between 2003 and 2005 to evaluate disposal options in preparation for a pipe cleaning project in the MLK Way sub-basin. Approximately 2,200 linear feet of pipe were cleaned in 2005 (Schmoyer 2008e).	In 1995, the Allentown diversion, which sent much of the flow to the South Plant and greatly reduced CSO events, was completed (King County 2008a). In 2005, the Henderson/MLK CSO treatment facility (storage and treatment tunnel) was constructed, which sends treated CSO discharges to the Norfolk outfall.
Other Outfalls					
BDC outfalls (Nos. 2093 [DC2], 2096 [DC3], and BDC-5 [DC16])	The Boeing Company	Three of the eighteen outfalls from the BDC storm drain system discharge to the Norfolk SCA; one catch basin at the BDC connects to the Norfolk CSO/SD. The BDC outfalls primarily drain rooftops and paved areas.	No historical operations were reported.	Boeing has conducted extensive investigation of the potential sources of PCBs within the south storm drain system (Ecology 2007c; Project Performance Corporation 2001).	Boeing has implemented source control activities within the south storm drain system, including cleanout of the pipes, installation of a sediment trap, and periodic monitoring. A SWPPP was prepared to identify and assist in the prevention of releases from potential sources of stormwater pollution (Ecology 2007c; Project Performance Corporation 2001, 2003).
Outfall No. 2094	unknown	Outfall No. 2094 is a pipe of unresolved origin and/or use within the Norfolk SCA boundary.	No historical operations were reported.	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.

Source: Ecology and Environment (2007a), Ecology (2007b)

[a] Major outfalls listed are those discussed as individual source control entities in the data gaps report (2007a) and the SCAP (2007b).

[b] A City pump station EOF also discharges through this outfall.

BDC – Boeing Developmental Center
CSO – combined sewer overflow
SCA – source control area
SD – storm drain
SWPPP – storm water pollution prevention plan

Several remedial activities and environmental investigations have been completed or are currently in progress within the Norfolk CSO/SD SCA (Tables I-55 and I-56, Map I-36). These investigations have detected some of the chemicals that occur at concentrations above the SQS in surface sediment within this SCA in various upland media, including soil, groundwater, stormwater, and source-tracing solids (Table I-57). The availability of data (by media type) is also presented in the table on Map I-36 for each facility associated with this SCA. An X in Table I-57 and the table on Map I-36 indicates that the source documents reported data or indicated that data exist; therefore, an X does not necessarily mean that the actual data were presented in the source document. Data are only summarized in media-specific and source-tracing tables if the data were reported in the source documents and if they met the criteria for data summation discussed in the introduction to this appendix (e.g., soil data were collected along the SCA shoreline; groundwater data were collected from shoreline facilities). The identification of a chemical in these media at facilities or within the drainage systems does not necessarily indicate that these potential sources contributed to sediment contamination in the past or that they will result in sediment contamination in the future.

Table I-57. Chemicals identified in various media in the Norfolk CSO/SDSCA

Chemical[a]	Soil	Groundwater	Seep[b]	Porewater[b]	Stormwater	Source-Tracing Samples	Sources
Fluoranthene						X	Ecology and Environment (2007a)
BBP						X	Ecology and Environment (2007a)
BEHP						X	Schmoyer (2008d)
1,4-dichlorobenzene	X[c]	X[c]				X	Ecology and Environment (2007a)
Total PCBs	X				X	X	Ecology (2007c)

Note: An X indicates that the source documents reported that data are available for the identified media. The absence of an X in any cell in this table does not necessarily mean that the chemical is absent in the upland media or in source-tracing samples; in many cases, that chemical may not have been analyzed or, if analyzed, could have been present but at concentrations below the RL.

[a] Chemicals included are those with at least one detected exceedance of an SQS in sediment within the SCA identified by Ecology. The chemical list is based on SMS exceedances in the RI baseline surface sediment dataset within the 2007 SCA boundary. Therefore, this list may differ from the list of exceedances in source documents.

[b] No porewater or seep data were identified in the source documents for any chemical.

[c] Unspecified halogenated organic compounds have been identified in soil and groundwater on the Associated Grocers property.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
CSO – combined sewer overflow
PCB – polychlorinated biphenyl
RI – remedial investigation
RL – reporting limit
SCA – source control area
SD – storm drain
SMS – Washington State Sediment Management Standards
SQS – sediment quality standard

This section summarizes the upland data provided in the source documents. No seep or porewater data were reported in the source documents. Soil and groundwater data are not presented in this section because the samples were not collected along the bank (soil) or from adjacent properties (groundwater) or actual data were not provided in the source documents.

If sufficient data for this SCA were available in the source documents, ranges of detected concentrations, median concentrations, and sample counts (n) are provided accordingly. In some instances, the source documents acknowledge the existence of certain data but do not provide actual concentrations. Data were included in the tables only if specific concentrations or a range of concentrations were included in the source documents. Table I-58 summarizes stormwater data as presented in the source documents.

Table I-58. Summary of chemical concentrations detected in stormwater in the Norfolk CSO/SD SCA

Facility	Chemical[a, b]	Year Collected	Location	Concentration Information (µg/L)[c, d]	Sources[e]	Additional Information
Boeing Developmental Center	total PCBs	2001	south end of property	4.2[f] n = 1/1	Project Performance Corporation (2001) as cited in Ecology and Environment (2007a)	Concentration presented is for Aroclor 1248 in a water sample (with suspended sediments) collected from a manhole within the south storm drain system.

Source: Ecology and Environment (2007a)

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Norfolk SCA.

[b] Fluoranthene, BBP, BEHP, and 1,4 dichlorobenzene were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

[f] Two samples were collected at the end-of-pipe. PCBs were not detected in either sample at an RL of 1 µg/L (Project Performance Corporation 2001).

BBP – butyl benzyl phthalate
BDC – Boeing Developmental Center
BEHP – bis(2-ethylhexyl) phthalate
CSO – combined sewer overflow
PCB – polychlorinated biphenyl
SCA – source control area
SD – storm drain
SQS – sediment quality standard

Most source-tracing data were collected between 2000 and 2007 because many of the source-tracing programs within the LDW were initiated within this time period.[34] Data relevant to source-tracing efforts include data from various sample types, including catch basin samples, samples of joint caulking and other construction materials, and in-line sediment samples. When multiple rounds of data were collected from the same sampling location, only the most recent round was selected for presentation in order to represent current conditions. Map I-36 shows the locations of storm drain lines on the properties upland of the Norfolk CSO/SD SCA. Additional details about source-tracing sampling programs conducted in the Norfolk CSO/SD SCA and the larger LDW drainage basin are presented in Section 9.4.4.7. Table I-59 summarizes source-tracing data as presented in the source documents. Map I-37 shows the locations of source-tracing samples for this SCA.

[34] Data from 2008 are not included in Table I-59. Many of the 2008 data are not yet validated or are otherwise not yet ready for use.

Table I-59. Summary of chemical concentrations detected in source-tracing samples in the Norfolk CSO/SD SCA

Sample Source	Year	Concentration Information (µg/kg dw)[a, b, c]					Sources[d]	Additional Information
		Fluoranthene	BEHP	BBP	1,4-Dichloro-benzene	Total PCBs		
Onsite Catch Basin Solids Samples								
Norfolk CSO/EOF/SD	2005	290 – 130,000 median = 6,100 n = 5/5	4,100 – 45,000 median = 13,000 n = 5/5	450 – 4,600 median = 750 n = 4/5	nr	320 n = 1/5	Schmoyer (2008d)	Samples were collected in the southern portion of the Norfolk SD basin.
BDC south storm drain (No. 2093)	2000	nr	nr	nr	nr	190 – 760,000 (initial analysis) 300 – 1,100,000 (split analysis) median = nr n = nr	Project Performance Corporation (2001), as cited in Ecology and Environment (2007a)	Concentrations presented are for Aroclor 1254. Samples were collected from catch basins and manholes within the BDC south storm drain system.
BDC south storm drain (No. 2093)	2001	nr	nr	nr	nr	2,600, 3,700 n = 2/nr	Project Performance Corporation (2001), as cited in Ecology and Environment (2007a)	Concentrations presented are for Aroclor 1254 in organic sludge/solids samples within the BDC south storm drain system.
ROW Catch Basin Solids Samples								
Norfolk CSO/EOF/SD	2007	99, 140 n = 2/4	270 – 2,700 median = 570 n = 4/4	640 n = 1/4	nr	nd	Schmoyer (2008d)	
Norfolk CSO/EOF/SD	2004	1,300 n = 1/1	21,000 n = 1/1	350 n = 1/1	nr	138 n = 1/1	Schmoyer (2008d)	
In-Line Sediment Samples								
Norfolk CSO/EOF/SD	2007	130 – 2,000 median = 1,065 n = 4/4	82 – 7,500 median = 2,960 n = 4/4	370 n = 1/4	nr	50 – 150 median = 68 n = 3/4	Schmoyer (2008d)	
Norfolk CSO/EOF/SD	2005	230 – 8,200 median = 3,300 n = 3/3	400 – 28,000 median = 22,000 n = 3/3	nd	nr	25, 110 n = 2/3	Schmoyer (2008d)	Samples were collected from three manholes.
Norfolk CSO/EOF/SD	2004	450 n = 1/2	63, 620 n = 2/2	nd	nr	108 n = 1/2	Schmoyer (2008d)	Samples were collected from WSDOT stormwater treatment pond.
Norfolk CSO/EOF/SD	2003	790, 1,800 n = 2/2	6,800, 24,000 n = 2/2	1,900 n = 1/1	nr	43, 79 n = 2/2	Schmoyer (2008d)	

Table I-59, cont. Summary of chemical concentrations detected in source tracing samples in the Norfolk CSO/SD SCA

Sample Source	Year	Concentration Information (µg/kg dw)[a, b, c]					Sources[d]	Additional Information
		Fluoranthene	BEHP	BBP	1,4-Dichloro-benzene	Total PCBs		
BDC south storm drain (No. 2093)	2004	nr	nr	nr	nr	7,100, 20,000 n = 2/2	CALIBRE (2006), as cited in Ecology and Environment (2007a)	Sediment samples were collected from manholes on the BDC property. The sample with the higher concentration was collected upstream of a sediment trap/oil/water separator and the sample with the lower concentration was collected downstream of the separator.
	2005	nr	nr	nr	nr	12,600, 61,500 n = 2/2		
	2006	nr	nr	nr	nr	5,900, 38,000 n = 2/2		
	2007	nr	nr	nr	nr	2,280, 3,200 n = 2/2		
Samples of Joint Caulking and Other Construction Materials								
Military Flight Center	2005	nr	nr	nr	nr	3,900 – 99,000,000 median = nr n = nr	Downey (2005) as cited in Ecology and Environment (2007a)	Nine different types of joint caulking material were identified and sampled at the BDC.
BDC south storm drain (No. 2093)	2001	nr	nr	nr	nr	500 – 2,100 median = nr n = nr	Project Performance Corporation (2001) as cited in Ecology and Environment (2007a)	PCB concentrations presented are for Aroclor 1254. Samples of joint caulking material, paint chips, asphalt, etc. were collected along the BDC south storm drain system.

Note: If multiple rounds of data were available for a single location, only the data collected during the most recent event were presented in order to represent the most current conditions possible.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Norfolk CSO/SD SCA.

[b] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/k to µg/kg), the number of significant figures was kept consistent with the number in the reported value.

[c] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[d] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

BBP – butyl benzyl phthalate
BDC – Boeing Developmental Center
BEHP – bis (2-ethylhexyl) phthalate
CSO – combined sewer overflow
dw – dry weight
nd – not detected
nr – non reported
PCB – polychlorinated biphenyl
ROW – right of way
SCA – source control area
SD – storm drain
SPU – Seattle Public Utilities
SD – storm drain
SPU – Seattle Public Utilities
WSDOT – Washington State Department of Transportation

PCB-contaminated sediments offshore of the Norfolk CSO/SD were dredged and capped between February and March 1999. Surface sediment samples collected prior to this action had CSL exceedances of 1,4-dichlorobenzene, mercury, total PCBs, benzoic acid, and BEHP, and SQS exceedances of BBP and several individual PAHs (King County 1996).

Subsequently, four cap locations (NFK501, NFK502, NFK503, and NFK504) were monitored on an annual basis by King County until 2004. These same locations were also sampled in October 2006 as part of the RI (Windward 2007). The monitoring data provide information on the quality of the sediment currently accumulating in this portion of the Norfolk CSO/SD SCA. Table I-60 summarizes chemicals with detected concentrations that exceeded SMS criteria during monitoring (Map I-38). Figure I-1 presents surface sediment data for the 0-to-10-cm interval for total PCBs and BEHP[35] for each of the monitoring locations.

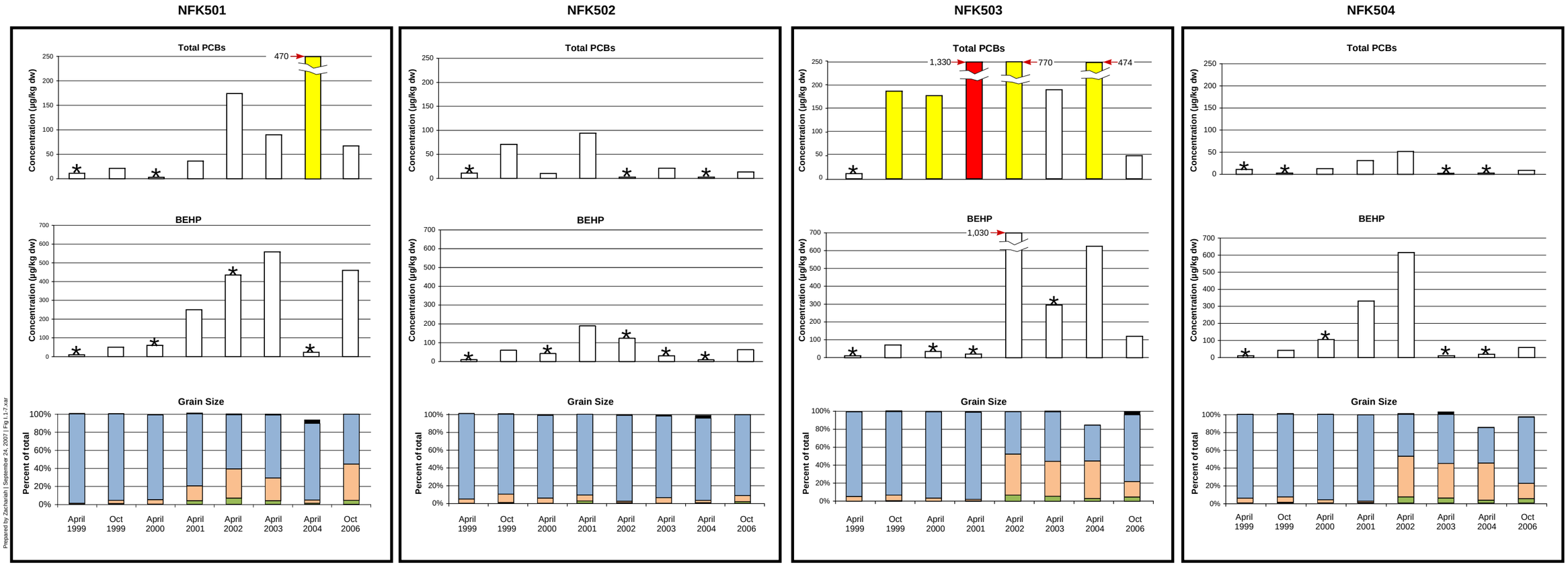
Table I-60. Monitoring information for the Norfolk CSO/SD cap placement area

Sampling Event	Date	Sampling Locations	Detected Chemicals Exceeding SQS	Detected Chemicals Exceeding CSL
Norfolk CSO 5-year monitoring program – post backfill	April 1999	NFK501, NFK502, NFK503, NFK504	none	none
Norfolk CSO 5-year monitoring program – 6-month post construction	October 1999	NFK501, NFK502, NFK503, NFK504	total PCBs	none
Norfolk CSO 5-year monitoring program – supplemental nearshore sampling	February 2000	NFK501, NFK502, NFK503, NFK504[a]	total PCBs	none
Norfolk CSO 5-year monitoring program – 12-month post-construction	April 2000	NFK501, NFK502, NFK503, NFK504	total PCBs	none
Norfolk CSO 5-year monitoring program, year 2	April 2001	NFK501, NFK502, NFK503, NFK504	total PCBs, BBP	total PCBs
Norfolk CSO 5-year monitoring program, year 3	April 2002	NFK501, NFK502, NFK503, NFK504	total PCBs	none
Norfolk CSO 5-year monitoring program, year 4	April 2003	NFK501, NFK502, NFK503, NFK504	none	none
Norfolk CSO 5-year monitoring program, year 5	April 2004	NFK501, NFK502, NFK503, NFK504	total PCBs	none
LDW RI – surface sediment sampling for chemical analyses	October 2006	LDW-SS341, LDW-SS342, LDW-SS343, LDW-SS344	none	none

[a] Samples were also collected at locations NFK505, NFK506, NFK507, NFK508 during this event. BEHP (NFK507), BBP (NFK507), and total PCBs (NFK507 and NFK508) exceeded the CSL. Exceedances for these locations were not included because they were located outside of the dredging limits and cannot be compared to other years.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
CSL – cleanup screening level
CSO – combined sewer overflow
LDW – Lower Duwamish Waterway
PCB – polychlorinated biphenyl
SD – storm drain
SQS – sediment quality standard
RI – remedial investigation

[35] Other analytes were also included in the monitoring program, but results have been limited to total PCBs and BEHP to focus the discussion.



Legend

SQS/CSL category

- > CSL
- > SQS, ≤ CSL
- ≤ SQS
- ⋆ Chemical was not detected at this location (one-half RL)

Concentrations are presented in µg/kg dw for the 0-to-10-cm depth interval surface sediment samples. SQS and CSL exceedances are based on OC-normalized concentrations if TOC is ≥ 0.5% and ≤ 4.0%. For samples with TOC < 0.5% or > 4.0%, the dry weight concentrations were compared to AETs to determine the exceedance status.

Grain size

- Gravel
- Sand
- Silt
- Clay

Because of the inherent imprecision in measuring each grain size category using multiple sieves, it is common for the calculated total of all size categories to range between 90% and 110% for any given sample.

Wind Ward environmental LLC

Figure I-1. Changes in total PCB and BEHP concentrations and grain size over time at four monitoring locations near the Norfolk CSO and BDC South storm drain

PCB-contaminated sediments offshore of the Boeing Developmental Center's south storm drain outfall (No. 2093) were removed and capped by Boeing in 2003 (Map I-38). Three locations on the cap offshore of the south storm drain were monitored for PCBs in surface sediment in 2004, 2005, and 2007 (Map I-38), including S01**,** the location that had the highest PCB concentration (46,000 µg/kg dw) after sediment removal but before cap placement. Table I-61 summarizes chemicals with detected concentrations that exceeded SMS criteria during monitoring.

Table I-61. Monitoring information for the BDC south storm drain cap placement area

SAMPLING EVENT	DATE	SAMPLING LOCATIONS	DETECTED CHEMICALS EXCEEDING SQS	DETECTED CHEMICALS EXCEEDING CSL
BDC monitoring	September 2004	S01, S02, S03	none	none
BDC monitoring	November 2005	S01, S02, S03	total PCBs	none
BDC monitoring	June 2007	S01, S02, S03	total PCBs	none

BDC – Boeing Developmental Center
CSL – cleanup screening level
PCB – polychlorinated biphenyl
SQS – sediment quality standards

PCBs were detected only at location S01 in 2004 and 2005, but at concentrations lower than those detected before the remedial action. In 2005, total PCB concentrations exceeded the SQS at location S01, but the field duplicate sample at this location did not contain a detectable concentration of PCBs at an RL of 32 µg/kg dw. In 2007, total PCB concentrations at S01 were lower than in 2005 although still marginally above the SQS (CALIBRE 2005, 2006, 2007, 2008).

Source control activities, including environmental investigations and source-tracing efforts, are ongoing within the Norfolk CSO/SD SCA. Additional information on the Norfolk CSO/SD SCA is provided on Ecology's website.

I.4.9 GLACIER BAY SOURCE CONTROL AREA (RM 1.2 W TO RM 1.5 W)

The Glacier Bay SCA is one of 23 areas identified by Ecology along the LDW for source control evaluation. Since the late 1980s, various soil, groundwater, source-tracing, and sediment investigations have been conducted within the Glacier Bay SCA. As part of the ongoing source control efforts for this SCA, a data gaps report (SAIC 2007d) and a SCAP (Ecology 2007e) were prepared in 2007. Information relevant to the Glacier Bay SCA was also available in the 2004 seep survey completed as part of the RI (Windward 2004) and in source-tracing information provided by the City of Seattle (Schmoyer 2008d). These documents are collectively referred to as the "source documents" throughout this section and on associated maps.

CSL exceedances in the surface sediment in this SCA included total PCBs, arsenic, copper, lead, mercury, and zinc. SQS exceedances included BBP, BEHP, acenaphthene, chrysene, fluoranthene, phenanthrene, benzo(g,h,i,)perylene, indeno(1,2,3,-cd)pyrene,

total HPAHs, and pentachlorophenol. Dioxins and furans were also detected in the SCA area at concentrations that were the highest reported for the LDW (Schmoyer 2008d). These exceedances are based on the RI baseline surface sediment dataset and the 2007 SCA boundary, as discussed in the introduction to this appendix. Ecology has identified COCs for this SCA based on different criteria (Table I-3); therefore, the chemicals identified for summary in this appendix are different than the COCs identified by Ecology. Surface sediment chemistry information for the Glacier Bay SCA is provided on Map I-39.

Commercial and industrial operations in the vicinity of the Glacier Bay SCA include cargo handling and storage (historical and current), vessel repair and maintenance (historical), concrete manufacturing (historical and current), lumber milling (historical), charcoal production (historical), glue and resin manufacturing (historical), and tin reclamation (historical) (SAIC 2007d).

Several adjacent and upland facilities were discussed in source documents associated with the Glacier Bay SCA. Adjacent facilities included Alaska Marine Lines, the former Duwamish Shipyard, Glacier Northwest, and the former MRI Corporation. Upland properties identified in the source documents included the Chemithon Corporation, several additional parcels owned by Alaska Marine Lines to the west of W Marginal Way SW, the vacant Wise Property, the DV Klier parcel, the Allen property, the Sayler property, and two parcels owned by the City of Seattle Parks Department. Table I-62 summarizes facility-specific information for the adjacent facilities associated with the Glacier Bay SCA. With the exception of the Chemithon Corporation property, no upland properties are discussed in this section because of the lack of source-tracing information (see the introduction for more information on facility selection criteria); these properties are also not labeled on Maps I-39 or I-40 because they were not adjacent to the shoreline and did not have available source-tracing data. The data gaps report and SCAP present additional information on all facilities associated with this SCA.

Table I-62. Summary of facility information for the Glacier Bay SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/ Investigations
Alaska Marine Lines (six parcels total)	Alaska Marine Lines (owned by Lynden)	container freight, barge terminal, and warehouse; fueling of onsite equipment; vehicle maintenance	graving dock operations, barge terminal	Several environmental investigations have been completed related to UST issues, test pitting in a former storage area, and general site characterization.	Several USTs and associated contaminated soil have been removed.	Groundwater sampling to assess historical contaminant sources is scheduled, inspections to follow up on previous concerns, NPDES permit compliance reviews, and graving dock remediation program verification.
Chemithon Corporation	Chemithon Corporation	design of surfactant plants; sales and service; new product and equipment testing	no information available	SPU completed site inspections at the property.	No remedial activities were reported.	Source-tracing sampling of storm drain system is completed. PCBs found in storm drain traced to old paint. Runoff from a large portion of this property was disconnected from the combined system in 2007 and now discharges to the LDW. Update to SWPPP underway; follow-up inspections scheduled.
Duwamish Shipyard	Duwamish Shipyard	equipment and container storage (tenant is Alaska Marine Lines)	shipyard operations, including repair and maintenance	Numerous environmental investigations have been completed involving general site characterization and assessment of spilled materials (sandblast grit; waste oil), illicit discharges (untreated wastewater), NPDES compliance (numerous discharge violations noted), and outfall effluent. An RI/FS will be conducted on the property under a MTCA order (Good 2009).	Four USTs and contaminated soil were removed in 2000. Ecology is negotiating an Agreed Order for this facility; a draft CAP will be included as part of the order, and additional remedial activities will be conducted (Good 2009).	Source control activities have included catch basin sampling and storm drain system cleaning. The Agreed Order will address further site characterization and source control requirements, if necessary.

Table I-62, cont. Summary of facility information for the Glacier Bay SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/ Investigations
Glacier Northwest	Glacier Northwest	cement production and terminal; construction and lumber yard operations; truck stop	lumber plant; charcoal filter and whetlerite production; production of adhesives, water-soluble glues, formaldehyde, wood-preserving resins, pentachlorophenol, hydrochloric acid, plastic polymers; cement terminal operations	Several environmental investigations have been completed including soil and groundwater sampling of the former impoundment area, truck washout area, and tank farm. Seep samples have also been analyzed. An RI/FS will be conducted on the property under a MTCA order (Good 2009).	Remedial activities have been conducted, but documents were not available for review. Ecology is negotiating an Agreed Order for this facility; a draft CAP will be included as part of the order (Good 2009).	Additional site investigation will be implemented. Source control inspections (including stormwater pathway) are underway.
MRI Corporation (former)	Port of Seattle (T-115)	building material distribution (Polar Supply Company under lease from the Port of Seattle)	tin reclamation	Several investigations have been completed to date, including an analysis of stockpiled black mud and general site characterization (including areas of two former unlined settling/evaporation lagoons). An RI/FS will be conducted on the property under a MTCA order (Good 2009).	No remedial activities were reported. Ecology is planning to negotiate an Agreed Order for this facility; a draft CAP will be included as part of the order (Good 2009).	Ongoing source-tracing inspections will be completed. Additional investigation into potential for groundwater/ stormwater transport to Glacier Bay will be investigated.

Sources: SAIC (2007d); Ecology(2007e)

[a] Facilities listed are those identified as adjacent properties in the data gaps report (SAIC 2007d) and the SCAP (Ecology 2007e). The Chemithon Corporation (identified as an upland property in the source documents) is also included because source-tracing data were reported in the source documentation.

CAP – cleanup action plan
FS – feasibility study
LDW – Lower Duwamish Waterway
MTCA – Model Toxics Control Act
NPDES – National Pollutant Discharge Elimination System
PAH – polycyclic aromatic hydrocarbons
PCB – polychlorinated biphenyls
RI – remedial investigation
SCA – source control area
SPU – Seattle Public Utilities
SWPPP – stormwater pollution prevention plan
T-115 – Terminal 115
UST – underground storage tank

Numerous active outfalls that discharge stormwater to the LDW have been identified along the shoreline of the Glacier Bay SCA (Herrera 2004). Most of the stormwater from adjacent properties associated with this SCA is collected in catch basins and runs through various private storm drain systems (many of which have operating oil/water separators) prior to discharging to the LDW. In addition to the privately owned storm drain systems, a city-owned storm drain line collects stormwater from approximately 164 ac of land along W Marginal Way SW, including portions of Terminal 115 (T-115), prior to discharge to the LDW, via a 48-in. pipe that traverses the border between the Glacier Northwest and T-115 properties (No. 2127) (SPU 2008). Some of the stormwater from adjacent facilities in the area also discharges into this city-owned stormwater line. In addition, King County's T-115 CSO also discharges through this 48-in. pipe during an overflow event. This city-owned outfall, with potential contributions from the T-115 CSO, is discussed as a major outfall in the source documents.

In addition to the major public outfall, seven privately owned outfalls were identified along the shoreline of this SCA during the 2003 outfall survey, including five at Alaska Marine Lines (Nos. 2132 to 2136), one at the former Duwamish Shipyard (No. 2129), and one at Glacier Northwest (No. 2130) (Herrera 2004). Information in the source documentation points to the existence of additional outfalls at the Alaska Marine Line and the former Duwamish Shipyard properties, which is inconsistent with the results of the outfall survey. Only information on those outfalls identified in the outfall survey is discussed in this section.

A Port of Seattle outfall (No. 2128) collects stormwater from the northern portion of T-115 and discharges into Glacier Bay. This outfall may also collect some of the stormwater from the area of the former MRI Corporation property. Information on the outfalls within the Glacier Bay SCA is included in Table I-63 and the locations of these outfalls are provided on Map I-39; additional outfall information is provided in Appendix H.

Table I-63. Summary of specific information for outfalls in the Glacier Bay SCA

Outfall	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
Outfalls Identified in the SCAP and Data Gaps Report as Major Outfalls[a]					
King County T-115 CSO/City of Seattle SW Kenny St SD (No. 2127)	King County/City of Seattle	Outfall (48-in.) drains approximately 164 ac along W Marginal Way SW with contributions from, Alaska Marine Lines, Glacier Northwest, and T-115. King County's T-115 CSO discharges through this 48-in pipe.	Outfall used to collect stormwater from public ROW and neighboring industrial facilities. Outfall was also the discharge point for the T-115 CSO.	ROW catch basin sampling within the SW Kenny St basin was conducted in 2006.	SPU collected samples from 4 ROW catch basins within SW Kenny Street SD basin in 2006. A sediment trap was installed in 2008. One inline grab and one trap sample have been collected at this location
Other Outfalls					
Alaska Marine Lines outfalls (Nos. 2132 to 2136)[b]	Alaska Marine Lines	Discharge is directed through sand filtration and O/W separator.	Outfall used to collect stormwater from industrial area and graving dock (graving dock previously owned by Duwamish Shipyard).	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.
Duwamish Shipyard private outfall (No. 2129)[c]	Duwamish Shipyard	Outfall collects stormwater from southern portion of property.	Outfall used to collect stormwater from industrial area along the southern portion of the property.	Catch basin samples and NPDES point of compliance samples were collected in 2006.	Additional NPDES compliance samples are scheduled for collection based on permit requirements.
Glacier Northwest private outfall (No. 2130)	Glacier Northwest	Outfall drains eastern portions of property that do not drain into W Marginal Way SW mainline.	Outfall used to collect stormwater from eastern portion of industrial property.	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.
Port of Seattle outfall (No. 2128)[d]	Port of Seattle	Outfall drains northern portion of T-115 with discharge into Glacier Bay via Glacier Northwest property.	Outfall used to collect stormwater from the northern portion of T-115 (with potential contributions from the former MRI Corporation site).	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.

Sources: SAIC (2007d); Ecology (2007e)

[a] Major outfalls listed are those discussed as individual source control entities in the source documents.

[b] Outfall Nos. 2133, 2135, and 2136 are associated with a graving dock previously owned and operated by Duwamish Shipyard. Outfalls are identified on Duwamish Shipyard's NPDES permit; the graving dock is now inactive.

Table I-63, cont. Summary of specific information for outfalls in the Glacier Bay SCA

[c] The outfall survey completed by Herrera (2004) identified one outfall associated with this property; Duwamish Shipyard NPDES documentation included in the source documentation notes that there are four active outfalls at the Duwamish Shipyard (in addition to those originally associated with the former graving dock), which is inconsistent with the information developed from the outfall survey. Only information on the one outfall identified during the 2004 survey is discussed in this table.

[d] T-115 is not identified as an adjacent property in the source documents; however, because this outfall discharges into Glacier Bay, it is included in this table.

CSO – combined sewer overflow
NPDES – National Pollutant Discharge Elimination System
O/W – oil/water
ROW – right-of-way
SAIC – Science Applications International Corporation
SCAP – source control action plan
SD – storm drain
T-115 – Terminal 115

Several remedial activities and environmental investigations have been completed or are currently in progress within the Glacier Bay SCA (Tables I-62 and I-63). Information about these activities has been summarized in the source documents and is provided on Map I-40. Several of the chemicals that have been detected above the SQS in Glacier Bay SCA surface sediment have also been detected in various upland media, including soil, groundwater, seep, and source-tracing samples (Table I-64). The availability of data (by media type) is also presented in the table on Map I-40 for each of the facilities in Table I-62 and the major outfall associated with this SCA. An X on Table I-64 and the table on Map I-40 indicates that the source documents reported data or indicated that data exist; therefore, an X does not necessarily mean that the actual data were presented in the source document. Data are only summarized in media-specific and source-tracing tables if the data were reported in the source documents and if they met the criteria for data summation discussed in the introduction to this appendix (e.g., soil data were collected along the SCA shoreline; groundwater data were collected from shoreline facilities). The identification of a chemical in these media at facilities or within the drainage systems of the Glacier Bay SCA does not necessarily indicate that these potential sources contributed to sediment contamination in the past or that they will result in sediment contamination in the future.

Table I-64. Chemicals identified in various media in the Glacier Bay SCA

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater	Source-Tracing Samples	Sources
Arsenic	X	X	X			X	SAIC (2007d), Windward (2004), Schmoyer (2008d)
Copper			X		X	X	SAIC (2007d), Windward (2004), Schmoyer (2008a)
Lead	X	X	X			X	SAIC (2007d), Windward (2004), Schmoyer (2008a)
Mercury	X	X	X			X	SAIC (2007d), Windward (2004), Schmoyer (2008d)
Zinc	X	X	X		X	X	SAIC (2007d), Windward (2004), Schmoyer (2008d)
Acenaphthene	X					X	SAIC (2007d), Schmoyer (2008d)
Chrysene	X					X	SAIC (2007d), Schmoyer (2008d)
Benzo(g,h,i)pyrene	X					X	SAIC (2007d), Schmoyer (2008d)
Fluoranthene						X	SAIC (2007d), Schmoyer (2008d)
Indeno (1,2,3-cd)pyrene	X					X	SAIC (2007d), Schmoyer (2008a)
Phenanthrene	X					X	SAIC (2007d), Schmoyer (2008d)
Total HPAHs						X	Schmoyer (2008d)
BBP						X	SAIC (2007d), Schmoyer (2008d)
BEHP						X	SAIC (2007d), Schmoyer (2008d)
PCP		X					SAIC (2007d)

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater	Source-Tracing Samples	Sources
Total PCBs	X					X	SAIC (2007d), Schmoyer (2008d)
Dioxins and furans[c]	X						SAIC (2007d)

Note: An X indicates that the source documents reported that data are available for the identified media. The absence of an X in any cell in this table does not necessarily mean that the chemical is absent in the upland media or in source-tracing samples; in many cases, that chemical may not have been analyzed or, if analyzed, could have been present but at concentrations below the RL.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Glacier Bay SCA. The chemical list is based on SMS exceedances in the RI baseline surface sediment dataset within the 2007 SCA boundary. Therefore, this list may differ from the list of exceedances in source documents.

[b] No porewater data were identified in the source documents for any chemical.

[c] SMS do not exist for dioxins and furans. They were included in this table because they are a risk driver chemical with highly elevated concentrations (i.e., TEQ > 100 ng/kg dw) in surface sediment in this area.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
HPAH – high-molecular-weight polycyclic aromatic hydrocarbons
PCB – polychlorinated biphenyl
PCP – pentachlorophenol
RL – reporting limit
SCA – source control area
SQS – sediment quality standard
TEQ – toxic equivalent

The following is a summary of the upland data as they were presented in the source documents for groundwater, seep, and source-tracing samples. No actual bank soil, porewater, or stormwater data were provided in the source documents for this area.

If sufficient data for this SCA were available in the Glacier Bay source documents, ranges of detected concentrations, median concentrations, and sample counts (n) are provided accordingly. In some instances, the source documents acknowledged the existence of certain data but did not provide actual concentrations. Data were included in these tables only if specific concentrations or a range of concentrations were included in the source documents.

Groundwater data collected in close proximity to the LDW (from shoreline properties Duwamish Shipyard and Glacier Northwest) are summarized in Table I-65 based on data presented in the data gaps report (2007d). Groundwater sampling was completed at Glacier Northwest in 1990 and at Duwamish Shipyard in 2006. In addition to groundwater information for those chemicals detected above the SQS in surface sediment in this SCA, Table I-65 also includes groundwater VOC data provided in the source documents. Seep sampling was conducted along the shoreline of Glacier Bay in 1995 and in 2004 as part of the RI (Windward 2004). Seep samples with detected concentrations of chemicals that exceeded the SQS in the Glacier Bay SCA surface sediment are presented in Table I-66.

Table I-65. Summary of chemical concentrations detected in groundwater samples from the Glacier Bay SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Chemicals with Detections Above the SQS in Surface Sediment						
Duwamish Shipyard	arsenic	2006	6.7 – 84.4 median = 11.2 n = 9/12	multiple groundwater wells throughout the facility	Anchor (2006), as cited in SAIC (2007d)	Source documents did not indicate whether these samples were total or dissolved.
Duwamish Shipyard	lead	2006	27 – 55 n = 2/2	multiple groundwater wells throughout the facility	Anchor (2006), as cited in SAIC (2007d)	Source documents did not indicate whether these samples were total or dissolved.
Glacier Northwest	arsenic	1990	150 – 330 n = 2/3	three wells on facility	Parametrix (1990), as cited in SAIC (2007d)	Source documents did not indicate whether these samples were total or dissolved.
Glacier Northwest	PCP	1990	2,800 – 3,000 n = 2/4	two wells; two sampling events	Parametrix (1990), as cited in SAIC (2007d)	Two wells were sampled for pentachlorophenol subsequent to the initial groundwater event. The range represents the range of detected values from same well over two sampling events.
VOCs[f]						
Alaska Marine Lines	benzene	1990	330 n= 1/1	collected within UST excavation	Dames and Moore (1991), as cited in SAIC (2007d)	Water sample collected from base of excavation after UST removal.
Duwamish Shipyard	benzene	2006	180 – 210 n = 2/12	multiple groundwater wells throughout the facility	Anchor (2006), as cited in SAIC (2007d)	
Duwamish Shipyard	vinyl chloride	2006	0.3 – 0.6 median = 0.4 n = 3/12	multiple groundwater wells throughout the facility	Anchor (2006), as cited in SAIC (2007d)	

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Glacier Bay SCA.

[b] Total PCBs, copper, mercury, zinc, BBP, BEHP, acenaphthene, benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, total HPAH, and dioxins/furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

[f] VOC data were summarized, as available, at EPA's request and not because of SQS exceedances in surface sediment in the SCA.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
PCP – pentachlorophenol
SAIC – Science Applications International Corporation
SCA – source control area
SQS – sediment quality standard
UST – underground storage tank

Table I-66. Summary of chemical concentrations detected in seep samples from the Glacier Bay SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources[e]	Additional Information
Glacier Northwest	arsenic	1995	82 – 85[f] n = 2/2	two seep locations	Hart Crowser (1996), as cited in SAIC (2007d)	Exact locations of seep sample collection not provided in source documents.
Glacier Northwest	arsenic	2004	67.2 (total) n = 1/1	sample collected from western shoreline of Glacier Bay	Windward (2004)	Seep sample was collected as part of LDW RI.
Glacier Northwest	arsenic	2004	72.4 (dissolved) n = 1/1	sample collected from western shoreline of Glacier Bay	Windward (2004)	Seep sample was collected as part of LDW RI.
Glacier Northwest	arsenic	2004	6.84 (dissolved) n = 1/1	sample collected from northwest shoreline of Glacier Bay	Windward (2004)	Seep sample was collected as part of LDW RI; total sample not analyzed.
Glacier Northwest	lead	2004	0.240 (total) n = 1/1	sample collected from western shoreline of Glacier Bay	Windward (2004)	Seep sample was collected as part of LDW RI.
Glacier Northwest	lead	2004	0.088 (dissolved) n = 1/1	sample collected from western shoreline of Glacier Bay	Windward (2004)	Seep sample was collected as part of LDW RI.
Glacier Northwest	lead	2004	0.1 (dissolved) n = 1/1	sample collected from northwest shoreline of Glacier Bay	Windward (2004)	Seep sample was collected as part of LDW RI; total sample not analyzed.
Glacier Northwest	mercury	2004	0.00216 (total) n = 1/1	sample collected from western shoreline of Glacier Bay	Windward (2004)	Seep sample was collected as part of LDW RI.
Glacier Northwest	mercury	2004	0.00099 (dissolved) n = 1/1	sample collected from western shoreline of Glacier Bay	Windward (2004)	Seep sample was collected as part of LDW RI.
Glacier Northwest	mercury	2004	0.00256 (dissolved) n = 1/1	sample collected from northwest shoreline of Glacier Bay	Windward (2004)	Seep sample was collected as part of LDW RI; total sample not analyzed.
Glacier Northwest	zinc	2004	3.49 (total) n = 1/1	sample collected from western shoreline of Glacier Bay	Windward (2004)	Seep sample was collected as part of LDW RI.
Glacier Northwest	zinc	2004	3.29 (dissolved) n = 1/1	sample collected from western shoreline of Glacier Bay	Windward (2004)	Seep sample was collected as part of LDW RI.

Table I-66, cont. Summary of chemical concentrations detected in seep samples from the Glacier Bay SCA

FACILITY	CHEMICAL[a, b]	YEAR COLLECTED	CONCENTRATION INFORMATION (µg/L)[c, d]	LOCATION	SOURCES[e]	ADDITIONAL INFORMATION
Glacier Northwest	zinc	2004	12.2 (dissolved) n = 1/1	sample collected from northwest shoreline of Glacier Bay	Windward (2004)	Seep sample was collected as part of LDW RI; total sample was not analyzed.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Glacier Bay SCA.

[b] Copper, BBP, BEHP, acenaphthene, benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, PCP, total HPAH, and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples. Concentration ranges were calculated using only detected data. For this reason, some estimated ranges may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

[f] It was not reported if the sample was filtered.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LDW – Lower Duwamish Waterway
PCP – pentachlorophenol
RI – remedial investigation
SAIC – Science Applications International Corporation
SCA – source control area
SQS – sediment quality standard

Source-tracing samples have been collected from the Duwamish Shipyard and Chemithon Corporation facilities and from the storm drain systems associated with the Glacier Bay SCA (see table on Map I-40), and data from these samples are available in the source documents. Table I-67 presents source-tracing data collected within the Glacier Bay SCA since 2004 in order to represent relatively current conditions; 2004 was selected because most of the data have been collected since 2004. Data collected prior to 2004 were included in Table I-67 only if newer data from the same sampling locations were not available. Source-tracing samples include onsite catch basin solids samples and right-of-way (ROW) catch basin solids samples. Information on the drainage basin area in which the ROW samples were collected and the basin's point of discharge is presented on Map I-41. Additional details on source-tracing sampling programs conducted within the Glacier Bay SCA are presented in Section 9.4.4.7. SPU has inspected several businesses within this area as part of ongoing source control efforts. The business inspection program is discussed in Section 9.4.4.5.

Table I-67. Summary of chemical concentrations detected in source-tracing samples from the Glacier Bay SCA

Sample Source	Year Collected	Concentration Information (mg/kg dw)[a, b, c, d]					Concentration Information (µg/kg dw unless noted)[a, b, c, d]		Sources[e]	Additional Information
		Arsenic	Copper	Lead	Mercury	Zinc	Acenaphthene	Benzo(g,h,i)perylene		
Catch Basin Solids Samples										
Duwamish Shipyard	2006	nr	2,450	nr	1.05	2,600	22.6 mg/kg OC	nr	Anchor (2006), as cited in SAIC (2007d)	
Chemithon Catch Basins	2006-2007	7 – 150 median = 30 n = 8/9	139 – 1,820 median = 734 n = 9/9	47 – 1,760 median = 185 n = 9/9	0.07 – 9.4 median = 0.31 n = 9/9	314 – 3,290 median = 1,380 n = 9/9	58 – 530 median = 200 n = 5/9	100 – 2,100 median = 380 n = 9/9	Schmoyer (2008d)	
ROW Catch Basin Solids Samples										
SW Kenny Street SD	2006	7 – 20 median = 11 n = 4/4	36 – 183 median = 77 n = 4/4	11 – 402 median = 31 n = 4/4	0.09 n = 1/4	78 – 635 median = 315 n = 4/4	nr	160 – 3,500 n = 2/4	Schmoyer (2008d)	Samples were collected along W Marginal Way SW ROW. SPU installed a sediment trap in Kenny SD in 2008 under a grant with Ecology. Trap sample was retrieved in 2009.

Sample Source	Year Collected	Concentration Information (µg/kg dw unless noted)[a, b, c, d]								Sources[e]	Additional Information
		Chrysene	Fluoranthene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Total HPAH	BEHP	BBP	Total PCBs		
Catch Basin Solids Samples											
Duwamish Shipyard	2006	nr	nr	nr	nr	nr	488 mg/kg OC	14.3 mg/kg OC	na	Anchor(2006), as cited in SAIC(2007d)	
Chemithon Catch Basins	2006-2007	240 – 7,000 median = 1,400 n = 9/9	560 – 16,000 median = 2,600 n = 9/9	92 – 2,200 median = 410 n = 9/9	150 – 7,000 median = 1,500 n = 9/9	nr	1,100 – 65,000 median = 5,050 n = 8/9	220 – 5,200 median = 1,000 n = 8/9	440 – 7,000 median = 1,450 n = 8/9	Schmoyer (2008d)	
ROW Catch Basin Samples											
SW Kenny Street SD	2006	220 – 4,900 median = 270 n = 3/4	180 – 5,700 median = 460 n = 3/4	130 – 3,300 n = 2/4	69 – 2,500 median = 400 n = 3/4	600 – 36,520 median = 2,052 n = 3/4	190 – 3,800 median = 1,000 n = 4/4	60 – 1,100 median = 325 n = 3/4	10 – 58 median = 27 n = 2/4	Schmoyer (2008d)	Samples were collected along W Marginal Way SW ROW. SPU installed a sediment trap in Kenny SD in 2008 under a grant with Ecology. Trap sample was retrieved in 2009.

Note: Data are not included for drainage structures that have been removed subsequent to sampling. If multiple rounds of data were available for a single location, only the data collected during the most recent event were presented in order to represent the most current conditions possible.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Glacier Bay SCA.

[b] PCP and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (e.g., from µg/kg to mg/kg), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
dw – dry weight
HPAH – high-molecular weight polycyclic aromatic hydrocarbons
nr – not reported
OC – organic carbon
PCB – polychlorinated biphenyl
PCP –pentachlorophenol
ROW – right of way
SAIC – Science Applications International Corporation
SCA – source control area
SQS – sediment quality standard

Source control activities in the LDW are ongoing. Additional characterization and remedial action efforts at facilities associated with the Glacier Bay SCA are scheduled for the future. Additional information on the Glacier Bay SCA is provided on Ecology's website.

I.4.10 TROTSKY INLET SOURCE CONTROL AREA (RM 2.2 W TO RM 2.3 W, EAA 2)

The Trotsky Inlet SCA is one of 23 areas identified by Ecology along the LDW for source evaluation. The Trotsky Inlet was also one of the seven candidate EAAs recommended to EPA and Ecology for early cleanup based on sediment chemistry data (Windward 2003c). As part of ongoing source control efforts at this SCA, a data gaps report was completed in February 2007 (SAIC 2007c) and was used as a basis for the development of a SCAP, which was finalized in June 2007 (Ecology 2007b). In addition, a site characterization activities data report was completed in July of 2007 (SAIC 2007b). Source-tracing data provided by the City of Seattle was also reviewed (Schmoyer 2008d). These three documents and an LDW seep survey conducted for the RI (Windward 2004) are collectively referred to as the "source documents" in this section.

CSL exceedances in surface sediment in this SCA included lead, mercury, total PCBs, and BEHP. SQS exceedances were reported for lead, mercury, zinc, total PCBs, BEHP, and BBP. These exceedances are based on the RI baseline surface sediment dataset and the 2007 SCA boundary, as discussed in the introduction to this appendix. Ecology has identified COCs for this SCA based on different criteria (Table I-3); therefore, the chemicals identified for summary in this appendix are different than the COCs identified by Ecology. This list of chemicals is also different from the COCs identified in the site characterization activities data report (SAIC 2007b) because the data included in that report were not in the RI baseline surface sediment dataset. Surface sediment chemistry information for the Trotsky Inlet SCA is provided on Map I-42. Dioxin and furan data were detected above a TEQ of 100 ng/kg dw in a surface sediment sample within the SCA. No dioxin and furan data were available for upland facilities in the source documents.

Commercial and industrial operations in the vicinity of this SCA include steel drum reconditioning (historical and current), storage (current), terminal operations (current), tractor maintenance (current), shipping container transportation (current), ship dismantling (historical), wrecking and salvaging (historical), wooden vessel construction (historical), sand and gravel batch plant operations (historical), parking (historical), and gravel transport (historical) (Ecology 2007b).

Ecology (2007b) has identified Douglas Management Company (operated as Alaska Marine Lines), Industrial Container Services (Trotsky/former Northwest Cooperage property, hereafter referred to as Trotsky), and the Boyer Towing, Inc., properties, which include three parcels, as adjacent facilities associated with this SCA (Map I-43). Boyer Towing, Inc. owns 13 parcels in the vicinity of the Trotsky Inlet SCA, but only 3

were discussed in this section because these parcels are adjacent to the SCA. Facility-specific information for adjacent properties is summarized in Table I-68. The data gaps reports also identified 26 associated upland properties. Information for Wells Trucking and leasing (an upland property) are also summarized in Table I-68 because source-tracing data were reported in the source documents (see the introduction for more information on facility selection criteria). The data gaps report and SCAP should be reviewed for additional information on these facilities.

Table I-68. Summary of facility information for the Trotsky Inlet SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/Investigations
Boyer Towing (three parcels)[b]	Boyer Towing	storage, terminal operations	No historical operations were reported.	No environmental investigations were reported.	No remedial activities were reported.	Source-tracing samples (sediment collected from an oil/water separator) were collected by SPU in 2003.
Douglas Management Company	Douglas Management Company	storage for Alaska Marine Lines, automobile loading	ship dismantling, wrecking and salvaging, large wooden vessel construction, sand and gravel batch plant, bus parking, gravel transport	A LUST investigation was conducted for an Alaska Marine Lines property, which may have been located on the Douglas Management Company property.	A cleanup of a LUST was completed prior to 1999.	Additional site characterization will be conducted.
Trotsky	Herman and Jacqueline Trotsky	steel drum reconditioning facility (cleaning, storage, and repainting)	drum refurbishing	A three-phase soil and groundwater assessment was conducted in 1986. Additional groundwater sampling and a site hazard assessment were conducted in 1991. A site characterization study was conducted in 2007. Site inspections have also been conducted. A report for additional site characterization activities is in review by Ecology in association with Agreed Order negotiations under MTCA (Good 2009). An RI/FS will also be conducted according to the Agreed Order.	No remedial activities were reported. Ecology is negotiating an Agreed Order for the property under MTCA (Good 2009). A draft CAP for the property will be included in the Agreed Order.	A pretreatment facility was installed around 1970, and all runoff from process areas was directed to the combined sewer system (Schmoyer 2008e). In 1973, the site was bermed with concrete in response to a spill. Additional source control investigations and activities will be conducted under an Agreed Order with Ecology (Good 2009).
Wells Trucking and Leasing	Boyer Towing	tractor storage and maintenance, shipping container transport	No historical operations were reported.	SPU inspected the facility in 2002.	No remedial activities were reported.	Catch basins were cleaned in 2002. Samples were collected from catch basins in 2003.

Sources: SAIC (2007b, c), Ecology (2007b)

[a] Facilities listed are those identified as adjacent properties in the data gaps report (SAIC 2007c). Wells Trucking and Leasing (identified as an upland property in the source documents) is also included because source-tracing data were included in the source documentation.

[b] Only 3 of the 13 Boyer Towing, Inc., parcels were included in this table because these parcels are the only parcels that are adjacent to the SCA.

CAP – cleanup action plan
Ecology – Washington State Department of Ecology
FS – feasibility study
LUST – leaking underground storage tank
MTCA – Model Toxics Control Act
O/W – oil/water
RI – remedial investigation
SAIC – Science Applications International Corporation
SCA – source control area
SD – storm drain
SPU – Seattle Public Utilities

Three outfalls have been identified in the Trotsky Inlet SCA. One of the outfalls (No. 2117), located on the south side of Trotsky Inlet near the mouth, is a private permitted storm drain outfall owned by Boyer Logistics. Outfall No. 2120, located at the head of Trotsky Inlet, is the overflow from the City of Seattle's West Seattle drinking water reservoir. Outfall No. 2118 is located on the south side near the Trotsky/former Northwest Cooperage property and was identified as a major outfall in the SCAP (Ecology 2007b) and data gaps report (SAIC 2007c). Ownership of this outfall is uncertain. City records indicate that SPU obtained an easement in 2000 to install a tide gate on this system (Ticeson 2007). Additional information on these outfalls is available in Appendix H. Information on the outfalls within the Trotsky Inlet SCA is included in Table I-69; the locations of these outfalls are provided on Map I-42. The drainage basin associated with the Trotsky Inlet SCA (the 2nd Avenue S drainage basin) is shown on Map I-44, and stormwater drainage features are shown on Map I-45.

Table I-69. Summary of specific information for outfalls in the Trotsky Inlet SCA

Outfall	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
Outfalls Identified in the SCAP and Data Gaps Report as Major Outfalls[a]					
2nd Avenue S SD outfall (No. 2118)	SPU	The 2nd Avenue S sub-basin collects drainage between SR 99 and the LDW from S Austin Street to the Trotsky Inlet SCA (approximately 36 ac). The outfall is served by open ditches and culverts that run along 2nd Avenue S.	The outfall discharged stormwater from streets and adjacent properties within the 36-ac basin.	In-line sediment samples were collected from drainage ditches in 2005.	SPU conducted additional source-tracing in this basin in 2009 (Schmoyer 2008e) under a grant with Ecology.
Other Outfalls					
Boyer Logistics outfall (No. 2117)	Boyer Logistics	No current operations were reported.	No historical operations were reported.	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.
Reservoir outfall (No. 2120)	SPU	The outfall drains overflow from a City of Seattle reservoir and tower in West Seattle and is not a stormwater outfall.	The outfall drained overflow from a City of Seattle reservoir and tower in West Seattle.	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.

Sources: SAIC (2007c), Ecology (2007b)

[a] Major outfalls listed are those identified as such in the SCAP (Ecology 2007b) and data gaps report (SAIC 2007c).

LDW – Lower Duwamish Waterway
SAIC – Science Applications International Corporation
SCA – source control area
SCAP – source control action plan
SD – storm drain
SPU – Seattle Public Utilities
SR – state route

Several environmental investigations have been completed within the Trotsky Inlet SCA and the adjacent properties (Tables I-68 and I-69). Several of the chemicals that have been detected at concentrations above the SQS in Trotsky Inlet surface sediment have also been detected in various upland media, including soil, groundwater, seeps, stormwater, and source-tracing solids samples (Table I-70). The availability of data (by media type) is also presented in the table on Map I-43 for each facility associated with this SCA. An X in Table I-70 and the table on Map I-43 indicates that the source documents reported data or indicated that data exist; therefore, an X does not necessarily mean that the actual data were presented in the source document. Data are only summarized in media-specific and source-tracing tables if the data were reported in the source documents and if they met the criteria for data summation discussed in the introduction to this appendix (e.g., soil data were collected along the SCA shoreline; groundwater data were collected from shoreline facilities). The identification of a chemical in these media at adjacent facilities or within the drainage systems of the Trotsky Inlet SCA does not necessarily indicate that these potential sources contributed to sediment contamination in the past or that they will result in sediment contamination in the future.

Table I-70. Chemicals identified in various media in the Trotsky Inlet SCA

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater	Source-Tracing Samples	Sources
Lead	X	X	X		X	X	Ecology (2007b), SAIC (2007b), Windward (2004)
Mercury	X	X	X			X	Ecology (2007b), SAIC (2007b), Windward (2004)
Zinc	X	X	X		X	X	SAIC (2007c), Windward (2004)
BEHP	X	X				X	SAIC (2007b, c)
BBP	X				X	X	SAIC (2007b, c)
Total PCBs	X	X	X			X	Ecology (2007b), SAIC (2007b), Windward (2004)
Dioxins and furans[c, d]							

Note: An X indicates that the source documents reported that data are available for the identified media. The absence of an X in any cell does not necessarily imply that the chemical is absent in the upland media or in source-tracing samples; in some cases, the chemical may not have been analyzed for or, if analyzed, could have been present but at concentrations below the RL.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Trotsky Inlet SCA. The chemical list is based on SMS exceedances in the RI baseline surface sediment dataset within the 2007 SCA boundary. Therefore, this list may differ from the list of exceedances in source documents.

[b] No porewater data were identified in the source documents for any chemical.

[c] No dioxin/furan data were identified in the source documents for soil, groundwater, seep, porewater, storm water, or source-tracing samples.

[d] SMS criteria do not exist for dioxins and furans. They were included in this table because they are a risk driver chemical with highly elevated concentrations (i.e., TEQ> 100 ng/kg dw) in one surface sample in this area.

BBP – butyl benzyl phthalate SAIC – Science Applications International Corporation

BEHP – bis(2-ethylhexyl) phthalate
Ecology – Washington State Department of Ecology
PCB – polychlorinated biphenyl
RI – remedial investigation
SCA – source control area
SMS – Washington State Sediment Management Standards
SQS – sediment quality standard

Upland data for soil, groundwater, seep, stormwater, and source-tracing samples have been summarized in the source documents; this section summarizes the data presented in the source documents. Seep data collected as part of the LDW RI (Windward 2004) are also presented. No porewater data were reported.

Table I-71 summarizes bank soil data from soil borings collected along the southern side of the inlet. Table I-72 summarizes the groundwater data presented in the source documents for the Trotsky Inlet SCA. If multiple years of data were collected from the same sampling location, only the most recent data are included in Table I-72. In addition to groundwater data for chemicals detected above the SQS in surface sediment, VOC data presented in the source documents were also summarized in Table I-72. Table I-73 includes the seep data presented in the source documents and data collected as part of the LDW RI (Windward 2004). Map I-42 shows the locations of the seeps sampled in the Trotsky Inlet SCA. Stormwater data were reported in the source documents for the 2nd Avenue S SD, located near the Trotsky property (Table I-74 and Map I-43).

Table I-71. Summary of chemical concentrations detected in bank soil in the Trotsky Inlet SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/kg dw, unless noted)[c, d]	Sampling Location	Sources	Additional Information
Trotsky	lead	2007	1,820 – 836,000 n=6/6	along the South side of the inlet	(SAIC 2007b)	Sample depths ranged from 5 to 15 ft below ground surface.
Trotsky	mercury	2007	19 – 2,010 n=6/6	along the South side of the inlet	(SAIC 2007b)	Sample depths ranged from 5 to 15 ft below ground surface.
Trotsky	zinc	2007	18,100 – 220,000 n=6/6	along the South side of the inlet	(SAIC 2007b)	Sample depths ranged from 5 to 15 ft below ground surface.
Trotsky	BEHP	2007	5.1 – 2,700 n=6/6	along the South side of the inlet	(SAIC 2007b)	Sample depths ranged from 5 to 15 ft below ground surface.
Trotsky	total PCBs	2007	211 – 76,500 n=5/6	along the South side of the inlet	(SAIC 2007b)	Sample depths ranged from 5 to 15 ft below ground surface.

Note: If duplicate samples were presented in data tables in the source documents, an average was calculated and included in the range, median, and sample count.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Trotsky Inlet SCA.

[b] BBP and dioxins and furans were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from µg/kg to mg/kg), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges were calculated using only detected data. For this reason, some estimated ranges may be higher than actual concentrations.

BEHP – bis(2-ethylhexyl) phthalate

PCB – polychlorinated biphenyl

SAIC – Science Applications International Corporation

SCA – source control area

SQS – sediment quality standard

Table I-72. Summary of chemical concentrations detected in groundwater samples collected from the Trotsky Inlet SCA

FACILITY	CHEMICAL[a]	YEAR COLLECTED	LOCATION	CONCENTRATION INFORMATION (µg/L)[b, c]	SOURCES[d]	ADDITIONAL INFORMATION
Chemicals Detected Above SQS in Surface Sediment						
Trotsky	lead	2007	monitoring wells on the property	0.065 – 70.7 (total) median = 26.2 n = 5/5	SAIC (2007b)	
Trotsky	lead	2007	monitoring wells on the property	0.038 – 22.3 (dissolved) median = 0.95 n = 5/5	SAIC (2007b)	
Trotsky	lead	1986 – 1987	monitoring well near the west end of Orchard Street	27 (dissolved) n = 1/1	Hart Crowser (1986), as cited in SAIC (2007c)	
Trotsky	mercury	2007	monitoring wells on the property	0.03 – 0.38 (total) median = 0.12 n = 5/5	SAIC (2007b)	
Trotsky	mercury	2007	monitoring wells on the property	0.03 – 0.09 (dissolved) median = 0.03 n = 4/5	SAIC (2007b)	
Trotsky	zinc	2007	monitoring wells on the property	1.68 – 94.6 (total) median = 34.4 n = 5/5	SAIC (2007b)	
Trotsky	zinc	2007	monitoring wells on the property	0.45 – 17.38 (dissolved) median = 7.580 n = 5/5	SAIC (2007b)	
Trotsky	zinc	1991	monitoring well near the west end of Orchard Street	29 (dissolved) n = 1/1	Hart Crowser (1986), as cited in SAIC (2007c)	
Trotsky	zinc	1986	two monitoring wells on the property	10, 110 (dissolved) n = 2/2	Hart Crowser (1986), as cited in SAIC (2007c)	Sample with the lower concentration was collected from a well identified as a background well.
Trotsky	BEHP	2007	monitoring wells on the property	0.840[e] n = 1/5	SAIC (2007b)	
Trotsky	BBP	2007	monitoring wells on the property	0.079[e] n = 1/5	SAIC (2007c)	

Table I-72, cont. Summary of chemical concentrations detected in groundwater samples from the Trotsky Inlet SCA

FACILITY	CHEMICAL[a]	YEAR COLLECTED	LOCATION	CONCENTRATION INFORMATION (µg/L)[b, c]	SOURCES[d]	ADDITIONAL INFORMATION
Trotsky	total PCBs	2007	monitoring wells on the property	0.18 – 3.79[e] median = 1.78 n = 4/5	SAIC (2007b)	
VOCs[f]						
Trotsky	benzene	1991	near the west end of Orchard Street	13 n = 1/1	Cabuco (1991), as cited in SAIC (2007c)	
Trotsky	benzene	1991	near the west end of Orchard Street	17 n = 1/1	Ecology (2007b)	
Trotsky	methylene chloride	1986	near the west end of Orchard Street	8,11 n = 2/2	SAIC (2006a), as cited in SAIC (2007c)	
Trotsky	trans-1,2-dichloroethylene	1986	near the west end of Orchard Street	190 n = 1/1	SAIC (2006a), as cited in SAIC (2007c)	
Trotsky	vinyl chloride	1991	near the west end of Orchard Street	25 n = 1/1	Cabuco (1991), as cited in SAIC (2007c)	
Trotsky	vinyl chloride	1991	near the west end of Orchard Street	310 n = 1/1	Ecology (2007b)	

Note: If duplicate samples were presented in data tables in the source documents, an average was calculated and included in the range, median, and sample count.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Trotsky Inlet SCA.

[b] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[c] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[d] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

[e] The site characterization activities data report (SAIC 2007b) did not specify whether the sample was filtered or unfiltered.

[f] VOC data were summarized, as available, at EPA's request and not because of SQS exceedances in surface sediment in the SCA. All detected VOC concentrations reported in the source documents were included.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
PCB – polychlorinated biphenyl
SAIC – Science Applications International Corporation
SCA – source control area
SQS – sediment quality standard
VOC – volatile organic compound

Table I-73. Summary of chemical concentrations detected in seep samples from the Trotsky Inlet SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Sources	Additional Information
Douglas Management Company	lead	2004	296 (total) n = 1/1	south side of inlet	Windward (2004)	Seep was identified as being adjacent to the former Swan Bay Holdings.
Douglas Management Company	lead	2004	0.703 (dissolved) n = 1/1	south side of inlet	Windward (2004)	Seep was identified as being adjacent to the former Swan Bay Holdings.
Douglas Management Company	mercury	2004	0.582 (total) n = 1/1	south side of inlet	Windward (2004)	Seep was identified as being adjacent to the former Swan Bay Holdings.
Douglas Management Company	mercury	2004	0.0132 (dissolved) n = 1/1	south side of inlet	Windward (2004)	Seep was identified as being adjacent to the former Swan Bay Holdings.
Douglas Management Company	zinc	2004	322 (total) n = 1/1	south side of inlet	Windward (2004)	Seep was identified as being adjacent to the former Swan Bay Holdings.
Douglas Management Company	zinc	2004	5.45 (dissolved) n = 1/1	south side of inlet	Windward (2004)	Seep was identified as being adjacent to the former Swan Bay Holdings.
Douglas Management Company	total PCBs	2004	8.9 (total) n = 1/1	south side of inlet	Windward (2004)	Seep was identified as being adjacent to the former Swan Bay Holdings.
Douglas Management Company	total PCBs	2004	0.26 (dissolved) n = 1/1	south side of inlet	Windward (2004)	Seep was identified as being adjacent to the former Swan Bay Holdings.
Trotsky	lead	2007	0.842, 11.8 (total) n = 2/2	south side of inlet	SAIC (2007b)	
Trotsky	lead	2007	0.163, 0.28 (dissolved) n = 2/2	south side of inlet	SAIC (2007b)	
Trotsky	mercury	2007	0.04 (total) n = 1/2	south side of inlet	SAIC (2007b)	
Trotsky	zinc	2007	27, 32.3 (total) n = 2	south side of inlet	SAIC (2007b)	
Trotsky	zinc	2007	6.3, 23.2 (dissolved) n = 2/2	south side of inlet	SAIC (2007b)	
Trotsky	total PCBs	2007	0.0254, 0.5[e] n = 2/2	south side of inlet	SAIC (2007b)	

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Trotsky Inlet SCA.

Table I-73, cont. Summary of chemical concentrations detected in seep samples from the Trotsky Inlet SCA

[b] BEHP and BBP were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges were calculated using only detected data. For this reason, some estimated ranges may be higher than actual concentrations.

[e] The site characterization activities data report (SAIC 2007b) did not specify whether the sample was filtered or unfiltered.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
PCB – polychlorinated biphenyl
SAIC – Science Applications International Corporation
SCA – source control area
SQS – sediment quality standard

Table I-74. Summary of chemical concentrations detected in stormwater in the Trotsky Inlet SCA

Facility	Chemical[a]	Year Collected	Concentration Information (µg/L)[b, c, d]	Location	Sources	Additional Information
2nd Avenue S SD (2118)	lead	2007	0.249 (dissolved) n = 1/1	near Trotsky property on south side of inlet	SAIC (2007b)	Sample was identified as outfall water.
2nd Avenue S SD (2118)	lead	2007	2.06 (total) n = 1/1	near Trotsky property on south side of inlet	SAIC (2007b)	Sample was identified as outfall water.
2nd Avenue S SD (2118)	zinc	2007	70.5 (dissolved) n = 1/1	near Trotsky property on south side of inlet	SAIC (2007b)	Sample was identified as outfall water.
2nd Avenue S SD (2118)	zinc	2007	57.8 (total) n = 1/1	near Trotsky property on south side of inlet	SAIC (2007b)	Sample was identified as outfall water.
2nd Avenue S SD (2118)	BBP	2007	0.073 n = 1/1	near Trotsky property on south side of inlet	SAIC (2007b)	Sample was identified as outfall water.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Trotsky Inlet SCA.

[b] Mercury, total PCBs and BEHP were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
PCB – polychlorinated biphenyl
SAIC – Science Applications International Corporation
SCA – source control area
SQS – sediment quality standard
SD – storm drain

Source-tracing data have been collected from several of the facilities and drainage systems within the Trotsky Inlet SCA (Map I-45). Table I-75 summarizes the source-tracing data collected within the Trotsky Inlet SCA and presented in the source documents. If multiple years of data were collected from the same sampling location, only the most recent data are included in Table I-75. Data relevant to source-tracing efforts in the Trotsky Inlet SCA include catch basin samples and in-line sediment samples. Maps I-44 and I-45 show the locations of stormwater drainage lines on the Trotsky and Boyer Towing, Inc. properties. Additional details about source-tracing sampling programs conducted in the Trotsky Inlet SCA and its associated drainage basin are presented in Section 9.4.4.7.

Table I-75. Summary of chemical concentrations detected in source-tracing samples collected from the Trotsky Inlet SCA

Sample Source	Year Collected	Concentration Information (mg/kg dw) [a, b, c]			Concentration Information (µg/kg dw unless noted) [a, b, c]			Sources [d]	Additional Information
		Lead	Mercury	Zinc	BEHP	BBP	Total PCBs		
Catch Basin Sediment Samples									
2nd Avenue S sub-basin	2003	157, 421 n = 2/2	0.12, 0.1 n = 2/2	729, 2,570 n = 2/2	37,000, 150,000 n = 2/2	4,100, 5,300 n = 2/2	200 µg/kg OC, 220 µg/kg OC n = 2/2	SPU (2003), as cited in SAIC (2007c)	Samples were collected from drums containing material that had been removed from oil/water separator.
2nd Avenue S sub-basin	2007	25 n = 1/1	nd	111 n = 1/1	4,200 n = 1/1	190 n = 1/1	20 n = 1/1	Schmoyer (2008a)	
ROW Catch Basin Samples									
2nd Avenue S sub-basin	2007	115, 547 n = 2/2	1.46, 0.13 n = 2/2	592, 655 n = 2/2	2,100, 21,000 n = 2/2	95 n = 1/2	203, 1,650 n = 2/2	Schmoyer (2008a)	SPU collected additional source tracing samples in 2008-2009.
In-Line Sediment Grab Samples									
2nd Avenue S sub-basin	2005	87, 113 n = 2/2	0.06 n = 1/2	394, 444 n = 2/2	1,600, 7,800 n = 2/2	200 n = 1/2	122 µg/kg OC, 250 µg/kg OC n = 2/2	Schmoyer (2008a), SPU (2006), both as cited in SAIC (2007b)	Samples collected from drainage ditch on west side of 2nd Ave S
2nd Avenue S sub-basin	2007	225 n = 1/1	0.296 n = 1/1	255 n = 1/1	2,200 n = 1/1	880 n = 1/1	3,600 n = 1/1	SAIC (2006)	Sample was collected from 2nd Avenue S SD outfall (1 ft inside the end of the pipe).

Note: If multiple rounds of data were available for a single location, only the data collected during the most recent event were presented in order to represent the most current conditions possible.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the Trotsky Inlet SCA.

[b] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges were calculated using only detected data. For this reason, some estimated ranges may be higher than actual concentrations.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/kg to µg/kg), the number of significant figures was kept consistent with the number in the reported value.

[d] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

BBP – butyl benzyl phthalate
BEHP – bis(2-ethylhexyl) phthalate
dw – dry weight
nd – not detected
OC – organic carbon
PCB – polychlorinated biphenyl
SAIC – Science Applications International Corporation
SCA – source control area
SD – storm drain
SPU – Seattle Public Utilities
SQS – sediment quality standard

Numerous investigations have been completed since the late 1980s (see Table I-68) and are expected to continue. Source control activities in the LDW are ongoing. For the most current information on the Trotsky Inlet SCA, see Ecology's website.

I.4.11 T-117 SOURCE CONTROL AREA (RM 3.4 W TO RM 3.8 W, EAA 5)

The Terminal 117 (T-117) SCA is one of 23 areas identified by Ecology along the LDW for source evaluation. T-117 was also one of the seven candidate EAAs recommended to EPA and Ecology for early cleanup based on sediment chemistry data (Windward 2003c). The T-117 SCA is shown on Map I-46.

An NTCRA for sediment and soils in the adjacent bank area was approved in 2005 for T-117. However, the discovery of PCB soil contamination in adjacent upland areas prompted EPA to implement a time-critical removal action (TCRA) and to expand the site boundary to include the Port of Seattle's T-117 upland property and adjoining City of Seattle street ROWs, in addition to the bank and sediment. An EE/CA is being prepared by the Port of Seattle and the City of Seattle for the facility and surrounding streets as part of the expanded NTCRA.

As part of ongoing source control efforts for this SCA, a data gaps report (Windward et al. 2003) and a SCAP (Ecology 2005) were completed in September 2003 and July 2005, respectively. In addition, property reviews for Basin Oil Company, South Park Marina, Boeing South Park, and T-117 have also been completed by Ecology (Ecology 2004c, d, e, f) and a site characterization activities report (SAIC 2008c) has been prepared. The 2005 and 2008 EE/CA documents (Windward et al. 2005b; 2008) were reviewed as well as data tables provided by the City of Seattle (City of Seattle 2004; Schmoyer 2008a). Collectively, these documents are referred to as the "source documents" in this section. Data provided in SAIC (2008c), City of Seattle (2004), Schmoyer (2008a), and Windward et al. (Windward et al. 2005b; 2008) were collected for or included at the request of a LDWG member.

CSL exceedances in the surface sediment in this SCA have included total PCBs, phenol, total LPAH, and 11 individual PAHs. SQS exceedances have included total PCBs, phenol, benzyl alcohol, total HPAHs, total LPAH, and 11 individual PAHs. These exceedances are based on the RI baseline surface sediment dataset and the 2007 SCA boundary, as discussed in the introduction to this appendix. Ecology has identified COCs for this SCA based on different criteria (Table I-3); therefore, the chemicals identified for summary in this appendix are different than the COCs identified by Ecology. Surface sediment chemistry information for the T-117 SCA is provided on Map I-47.

Commercial and industrial operations in the vicinity of the T-117 SCA have included asphalt manufacturing (historical), marina operations (current), boat maintenance and storage (current), boat building (current), barrel reconditioning (historical), lumber storage (historical), cargo handling and storage (historical), metal fabrication

(historical), food processing (historical), and oil reclamation (historical) (Windward et al. 2003).

Adjacent properties discussed in the data gaps report and SCAP included T-117, South Park Marina, and Boeing South Park. Upland properties identified in the source documents included Basin Oil and City of Seattle street ROWs. Table I-76 provides information on the adjacent and upland facilities associated with the T-117 SCA.

Table I-76. Summary of facility information for the T-117 SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/ Investigations
T-117	Port of Seattle	manufacturing and industrial activities	roofing asphalt manufacturing, oily water separation, petroleum storage, untreated lumber storage and loading	Sampling of groundwater, soil, and catch basin solids has been conducted throughout the property. Sediment and shoreline seep sampling has been conducted. Focused site characterization and inspection, asbestos survey, site hazard assessment, and TSCA inspections have also been conducted.	Four USTs were decommissioned in 1992, and one UST was removed in 2000. A below-ground utility corridor, which contained asphalt and oil, was cleaned out in 2000. Two CERCLA removal actions, which included the removal of PCB contaminated soil, were conducted in 1999/2000 and 2006. After both removal actions, clean back fill and an asphalt cap was installed in the removal areas. After both removal actions, the onsite drainage system was cleaned and restored.	The soil cover barrier was checked and outdoor storage practices were inspected in 2006. An erosion and sediment control inspection was also conducted. The catch basins include filter fabric and filter socks in inlets and are surrounded by hay bales. O & M activities are ongoing at the site.
South Park Marina	South Park Marina	residential and commercial activity (e.g., boat storage, closed-loop boat washing, hull refinishing, maintenance)	reconditioning and repainting of used barrels and drums; miscellaneous trades and commercial activities	Soil sampling was conducted in 2005 near the T-117/South Park Marina boundary and ground water and soil sampling was conducted in the southern portion of the Marina. In the location of the former A&B Barrel Co. Modeling of the fate and transport of contaminants is being conducted (Good 2009).	No remedial activities were reported.	Ecology conducted a permit compliance inspection in 2005, investigating sewer connections, discharge locations, a waste lagoon, and sampling catch basins. Water quality and stormwater compliance inspections have also been conducted.
Boeing South Park	The Boeing Company	manufacturing and industrial activities (e.g., laboratories, flight simulator training)	various training, information technology, and research activities	An initial site characterization has been conducted.	No remedial activities were reported.	In 2005, the property was inspected for potential sources of contamination.

Table I-76, cont. Summary of facility information for the T-117 SCA

Facility[a]	Current Ownership	Current Operations	Historical Operations	Environmental Investigations	Remedial Activities	Source Control Activities/ Investigations
Basin Oil	Basin Oil	currently inactive	used oil and oily wastewater processing, antifreeze storage, empty drum and equipment storage	Site visits have been conducted, and a complaint alleging violation of the Clean Water Act was investigated.	Tanks and contaminated soil have been removed.	Sludge samples were collected from the oil/water separator and one catch basin was sampled in 2004 by Ecology and SPU. Site was remediated in 2006 with Ecology oversight.
City of Seattle street ROWs (Dallas Avenue S vicinity)	City of Seattle	street ROWs	street ROWs	Street dust and other soil samples were collected.	In 2004 and 2005, streets were paved, shoulders were excavated and re-graveled, a temporary storm drain system was installed, and some PCB contaminated soils were removed.	SPU continues to collect stormwater samples as required under its discharge authorization with King County. Catch basin sediment monitoring was conducted as part of the interim action in 2004 and again in 2005 and 2007.

Source: Windward et al. (2003), Ecology (2005)

[a] Facilities listed are those identified as adjacent properties in the data gaps report (Windward et al. 2003) and the SCAP (Ecology 2005).

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
Ecology – Washington State Department of Ecology
EPA – Environmental Protection Agency
O & M – operation and maintenance
PCB – polychlorinated biphenyl
ROW – right-of-way
SCA – source control area
SPCC – spill prevention, control, and countermeasure
SPU – Seattle Public Utilities
T-117 – Terminal 117
TSCA – Toxic Substances Control Act
UST – underground storage tank

Six outfalls were identified that discharge to the T-117 SCA, including T-117 storm drains (Nos. 2209 and 2212), the South Park Marina private storm drain (No. 2214), 16th Avenue Bridge public storm drain (No. 2215), and Boeing South Park private storm drains (Nos. SP-4 and SP-5). There is also a small ditch (No. 2213) on the southern boundary between the Boeing South Park and T-117 properties that may collect roof drainage from the warehouse on the sound end of T-117 and runoff from the hillside between these two properties, which discharges to a mudflat area on the LDW (Windward et al. 2008). . Information on these outfalls is provided on Table I-77; additional details are provided in Appendix H. King County and SPU have inspected businesses in the T-117 basin as part of their source control efforts within the basin (King County and SPU 2005). The business inspection program is discussed in Section 9.4.4.5.

Table I-77. Summary of specific information for each outfall in the T-117 SCA

Outfall[a]	Current Ownership	Current Operations	Historical Operations	Environmental and Source-Tracing Investigations	Remedial and Source Control Activities
Public SD (No. 2215)	16th Avenue Bridge (south side)	Composite construction storm drain pipe (12-in.) is relatively new and likely discharges drainage from bridge.	No historical operations were reported.	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.
South Park Marina permitted private SD (No. 2214)	South Park Marina	Composite construction storm drain (12-in.) collects stormwater in two catch basins; the water is passed through an oil/water separator before being discharged to the LDW.	Outfall may have served as a stormwater discharge point for North Star Trading Co., Evergreen Boat Transport, RP Boatbuilding, A&B Barrel, and Dekker Engineering.	Catch basin sampling was performed.	Water quality and stormwater compliance inspection was performed by Ecology in 2005.
Port of Seattle SD (No. 2212)	Port of Seattle	PVC outfall (6-in.) drains stormwater from the northern portions of the T-117 upland property; stormwater is collected in a catch basin before it is discharged to the LDW.	Outfall served as a stormwater discharge point for Malarkey Asphalt Co. and Evergreen West Wholesale.	Catch basin sampling was performed throughout T-117.	Catch basins on T-117 were cleaned in 2006.
Port of Seattle SD (No. 2209)	Port of Seattle	PVC outfall (8-in.) drains stormwater from the central and southern portion of the T-117 upland property; stormwater is collected in catch basins before it is discharged to the LDW.	Outfall used to discharge stormwater runoff from Basin Oil parcels, which entered the catch basin and discharged to LDW via outfall No. 2209. Outfall also served as a stormwater discharge point for Allied Bolt Co.	Catch basin sampling was performed throughout T-117 and at the Basin Oil.	Catch basins on T-117 were cleaned in 2006. Catch basins at Basin Oil were cleaned in 2007. The Basin Oil site was demolished in 2006-2007. No drainage structures exist on this property.
Boeing South Park permitted private SDs (Nos. SP-4 and SP-5)	Boeing South Park	Storm drains discharge stormwater from the facility.	No historical operations were reported.	No environmental or source-tracing investigations were reported.	No remedial or source control activities were reported.

Source: Windward et al. (2003), Ecology (2005)

[a] Outfalls listed are those discussed in the SCAP (Ecology 2005) or data gaps report (Windward et al. 2003); none of the outfalls were identified as major outfalls.

LDW – Lower Duwamish Waterway
PVC – polyvinyl chloride
SCA – source control area
SD – storm drain

Several remedial activities and environmental investigations have been completed or are currently in progress within the T-117 SCA (Tables I-76 and I-77). Information about these activities has been summarized based on information in the source documents. Several of the chemicals that have been detected above the SQS in T-117 surface sediment have also been detected in various upland media, including soil, groundwater, seeps, stormwater, and source-tracing solids as indicated on Table I-78. The availability of data (by media type) is also presented in the table on Map I-48 for each of the facilities and outfalls associated with this SCA. In both Table I-78 and the table on Map I-48, an X indicates that the source documents reported data or indicated that data exist; therefore, an X does not necessarily mean that the actual data were presented in the source document. Data are only summarized in media-specific and source-tracing tables if the data were reported in the source documents and if they met the criteria for data summation discussed in the introduction to this appendix (e.g., soil data were collected along the SCA shoreline; groundwater data were collected from shoreline facilities). The identification of a chemical in these media at the adjacent facilities or within the drainage systems of the T-117 SCA does not necessarily indicate that these potential sources contributed to sediment contamination in the past or that they will result in sediment contamination in the future.

Table I-78. Chemicals identified in various media in the T-117 SCA

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater	Source-Tracing Samples	Sources
2-methylnaphthalene	X					X	City of Seattle (2004), Windward et al. (2005b; 2008)
Acenaphthene	X	X				X	Schmoyer (2008a), Windward et al. (2003, 2005b; 2008)
Anthracene	X					X	Schmoyer (2008a), Windward et al. (2008)
Benzo(a)anthracene	X	X				X	SAIC (2008c), Schmoyer (2008a), Windward et al. (2003, 2005b; 2008)
Benzo(a)pyrene	X					X	SAIC (2008c), Schmoyer (2008a), Windward et al. (2005b; 2008)
Benzo(g,h,i)perylene	X					X	SAIC (2008c), Schmoyer (2008a), Windward et al. (2008)
Benzofluoranthenes	X	X				X	Schmoyer (2008a), Windward et al. (2003; 2008)
Chrysene	X	X				X	SAIC (2008c), Schmoyer (2008a), Windward et al. (2003; 2008)

Chemical[a]	Soil	Groundwater	Seep	Porewater[b]	Stormwater	Source-Tracing Samples	Sources
Dibenzo(a,h) anthracene	X					X	SAIC (2008c), Schmoyer (2008a), Windward et al. (2005b; 2008)
Dibenzofuran	X						Windward et al. (2008), SAIC (2008c)
Fluoranthene	X					X	SAIC (2008c), Schmoyer (2008a), Windward et al. (2003, 2005b; 2008)
Fluorene	X	X				X	SAIC (2008c), Schmoyer (2008a), Windward et al. (2003, 2005b; 2008)
Indeno (1,2,3-cd)pyrene	X					X	SAIC (2008c), Schmoyer (2008a), Windward et al. (2005b; 2008)
Phenanthrene	X					X	Schmoyer (2008a), Windward et al. (2005b; 2008)
Phenol		X					Windward et al. (2008)
Total HPAHs	X	X					Windward et al. (2003; 2008)
Total LPAHs	X	X				X	Windward et al. (2003, 2005b; 2008)
Benzyl alcohol	X						SAIC (2008c), Windward et al. (2008)
Total PCBs	X	X	X		X	X	Schmoyer (2008a), Windward et al. (2005b; 2008)

Note: An X indicates that the source documents reported that data are available for the identified medium. The absence of an X in any cell does not necessarily mean that the chemical is absent in the upland media or in source-tracing samples; in some cases, the chemical may not have been analyzed for or, if analyzed, could have been present but at concentrations below the RL.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the T-117 SCA. The chemical list is based on SMS exceedances in the RI baseline surface sediment dataset within the 2007 SCA boundary. Therefore, this list may differ from the list of exceedances in source documents.

[b] No porewater data were identified in the source documents for any chemical.

HPAH – high-molecular-weight polycyclic aromatic hydrocarbon

LPAH – low-molecular-weight polycyclic aromatic hydrocarbon

PCB – polychlorinated biphenyl

RI – remedial investigation

SAIC – Science Applications International Corporation

SCA – source control area

SMS – Washington State Sediment Management Standards

SQS – sediment quality standard

Upland data for these media from adjacent properties have been summarized in the source documents. This section summarizes the upland data as they were presented in these documents for bank soil, groundwater, seep, stormwater, and source-tracing samples. No data were reported for porewater. In some instances, the source

documents acknowledged the existence of certain data while not providing actual concentrations. Data were included only if specific concentrations or a range of concentrations was included in the source documents.

Soil sampling has been conducted at several of the facilities associated with the T-117 SCA. Extensive soil sampling has been conducted throughout the T-117 upland property. This summary focuses on the soil samples collected along the bank because bank soils can be a direct source (via erosion) to the sediment. Bank soil data were presented in the EE/CA (Windward et al. 2008) and the South Park Marina site characterization activities data report (SAIC 2008c); these data are summarized in Table I-79. Bank soil samples were collected along the shorelines of the South Park Marina and T-117, including the southern drainage ditch. Groundwater sampling has been conducted within the T-117 SCA since the early 1990s; the most recent data for each location are presented in Table I-80. Data are also available for seep samples collected within the T-117 SCA (Table I-81). Additional groundwater and seep information for T-117 and Basin Oil is also included in Section 9.4.6 of the main body of the RI. Stormwater sampling has been conducted within one area associated with the T-117 SCA; the data are summarized in Table I-82. Stormwater sampling locations include five 18,000-gal. holding tanks, which are located just south of 17th Avenue S next to Boeing South Park; these tanks collect stormwater from the adjacent paved streets.

Table I-79. Summary of chemical concentrations detected in bank soil in the T-117 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/kg dw, unless noted)[c, d]	Location	Sources	Additional Information
South Park Marina	benzo(a)-anthracene	2007	58 n = 1/4	southern South Park Marina bank area, close to T-117 property line	SAIC (2008c)	Samples include shallow soil collected from the shoreline bank.
South Park Marina	benzo(a)pyrene	2007	76 n = 1/4	southern South Park Marina bank area, close to T-117 property line	SAIC (2008c)	Samples include shallow soil collected from the shoreline bank.
South Park Marina	benzo(g,h,i)-perylene	2007	92, 290 n = 2/4	southern South Park Marina bank area, close to T-117 property line	SAIC (2008c)	Samples include shallow soil collected from the shoreline bank.
South Park Marina	benzyl alcohol	2007	11 – 940 median = 48 n = 3/4	southern South Park Marina bank area, close to T-117 property line	SAIC (2008c)	Samples include shallow soil collected from the shoreline bank.
South Park Marina	chrysene	2007	120 n = 1/4	southern South Park Marina bank area, close to T-117 property line	SAIC (2008c)	Samples include shallow soil collected from the shoreline bank.
South Park Marina	dibenzo(a,h)-anthracene	2007	4.2 – 64 median = 15 n = 3/4	southern South Park Marina bank area, close to T-117 property line	SAIC (2008c)	Samples include shallow soil collected from the shoreline bank.
South Park Marina	dibenzofuran	2007	3.7 n = 1/4	southern South Park Marina bank area, close to T-117 property line	SAIC (2008c)	Samples include shallow soil collected from the shoreline bank.
South Park Marina	fluoranthene	2007	170 n = 1/4	southern South Park Marina bank area, close to T-117 property line	SAIC (2008c)	Samples include shallow soil collected from the shoreline bank.
South Park Marina	fluorene	2007	4.6, 12 n = 2/4	southern South Park Marina bank area, close to T-117 property line	SAIC (2008c)	Samples include shallow soil collected from the shoreline bank.
South Park Marina	indeno(1,2,3-cd)pyrene	2007	98, 330 n = 2/4	southern South Park Marina bank area, close to T-117 property line	SAIC (2008c)	Samples include shallow soil collected from the shoreline bank.

Table I-79, cont. Summary of chemical concentrations detected in bank soil in the T-117 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/kg dw, unless noted)[c, d]	Location	Sources	Additional Information
T-117	2-methyl-naphthalene	2003	65, 260 n = 2/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include soil borings up to 1.5 ft deep and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	acenaphthene	2003	39, 190 n = 2/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include soil borings up to 1.5 ft deep and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	anthracene	2003	26, 950 n = 2/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include soil borings up to 1.5 ft deep and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	benzo(a)-anthracene	2003	59 – 2,200 median = 210 n = 5/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include soil borings up to 1.5 ft deep and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	benzo(a)pyrene	2003	89 – 3,800 median = 230 n = 5/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include soil borings up to 1.5 ft deep and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	benzo(g,h,i)-perylene	2003	110 – 1,100 median = 190 n = 5/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include soil borings up to 1.5 ft deep and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	total benzo-fluoranthenes	2003	190 – 9,100 median = 890 n = 5/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include soil borings up to 1.5 ft deep and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.

Table I-79, cont. Summary of chemical concentrations detected in bank soil in the T-117 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/kg dw, unless noted)[c, d]	Location	Sources	Additional Information
T-117	benzyl alcohol	2003	190 – 1,000 median = 860 n = 3/3	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include soil samples from the southern drainage ditch collected from the shoreline bank.
T-117	chrysene	2003	63 – 4,000 median = 250 n = 6/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include surface/subsurface soil borings and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	dibenzo(a,h)-anthracene	2003	41 –400 median = 175 n = 4/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include surface/subsurface soil borings and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	dibenzofuran	2003	81, 470 n = 2/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include surface/subsurface soil borings and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	fluoranthene	2003	24 – 9,300 median = 550 n = 6/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include surface/subsurface soil borings and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	fluorene	2003	35, 770 n = 2/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include surface/subsurface soil borings and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	indeno(1,2,3-cd)pyrene	2003	62 – 1,200 median = 210 n = 5/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include surface/subsurface soil borings and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.

Table I-79, cont. Summary of chemical concentrations detected in bank soil in the T-117 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/kg dw, unless noted)[c, d]	Location	Sources	Additional Information
T-117	phenanthrene	2003	22 – 9,000 median = 203 n = 8/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include surface/subsurface soil borings and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	total HPAH	2003	24 – 39,600 median = 940 n = 9/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include surface/subsurface soil borings and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	total LPAH	2003	22 – 12,500 median = 210 n = 9/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include surface/subsurface soil borings and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	total PCBs	2003	16 – 15,000 median = 1,900 n = 10/15	southern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include surface/subsurface soil borings and three soil samples from the southern drainage ditch; all samples were collected from the shoreline bank.
T-117	total PCBs	2003	4,000 n = 1/1	northern T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Sample was a composite surface grab sample collected from the bank.
T-117	total PCBs	2004	5,000 – 100,000 median = 34,000 n = 8/8	north and central T-117 bank area	Windward et al. (2005a) as cited in Windward et al. (2008)	Samples include shallow soil borings collected from the shoreline bank.
T-117	total PCBs	2005	8.2 – 530,000 median = 6,550 n = 42/49	northern and southern-most T-117 bank area	Windward et al. (2005c) as cited in Windward et al. (2008)	Samples include surface and subsurface soil collected from the shoreline bank.

Table I-79, cont. Summary of chemical concentrations detected in bank soil in the T-117 SCA

FACILITY	CHEMICAL[a, b]	YEAR COLLECTED	CONCENTRATION INFORMATION (µg/kg dw, unless noted)[c, d]	LOCATION	SOURCES	ADDITIONAL INFORMATION
T-117	total PCBs	2005	1,900 – 47,000 median = 15,700 n = 4/4	northern T-117 bank area	Windward et al. (2005d) as cited in Windward et al. (2008)	Samples include surface and subsurface soil collected from the shoreline bank.
T-117/ South Park Marina	total PCBs	2006	81.5 – 3,200 median = 405 n = 4/4	T-117/South Park Marina property line	Windward and DOF (2006), as cited in Windward et al. (2008)	Samples include shallow soil collected from the shoreline bank.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the T-117 SCA.

[b] Phenol was either not analyzed or was not detected, or the data for this chemical were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/kg to µg/kg), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

dw – dry weight
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
SCA – source control area
SQS –sediment quality standard
T-117 – Terminal 117

Table I-80. Summary of chemical concentrations detected in groundwater in the T-117 SCA

FACILITY	CHEMICAL[a, b]	YEAR COLLECTED	CONCENTRATION INFORMATION (µg/L)[c, d, e]	LOCATION	SOURCES[f]	ADDITIONAL INFORMATION
T-117	acenaphthene	2003 – 2007	0.39 n = 1/3	central portion of T-117	Onsite (2003), as cited in Windward et al. (2003)	
T-117	benzo(a)anthracene	2003	0.016 n = 1/3	central portion of T-117	Onsite (2003), as cited in Windward et al. (2003)	
T-117	total benzofluoranthenes	2003	0.013 n = 1/3	central portion of T-117	Windward et al. (2008)	
T-117	chrysene	2003	0.10 n = 1/3	central portion of T-117	Onsite (2003), as cited in Windward et al. (2003)	
T-117	fluorene	2003	1.6 n = 1/3	central portion of T-117	Onsite (2003), as cited in Windward et al. (2003)	
T-117	phenol	2006	5.8 n = 1/3	central portion of T-117	Windward and DOF (2006), as cited in Windward et al. (2008)	
T-117	total HPAHs	2003	0.1 n = 1/3	central portion of T-117	Windward and DOF (2006), as cited in Windward et al. (2008)	
T-117	total LPAHs	2003	2.0 n = 1/3	central portion of T-117	Windward and DOF (2006), as cited in Windward et al. (2008)	
T-117	total PAHs	2003	2.1 n = 1/3	central portion of T-117	Windward and DOF (2006), as cited in Windward et al. (2008)	
T-117	total PCBs	2003 – 2006	0.010 – 0.32 median = 0.029 n = 7/22	T-117	Windward and DOF (2006), as cited in Windward et al. (2008)	Samples from multiple wells.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the T-117 SCA.

[b] 2-Methylnaphthalene, anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzyl alcohol, dibenzofuran, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and phenanthrene were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

[e] Concentrations reported are from samples that were not filtered.

[f] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PAH – polycyclic aromatic hydrocarbon
SCA – source control area
PCB – polychlorinated biphenyl
SQS – sediment quality standard
T-117 – Terminal 117

Table I-81. Summary of chemical concentrations detected in seeps in the T-117 SCA

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/L)[c, d]	Location	Source	Additional Information
T-117	total PCBs	2003	0.94 n = 1/4	northern portion of T-117	Windward et al. (2008)	Three seeps were sampled along the T-117 along the base of shoreline riprap. One sample at northern end of T-117 was not filtered or centrifuged. This seep was subsequently re-sampled, and centrifuged generating a fourth PCB results. PCBs were not detected in the re-sampled seep.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the T-117 SCA.

[b] 2-Methylnaphthalene, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzyl alcohol, benzofluoranthenes, chrysene, dibenzofuran, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, phenol, total LPAHs, and total HPAHs were not detected.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed during the sampling event (s) when a chemical was detected.

HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
SCA – source control area
SQS – sediment quality standard
T-117 – Terminal 117

Table I-82. Summary of chemical concentrations detected in stormwater in the T-117 SCA

Facility	Chemical[a, b]	Year Collected	Sampling Location	Concentration Information (µg/L)[c, d]	Sources[e]	Additional Information
17th Avenue S and associated catchment area	total PCBs	2005	holding tanks located just south of intersection of 17th Avenue S and S Donovan Street	0.141 – 0.383 median = nr n = nr	Ecology (2007f), as cited in Windward et al. (2008)	Samples were collected from the temporary stormwater system, which collects runoff from the adjacent paved streets and releases it to the combined sewer system.
17th Avenue S and associated catchment area	total PCBs	2005-2008	holding tanks located just south of intersection of 17th Avenue S and S Donovan Street	0.12 n = 1/30	Ecology (2007f), as cited in Windward et al. (2008)	Samples are collected from the temporary stormwater system every month that a discharge occurs. The temporary system collects runoff from the adjacent paved streets and Basin Oil property. Stormwater is stored in five 18,000-gal. tanks and released at a controlled rate to the combined sewer system. During large storm events or periods of extended rainfall, when the capacity of the tanks is exceeded, runoff is routed to the Port of Seattle's storm drain system on T-117 and discharged to the LDW.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the T-117 SCA.

[b] 2-Methylnaphthalene, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzyl alcohol, benzofluoranthenes, chrysene, dibenzofuran, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, phenol, total LPAHs, and total HPAHs were either not analyzed or were not detected, or the data for these chemicals were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/L to µg/L), the number of significant figures was kept consistent with the number in the reported value.

[d] n was not reported for these sampling events. Concentration ranges were calculated using only detected data. For this reason, some estimated ranges may be higher than actual concentrations.

[e] Primary source materials (i.e., any documents listed as "as cited in") were not reviewed to compile this table.

HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
nr – not reported
PCB – polychlorinated biphenyl
SCA – source control area
SQS – sediment quality standard
T-117 – Terminal 117

Source-tracing samples have been collected from the T-117 SCA, and data from these sampling efforts are available in the source documents. Data relevant to source-tracing efforts include onsite catch basin solids and right-of-way catch basin solids; these data are presented in Table I-83. The drainage basin associated with the T-117 SCA is shown on Map I-48. Additional details on source-tracing sampling programs conducted within the T-117 SCA and the larger LDW drainage basin are presented in Section 9.4.4.7.

Table I-83. Summary of chemical concentrations detected in catch basins at the T-117 SCA

FACILITY	CHEMICAL[a, b]	YEAR COLLECTED	CONCENTRATION INFORMATION (µg/kg dw, unless noted)[c d]	LOCATION	SOURCES
T-117	2-methylnaphthalene	2003	62, 810 n = 2/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	acenaphthene	2003	79 n = 1/3	T-117 central and southern areas near bank	SAIC. (2008c)
T-117	anthracene	2003	93, 95 n = 2/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	benzo(a)anthracene	2003	73, 290 n = 2/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	benzo(a)pyrene	2003	79 – 280 median = 240 n = 3/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	benzo(g,h,i)perylene	2003	67 – 210 median = 150 n = 3/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	total benzofluoranthenes	2003	390 – 980 median = 910 n = 3/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	benzyl alcohol	2003	57, 87 n = 2/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	chrysene	2003	160 – 510 median = 440 n = 3/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	dibenzo(a,h)-anthracene	2003	54 n = 1/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	dibenzofuran	2003	86, 95 n = 2/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	fluoranthene	2003	230 – 1,300 median = 880 n = 3/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	fluorene	2003	130, 380 n = 2/3	T-117 central and southern areas near bank	SAIC (2008c)

Facility	Chemical[a, b]	Year Collected	Concentration Information (µg/kg dw, unless noted)[c d]	Location	Sources
T-117	indeno(1,2,3-cd)pyrene	2003	190, 230 n = 2/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	phenanthrene	2003	160 – 960 median = 910 n = 3/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	total HPAH	2003	1,530 – 5,300 median = 4,800 n = 3/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	total LPAH	2003	160 – 1,650 median = 1,350 n = 3/3	T-117 central and southern areas near bank	SAIC (2008c)
T-117	total PCBs	2003-2006	620 – 50,000 median = 2,800 n = 10/10	T-117 central and southern areas near bank	SAIC (2008c)
T-117	total PCBs	2004	140 n = 1/1	T-117 southern area (inland) near Dallas Avenue	SAIC (2008c)
Dallas Avenue S	chrysene	2007	310 n = 1/1	Sample was collected from CB installed during 2004 emergency cleanup on Dallas Avenue between T-117 and Basin Oil facilities.	Schmoyer (2008a)
Dallas Avenue S	fluoranthene	2007	470 n = 1/1	Sample was collected from CB installed during 2004 emergency cleanup on Dallas Avenue between T-117 and Basin Oil facilities.	Schmoyer (2008a)
Dallas Avenue S	phenanthrene	2007	180 n = 1/1	Sample was collected from Dallas Avenue between T-117 and Basin Oil facilities. Sample was collected from CB installed during 2004 emergency cleanup on Dallas Avenue between T-117 and Basin Oil facilities.	Schmoyer (2008a)
Dallas Avenue S	total PCBs	2007	310 n = 1/1	Sample was collected from CB installed during 2004 emergency cleanup on Dallas Avenue between T-117 and Basin Oil facilities.	SAIC (2008c)

Note: If multiple rounds of data were available for a single location, only the data collected during the most recent event were presented in order to represent the most current conditions possible.

[a] Chemicals with at least one detected exceedance of an SQS in surface sediment within the T-117 SCA.

[b] Phenol was either not analyzed or was not detected, or the data for this chemical were not reported in the source documents in a format that would allow them to be summarized in this table.

[c] Significant figures are reported as available in source documentation; when converting units (i.e., from mg/kg to µg/kg), the number of significant figures was kept consistent with the number in the reported value.

[d] n is the ratio of the number of detects to the total number of samples analyzed. Concentration ranges and median values were calculated using only detected data. For this reason, some estimated ranges and median values may be higher than actual concentrations.

dw – dry weight
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
T-117 – Terminal 117

Source identification and control efforts in the T-117 SCA are ongoing. Planned activities include a NTCRA cleanup under CERCLA at T-117 to address elevated PCB concentrations, a follow-up on compliance issues at Basin Oil as part of Ecology's Hazardous Waste Program, additional sampling at South Park Marina to characterize potential residual contamination from the A&B Barrel Co., and the Dallas Avenue S interim PCB cleanup (Ecology 2007f). Additional information on the T-117 SCA is provided on Ecology's website.

I.5 References

Anchor. 2006. Preliminary investigation data report, Duwamish Shipyard, Inc. (site #1429), Seattle, Washington. Anchor Environmental, L.L.C., Seattle, WA.

Anchor. 2007a. Duwamish/Diagonal sediment remediation project 2005 monitoring report: Elliott Bay/Duwamish restoration program panel. Panel publication 40. Prepared for King County Department of Natural Resources and Parks Elliot Bay/Duwamish restoration program. Anchor Environmental, L.L.C., Seattle, WA.

Anchor. 2007b. Memorandum dated June 29, 2007 from J. Keithly and D. Templeton to M. O'Brien, B. Helland, and R. Thomas, Washington Department of Ecology, regarding March 2007 stormwater and stormwater solids results. Anchor Environmental, L.L.C., Seattle, WA.

Anchor. 2008. Memorandum dated January 14, 2008 from J. Keithly and D. Templeton to M. O'Brien, B. Helland, and R. Thomas, Washington Department of Ecology, regarding May and July 2007 stormwater results. Anchor Environmental, L.L.C., Seattle, WA.

ARI. 2005. Analytical results for Project: NBF 025082 (folder); ARI Job: IT45. December 5, 2005. Analytical Resources, Incorporated, Tukwila, WA.

Bach C. 2005. Personal communication (email to S. Becker and D. Cargill, Washington Department of Ecology). Project Manager, The Boeing Company, Seattle, WA. February 28, 2005.

Boeing. 2005. Letter dated November 16, 2005 from Carl Bach, Boeing, to Dan Cargill, Ecology, re: Lower Duwamish Waterway source control information request, Slip 4 early action drainage basin. . The Boeing Company, Seattle, WA.

Cabuco R. 1991. Letter From Rick Cabuco, Northwest Cooperage Co., Inc., to Mike Gallagher, Toxics Cleanup Program, Northwest Regional Office, Washington Department of Ecology, Re: results of recent groundwater sampling. October 1, 1991. Northwest Cooperage Co., Seattle, WA.

CALIBRE. 2005. 2004 annual sampling report, south storm drain system, Boeing Developmental Center. Prepared for the Boeing Group. CALIBRE Systems, Bellevue, WA.

CALIBRE. 2006. 2005 annual sampling report, south storm drain system, Boeing Developmental Center. Prepared for the Boeing Group. CALIBRE Systems, Bellevue, WA.

CALIBRE. 2007. 2006 annual sampling report, south storm drain system, Boeing Developmental Center. Prepared for the Boeing Group. CALIBRE Systems, Bellevue, WA.

CALIBRE. 2008. 2007 annual sampling report, south storm drain system, Boeing Developmental Center. Prepared for the Boeing Group. CALIBRE Systems, Bellevue, WA.

CH2M HILL. 2005. Memorandum of May 23, 2005 to J Bartlett, Emerald Services, Inc. CH2M HILL, Bellevue, WA.

City of Seattle. 1925. As-built drawing: Michigan Street et.al., trunk sewer, lateral sewers, etc. SPU Vault No. 776-22. City of Seattle, WA.

City of Seattle. 2004. Personal communication (Unpublished data provided by B. Schmoyer). Seattle Public Utilities, Seattle, WA.

Colligan T. 2008. Personal communication (e-mail with attached Word document to L. Cognato, Windward Environmental, regarding unpublished data for Boeing Plant 2/Jorgensen Forge SCA). Floyd|Snider, Seattle, WA. May 25, 2008.

Downey S. 2005. PCB remediation plan approval letter. From EPA to The Boeing Company. July 5, 2005.

Ecology. 2004a. Lower Duwamish Waterway source control action plan for the Duwamish/Diagonal Way early action cleanup. No. 04-09-003. Washington Department of Ecology, Northwest Regional Office, Toxics Cleanup Program, Bellevue, WA.

Ecology. 2004b. Lower Duwamish Waterway source control strategy. No. 04-09-043. Washington Department of Ecology, Northwest Regional Office, Toxics Cleanup Program, Bellevue, WA.

Ecology. 2004c. Property review: Basin Oil Company, Inc. Early Action Area 5, Terminal 117 property reviews. Facility site ID 2202, Seattle, King County [online]. Toxics Cleanup Program, Washington Department of Ecology, Olympia, WA. Updated June 18, 2004. [Cited 6/17/08.] Available from: http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/sites/terminal_117/property_reviews/reviews.htm

Ecology. 2004d. Property review: Boeing South Park. Early Action Area 5, Terminal 117 property reviews. Facility site ID 2202, Seattle, King County [online]. Toxics Cleanup Program, Washington Department of Ecology, Olympia, WA. Updated June 25, 2004. [Cited 6/17/08.] Available from: http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/sites/terminal_117/property_reviews/reviews.htm

Ecology. 2004e. Property review: South Park Marina. Early Action Area 5, Terminal 117 property reviews. Facility site ID 2202, Seattle, King County [online]. Toxics

Cleanup Program, Washington Department of Ecology, Olympia, WA. Updated June 24, 2004. [Cited 6/17/08.] Available from: http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/sites/terminal_117/property_reviews/reviews.htm

Ecology. 2004f. Property review: Terminal 117/formerly Malarkey Asphalt Company. Early Action Area 5, Terminal 117 property reviews. Facility site ID 2202, Seattle, King County [online]. Toxics Cleanup Program, Washington Department of Ecology, Olympia, WA. Updated June 18 2004. [Cited 6/17/08.] Available from: http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/sites/terminal_117/property_reviews/reviews.htm

Ecology. 2005. Lower Duwamish Waterway source control action plan for the Terminal 117 early action cleanup. Washington Department of Ecology, Northwest Regional Office, Bellevue, WA.

Ecology. 2006. Lower Duwamish Waterway source control action plan for the Slip 4 Early action area. No. 06-09-046. Washington Department of Ecology, Northwest Regional Office, Toxics Cleanup Program, Bellevue, WA.

Ecology. 2007a. Letter from Maura S. O'Brien, Site Manager, Toxics Cleanup Program, to Mr. Paul Frankel, Energy and Environmental Affairs, The Boeing Company, Re: groundwater sampling results for wet and dry season at I-205 and -206 at Boeing Isaacson Property, 8625 East Marginal Way, Tukwila, WA 98018. November 8, 2007. Northwest Regional Office, Washington Department of Ecology, Bellevue, WA.

Ecology. 2007b. Lower Duwamish Waterway source control action plan for Early Action Area 2. No. 07-09-002. Washington Department of Ecology, Northwest Regional Office, Bellevue, WA.

Ecology. 2007c. Lower Duwamish Waterway source control action plan for Early Action Area 4. No. 07-09-004. Washington Department of Ecology, Northwest Regional Office, Bellevue, WA.

Ecology. 2007d. Lower Duwamish Waterway source control action plan for Early Action Area 7. No. 07-09-003. Washington Department of Ecology, Northwest Regional Office, Bellevue, WA.

Ecology. 2007e. Lower Duwamish Waterway source control action plan for Glacier Bay source control action area. No. 07-09-005. Washington Department of Ecology, Northwest Regional Office, Bellevue, WA.

Ecology. 2007f. Lower Duwamish Waterway source control status report, 2003-2007. No. 07-09-064. Toxics Cleanup Program, Washington State Department of Ecology, Bellevue, WA.

Ecology, Ecology and Environment. 2008. Lower Duwamish Waterway RM 3.9-4.4 East (Slip 6) source control action plan. Draft report. WA-09-1010. Washington Department of Ecology, Northwest Regional Office, Bellevue, WA, and Ecology and Environment, Inc., Seattle, WA.

Ecology. 2008a. Lower Duwamish Waterway source control action plan for Early Action Area 6, RM 3.7-3.9 east. Draft 1. Washington Department of Ecology, Northwest Regional Office, Bellevue, WA.

Ecology, SAIC. 2008. Lower Duwamish Waterway source control status report, July 2007 to March 2008. No. 08-09-063. Northwest Regional Office, Washington Department of Ecology, Bellevue, WA, and Science Applications International Corporation, Bothell, WA.

Ecology. 2008b. Property review: Chevron USA Site no. 4097 (Chiyoda property). Early Action Area 1, Duwamish/Diagonal combined sewer overflow/storm drain Washington Department of Ecology, Olympia, WA.

Ecology. 2008c. Property review: Container-Care International, Inc., Port of Seattle - Terminal 106W-Terminal 108. Early Action Area 1, Duwamish/Diagonal combined sewer overflow/storm drain. Washington Department of Ecology, Olympia, WA.

Ecology. 2008d. Property review: Federal Center South. Early Action Area 1, Duwamish/Diagonal combined sewer overflow/storm drain. Washington Department of Ecology, Olympia, WA.

Ecology and Environment. 2007a. Final summary of existing information and identification of data gaps report, Lower Duwamish Waterway Early Action Area 7. Ecology and Environment, Inc., Seattle, WA.

Ecology and Environment. 2007b. Lower Duwamish Waterway, early action area 4: summary of existing information and identification of data gaps. Prepared for Toxics Cleanup Program, Washington State Department of Ecology. Ecology and Environment, Inc., Seattle, WA.

Ecology and Environment. 2008a. Lower Duwamish Waterway river mile 2.0-2.3 East (Slip 3 to Seattle Boiler Works) source control area: summary of existing information and identification of data gaps. Final report. Prepared for Washington Department of Ecology. Ecology and Environment, Inc., Seattle, WA.

Ecology and Environment. 2008b. Lower Duwamish Waterway, RM 3.9-4.4 east (Slip 6): summary of existing information and identification of data gaps. Final report. Prepared for Toxics Cleanup Program, Washington State Department of Ecology. Ecology and Environment, Inc., Seattle, WA.

Environmental Partners, Golder Associates. 2005. Uplands corrective measures study, Volume IIIb: South yard area. Data gap investigation work plan. Prepared for The Boeing Company, Seattle, Washington. Environmental Partners, Inc., and Golder Associates, Seattle, WA.

Environmental Partners. 2006. CMS phase quarterly shoreline ground water monitoring report, August 2006, Boeing Plant 2, Seattle/Tukwila, Washington. Environmental Partners, Inc., Issaquah, WA.

Environmental Partners, Golder Associates. 2006a. Draft data gap investigation report. Corrective measures study, Volume IVb: 2-60s area. work plan. Prepared for The Boeing Company, Seattle, Washington. Environmental Partners, Inc., and Golder Associates, Seattle, WA.

Environmental Partners, Golder Associates. 2006b. Uplands corrective measures study, Volume Va: 2-66 area. Data gap investigation work plan. Prepared for The Boeing Company, Seattle, Washington. Environmental Partners, Inc., and Golder Associates, Seattle, WA.

Environmental Partners, Golder Associates. 2007a. Boeing Plant 2, Seattle/Tukwila, Washington. Uplands corrective measures study, Volume IIIb: South yard area. Data gap investigation report, part 1 of 2. Prepared for The Boeing Company, Seattle, Washington. Environmental Partners, Inc., and Golder Associates Seattle, WA.

Environmental Partners, Golder Associates. 2007b. Boeing Plant 2, Seattle/Tukwila, Washington. Uplands corrective measures study, Volume IVb: 2-60s area. Data gap investigation report. Prepared for The Boeing Company, Seattle, Washington. Environmental Partners, Inc., and Golder Associates, Seattle, WA.

Environmental Partners, Golder Associates. 2007c. Boeing Plant 2, Seattle/Tukwila, Washington. Uplands corrective measures study, Volume Vb: 2-66 area. Data gap investigation report, part 1 of 2. Prepared for The Boeing Company, Seattle, Washington. Environmental Partners, Inc., and Golder Associates, Seattle, WA.

Environmental Partners. 2008. CMS phase quarterly shoreline ground water monitoring report, November 2007, Boeing Plant 2, Seattle/Tukwila, Washington. Prepared for The Boeing Company. Environmental Partners, Inc., Issaquah, WA.

EPA. 2005. Rhône-Poulenc (Rhodia) sediment & porewater investigation Aug/Sept 2004. Data report: volatile organic compounds, metals, and pesticides/PCBs detected in sediment and porewater. Draft. US Environmental Protection Agency Region 10, Seattle, WA.

EPA. 2006. Statement of basis for remedy selection and corrective action complete without controls determination at Rhône-Poulenc, Inc., East Parcel located at 9229 East Marginal Way South, Tukwila, WA. EPA ID WAD 00928 2302.

Administrative Order on Consent 1091-11-20-3008(h). US Environmental Protection Agency Region 10, Seattle, WA.

EPA. 2008. Region 10 cleanup: Boeing Plant 2 [online]. US Environmental Protection Agency Region 10, Seattle, WA. Updated 4/1/08. [Cited 4/23/08.] Available from: http://yosemite.epa.gov/r10/cleanup.nsf/sites/BP2/.

ERM. 2000. Request for groundwater NFA determination. hydrogeologic investigation and site-specific action level for arsenic in groundwater, Boeing Isaacson site, VCP ID#NW0453. Prepared The Boeing Company. Environmental Resources Management, Bellevue, WA.

Ernst WD. 2008. Personal communication (e-mail to Sarah Fowler, Windward Environmental, regarding verification of Plant 2 BMP). The Boeing Company, Seattle, WA. October 21, 2008.

Farallon, Anchor. 2006. Final investigation data summary report, Jorgensen Forge facility. Prepared for the Earle M. Jorgensen Company. Farallon Consulting, LLC, Issaquah, WA, and Anchor Environmental, L.L.C., Seattle, WA.

Floyd|Snider. 2005. Memorandum to W. Ernst, The Boeing Company: Summary of recent storm system solids survey and source control sampling at Plant 2. Floyd|Snider, Inc., Seattle, WA.

Floyd|Snider. 2006. Memorandum dated October 5, 2006 from T. Colligan to W. Ernst, The Boeing Company: Boeing Plant 2 outfall overlay update re-evaluation. Floyd|Snider, Inc., Seattle, WA.

Floyd|Snider, Weston Solutions. 2005. Phase II transformer PCB investigation report. Prepared for The Boeing Company. Floyd|Snider, Inc. and Weston Solutions, Inc., Seattle, WA.

GeoEngineers. 2002. Round 15 groundwater monitoring, former Rhône-Poulenc site, 9229 East Marginal Way South, Tukwila, Washington. Prepared for RCI Environmental, Inc. Volume 1 of 2. GeoEngineers, Inc., Seattle, WA.

Geomatrix. 2007. Revised performance monitoring report, Round 34, December 2006. Former Rhone-Poulenc Site, Tukwila, WA. Prepared for Container Properties, LLC. Geomatrix Consultants, Inc., Seattle, WA.

Goldberg J. 2009. Personal communication (e-mail to S. Fowler and J. Buening, Windward Environmental, regarding comments on Agreed Order summary table provided by S. Good, Ecology, in 2/2009, with attached edited summary table). Senior Environmental Analyst, Seattle City Light, Seattle, WA. May 12, 2009.

Golder Associates. 2007. Stormwater source control round 1 sampling report (2006-2007) for Boeing Plant 2. Prepared for the Boeing Company. Golder Associates, Redmond, WA.

Golder Associates. 2008a. 2008 stormwater source control interim measure work plan for Boeing Plant 2. Prepared for the Boeing Company. Golder Associates, Redmond, WA.

Golder Associates. 2008b. Interim measure completion report: removal of stormwater lines X and Y (OA 23.1 and OA 23.2) in 2-60s area at Boeing Plant 2. Prepared for the Boeing Company. Golder Associates, Redmond, WA.

Golder Associates. 2008c. Phase 2 report and work plan: characterization of caulk in concrete pavements at Boeing Plant 2. Draft. Prepared for the Boeing Company. Golder Associates, Redmond, WA.

Golder Associates. 2008d. Stormwater source control round 2 sampling report 2007-2008 for Boeing Plant 2. Prepared for the Boeing Company. Golder Associates, Redmond, WA.

Good S. 2008. Personal communication (e-mail and attached Word file to Jeffrey Fellows, Windward Environmental, regarding SCA and SCAP status table). Environmental Planner, Washington Department of Ecology, Bellevue, WA. October 2, 2008.

Good S. 2009. Personal communication regarding Agreed Orders and other source control activity updates in LDW source control areas (e-mail exchange with Jenny Buening and Jeffrey Fellows, Windward Environmental, February 20 [with attached summary table] and March 16, 2009). Environmental Planner, Washington Department of Ecology, Bellevue, WA. 2/20/09 and 3/16/09.

Hart Crowser. 1986. Preliminary groundwater and soil quality assessment, Northwest Cooperage Company, Inc. Seattle, WA. August 1986. Hart Crowser & Associates Inc., Seattle, WA.

Hart Crowser. 1989a. Environmental assessment. Parcel E, soil and groundwater conditions, Evergreen Marine Leasing Property, Seattle, WA. Hart Crowser, Inc., Seattle, WA.

Hart Crowser. 1989b. Environmental assessment. Parcel F, soil and groundwater conditions, Evergreen Marine Leasing Property, Seattle, WA. Hart Crowser, Inc., Seattle, WA.

Hart Crowser. 1990. Supplemental site characterization report, Parcel D, Evergreen Marine Leasing Property, Seattle, WA. Hart Crowser, Inc., Seattle, WA.

Hart Crowser. 1996. Dry dock and graving dock discharge metals report, Duwamish Shipyard, Seattle, Washington. Hart Crowser, Inc., Seattle, WA.

Herrera. 2004. Summary report, Lower Duwamish Waterway outfall survey. Prepared for Seattle Public Utilities. Herrera Environmental Consultants, Inc., Seattle, WA.

Hiltner A. 2008. Personal communication (e-mail to Jeffrey Fellows, Windward Environmental, regarding response to 7-3-08 "SC in RI" meeting notes, with attached file: SC in RI meeting notes 7-3-08 agency edits.doc). US Environmental Protection Agency Region 10, Seattle, WA. August 5, 2008.

Integral. 2006a. Lower Duwamish Waterway Slip 4 Early Action Area, 60% design submittal, Design analysis report. Appendix A, Pre-design investigation data summary report. Prepared for City of Seattle. Integral Consulting, Inc., Mercer Island, WA.

Integral. 2006b. Lower Duwamish Waterway Slip 4 early action area: engineering evaluation/cost analysis. Prepared for City of Seattle and King County. Integral Consulting, Inc., Mercer Island, WA.

Integral. 2007. Lower Duwamish Waterway Slip 4 early action area: 100% design submittal design analysis report. Prepared for City of Seattle and King County. Integral Consulting, Inc., Mercer Island, WA.

IT Corporation. 2001. SWMU 16 and AOC 05 site assessment report, Boeing Developmental Center, Tukwila, Washington. Prepared for The Boeing Company. IT Corporation, Bothell, WA.

Kennedy/Jenks. 1996. Groundwater monitoring status report, north fire aisle, Kenworth Truck Company, Tukwila, Washington. Kennedy/Jenks Consultants, Federal Way, WA.

Kennedy/Jenks. 2002. Phase 1 data gaps investigation summary report. Prepared for PACCAR, Inc. Kennedy/Jenks Consultants, Federal Way, WA.

Kennedy/Jenks. 2007. Air sparging and soil vapor extraction system 2nd quarter 2007 operations report. East Marginal Way South Property. Prepared for PACCAR, Inc. Kennedy/Jenks Consultants, Federal Way, WA.

King County. 1996. Norfolk CSO sediment cleanup study. Prepared for Elliott Bay/Duwamish Restoration Program. King County Department of Natural Resources, Seattle, WA.

King County. 1999. Norfolk sediment remediation project-closure report. Prepared for Elliott Bay/Duwamish Restoration Program. King County Department of Natural Resources, Seattle, WA.

King County, Anchor, EcoChem. 2005. Duwamish/Diagonal CSO/SD cleanup study report. Final. Prepared for Elliott Bay/Duwamish Restoration Program panel. King County Department of Natural Resources, Anchor Environmental, L.L.C., and EcoChem, Inc., Seattle, WA.

King County. 2008a. Combined Sewer Overflow Control Program: 2008 CSO control plan update. Wastewater Treatment Division, King County Department of Natural Resources and Parks, Seattle, WA.

King County. 2008b. King County Parcel Viewer web page [online]. King County GIS Center, Seattle, WA. Available from: http://www.metrokc.gov/gis/index.htm.

King County, SPU. 2005. King County and Seattle Public Utilities source control program for the Lower Duwamish Waterway: June 2005 progress report. King County Department of Natural Resources and Parks and Seattle Public Utilities, Seattle, WA.

Landau. 1990. Environmental site assessment, First Interstate Bank of Washington property, 7400 8th Avenue South and 7343 East Marginal Way South, Seattle, Washington. Vol 1 of 2. Prepared for Boeing Environmental Affairs. Landau Associates, Inc., Edmonds, WA.

Landau. 2004. Construction completion report, stormwater treatment vault installation, Boeing Developmental Center. Landau Associates, Inc., Edmonds, WA.

McCrone L. 2008. Personal communication (e-mail from Lawrence McCrone, Exponent, to Sarah Good, Ecology, Re: Boeing Comments on draft Summary of Existing Information and Identification of Data Gaps Report for Early Action Area 6). Exponent, Bellevue, WA. March 19, 2008.

Onsite. 2003. Groundwater sampling results for Port of Seattle's Terminal 117. Letter report submitted to T. Newlon, Stoel Rives, LLP. Onsite Enterprises, Inc., Redmond, WA.

Pacific Groundwater Group. 2006. Port of Seattle T-108 interim groundwater and soil investigation. Pacific Groundwater Group, Seattle, WA.

Pacific Groundwater Group. 2007. Port of Seattle T-108 groundwater investigation final report. Pacific Groundwater Group, Seattle, WA.

Parametrix. 1990. Phase II site assessment - Appendix A (Well Installation Logs) and Appendix B (Analytical Results). No text. Parametrix, Inc., Bellevue, WA.

Parametrix. 2005. Results of the bank sediment and uplands soil sampling at the Duwamish Slip 4. Prepared for Washington State Department of Ecology. Parametrix, Inc., Bremerton, WA.

Pentec. 2002. Focused corrective measures report, southwest bank corrective measure, Boeing Plant 2. Pentec Environmental, Edmonds, WA.

Pinnacle Geosciences. 2005. Phase I environmental site assessment, Terminal 106 West, Building 1, 44 South Nevada Street, Seattle, Washington. Prepared for Port of Seattle. Pinnacle Geosciences, Inc., Bellevue, WA.

Project Performance Corporation. 2001. Data summary of PCB sampling from accumulated solids and construction materials in and around storm sewer lines

at the Developmental Center. Prepared for The Boeing Company. Project Performance Corporation, Bellevue, WA.

Project Performance Corporation. 2002. Summary of storm drain cleanout work conducted at Developmental Center. Prepared for The Boeing Company. Project Performance Corporation, Bellevue, WA.

Project Performance Corporation. 2003. Cleanup action report, sediment removal near south storm drain outfall, Boeing Developmental Center. Prepared for The Boeing Company. Project Performance Corporation, Bellevue, WA.

Renaud R. 2007. Electronic mail communication from Mr. Rick Renaud, King County International Airport to Ms. Blythe Mackey, Ecology and Environment, Inc. February 14, 2006. Stormwater catch basin sampling map and sampling result table. King County International Airport Seattle, WA.

Rhône-Poulenc. 1996. RCRA facility investigation (RFI) report for the Marginal Way facility. Round 3 data and sewer sediment technical memorandum. Prepared for US Environmental Protection Agency, Region 10. Rhône-Poulenc, Tukwila, WA.

RoseWater. 2006. Georgetown flume drainage improvements project preliminary engineering report. Prepared for Seattle Public Utilities. RoseWater Engineering, Seattle, WA.

SAIC. 2006a. Source Control Action Plan, Slip 4, Lower Duwamish Waterway. Task 2.3 - Soil and groundwater screening criteria. Draft. Science Applications International Corporation, Bothell, WA.

SAIC. 2006b. Technical memorandum: Crowley and First South properties, potential for Slip 4 sediment recontamination via groundwater discharge. Prepared for Toxics Cleanup Program, Washington State Department of Ecology. Science Applications International Corporation, Bothell, WA.

SAIC. 2007a. Lower Duwamish Waterway Slip 4. Technical memorandum: status of Slip 4 source control. Prepared for Toxics Cleanup Program, Washington State Department of Ecology. Science Applications International Corporation, Bothell, WA.

SAIC. 2007b. Lower Duwamish Waterway, early action area 2 data report: additional site characterization activities. Prepared for Toxics Cleanup Program, Washington State Department of Ecology. Science Applications International Corporation, Bothell, WA.

SAIC. 2007c. Lower Duwamish Waterway, early action area 2: summary of existing information and identification of data gaps. Prepared for Toxics Cleanup Program, Washington State Department of Ecology. Science Applications International Corporation, Bothell, WA.

SAIC. 2007d. Lower Duwamish Waterway, Glacier Bay source control area: summary of existing information and identification of data gaps. Prepared for Toxics Cleanup Program, Washington State Department of Ecology. Science Applications International Corporation, Bothell, WA.

SAIC. 2007e. North Boeing Field and Georgetown Steam Plant: Summary of existing information and identification of data gaps. Prepared for Toxics Cleanup Program, Washington State Department of Ecology. Science Applications International Corporation, Bothell, WA.

SAIC. 2008a. Lower Duwamish Waterway, RM 2.3-2.8 east, East Seattle Boiler Works to Slip 4: summary of existing information and identification of data gaps. Prepared for Toxics Cleanup Program, Washington State Department of Ecology. Science Applications International Corporation, Bothell, WA.

SAIC. 2008b. Lower Duwamish Waterway, RM 3.7-3.9 east, early action area 6: summary of existing information and identification of data gaps. Prepared for Toxics Cleanup Program, Washington State Department of Ecology. Science Applications International Corporation, Bothell, WA.

SAIC. 2008c. South Park Marina, Seattle, Washington: additional site characterization activities data report. Final. Prepared for Toxics Cleanup Program, Washington State Department of Ecology. Science Applications International Corporation, Bothell, WA.

Schmoyer B. 2008a. Personal communication (compact disk delivered to Jeffrey Fellows, Windward Environmental, containing unpublished data: GIS shapefiles for drainage basins used in the 2008 lateral loads report, GIS shapefiles for associated drainage lines, and Excel file with source-tracing data and sampling location coordinates). Seattle Public Utilities, Seattle, WA. July 18, 2008.

Schmoyer B. 2008b. Personal communication (e-mail exchange with Jenny Buening, Windward Environmental, regarding the historical uses of the I-5 storm drain and the Greeley Street sewer system, with attached maps). Seattle Public Utilities, Seattle, WA. October 17, 2008.

Schmoyer B. 2008c. Personal communication (e-mail to Jeffrey Fellows, Windward Environmental, regarding source tracing data presentation and missing X/Y coordinates). Seattle Public Utilities, Seattle, WA. October 24, 2008.

Schmoyer B. 2008d. Personal communication (e-mail to Windward Environmental regarding source data through December 2007, with Excel attachment: source_chemistry_thru_12-07_0ND_2B_10_20_08.xls). Seattle Public Utilities, Seattle, WA. October 20, 2008.

Schmoyer B. 2008e. Personal communication (telephone conversation with Sarah Fowler, Windward Environmental, regarding City of Seattle's comments on Appendix I). Seattle Public Utilities, Seattle, WA. October 24, 2008.

Schmoyer B. 2009. Personal communication (e-mail to Jeffrey Fellows, Windward Environmental, regarding correction of information for outfall #2041, with attached photos). Seattle Public Utilities, Seattle, WA. July 10, 2009.

SEA. 2004. Lower Duwamish Waterway, Slip 4 early action area. Summary of existing information and identification of data gaps. Prepared for City of Seattle and King County. Striplin Environmental Associates, Inc., Olympia, WA.

SEACOR. 1990. Report of preliminary results, soil and groundwater investigation, 7201 East Marginal Way South, Seattle, Washington, Sternoff Property, for the Department of Ecology. SEACOR, Bellevue, WA.

Seattle City Light. 2008. Environmental (SEPA) checklist, Georgetown flume remediation and drainage project. January 22, 2008. Seattle City Light, Seattle, WA.

SPU. 2003. Letter from Tanya Treat, Seattle Public Utilities, to Boyer Halvorsen, Boyer Alaska Barge Lines, RE: laboratory analytical results from February 11, 2003 Sediment Sampling. March 7, 2003. Seattle Public Utilities, Seattle, WA.

SPU. 2006. LDW: Inline sediment sample data. Preliminary. November 2006. Seattle Public Utilities, Seattle, WA.

SPU. 2008. Lower Duwamish Waterway, lateral load analysis for stormwater and city-owned CSOs. July 2008 update. Seattle Public Utilities, Seattle, WA.

Stern J. 2002. Personal communication (e-mail to K. Godtfredsen, Windward Environmental, regarding unpublished King County CSO data). Senior water quality planner, King County Department of Natural Resources and Parks, Seattle, WA. December 19, 2002.

Stern J. 2008. Personal communication (e-mail to Jenny Buening, Windward Environmental, regarding historical uses of the E Marginal Way EOF). Senior water quality planner, King County Department of Natural Resources and Parks, Seattle, WA. October 28, 2008.

Sutton V. 2008a. Personal communication (telephone conversation with J. Buening, Windward Environmental, regarding Crowley Marine Services property in Slip 4 Source Control Area). Northwest Regional Office, Washington Department of Ecology, Bellevue, WA. May 12, 2008.

Sutton V. 2008b. Personal communication (telephone conversation with J. Buening, Windward Environmental, regarding follow-up on Crowley Marine Services property in Slip 4 Source Control Area: progress of Agreed Order negotiations

and catch basin cleaning). Northwest Regional Office, Washington Department of Ecology, Bellevue, WA. October 27, 2008.

Tetra Tech. 1988. Elliott Bay action program: evaluation of potential contaminant sources. Final report plus appendices. Prepared for Puget Sound Estuary Program, US Environmental Protection Agency, Region 10. Tetra Tech, Inc., Bellevue, WA.

Ticeson SD. 2007. Personal communication (email to Beth Schmoyer, Seattle Public Utilities regarding ownership of the 2nd Ave S storm drain)

Seattle Public Utilities, Seattle, WA.

Tiffany B. 2008a. Personal communication (e-mail exchange with L. Cognato, Windward Environmental, regarding FAA requirements for King County International Airport). Water Quality Engineer, King County Industrial Waste Program, Seattle, WA. May 29, 2008.

Tiffany B. 2008b. Personal communication (telephone conversation with J. Buening, Windward Environmental, regarding stormwater vault source tracing samples at King County International Airport). Water Quality Engineer, King County Industrial Waste Program, Seattle, WA. May 9, 2008.

Weston. 1998. Comprehensive RCRA facility investigation report, Boeing Plant 2, Seattle/Tukwila, Washington. Roy F. Weston, Inc., Seattle, WA.

Weston. 1999. Site inspection report, Lower Duwamish River (RK 2.5-11.5), Seattle, Washington. Vol 1-Report and appendices. Prepared for US Environmental Protection Agency, Region 10. Roy F. Weston, Inc., Seattle, WA.

Weston Solutions. 2000. Technical memorandum: SWMU/AOC/OA-specific data presentation, RECRA corrective measures study, Volume I. Prepared for The Boeing Company. Weston Solutions, Inc., Seattle, WA.

Windward. 2003a. Lower Duwamish Waterway remedial investigation. Phase 1 remedial investigation report. Prepared for Lower Duwamish Waterway Group. Windward Environmental LLC, Seattle, WA.

Windward. 2003b. Lower Duwamish Waterway remedial investigation. Phase 1 remedial investigation report. Appendix G: Groundwater pathway assessment. Prepared for Lower Duwamish Waterway Group. Windward Environmental LLC, Seattle, WA.

Windward. 2003c. Lower Duwamish Waterway remedial investigation. Task 5: Identification of candidate sites for early action, technical memorandum: Data analysis and candidate site identification. Prepared for Lower Duwamish Waterway Group. Windward Environmental LLC, Seattle, WA.

Windward. 2004. Lower Duwamish Waterway remedial investigation. Data report: Survey and sampling of Lower Duwamish Waterway seeps. Prepared for Lower Duwamish Waterway Group. Windward Environmental LLC, Seattle, WA.

Windward. 2006a. Lower Duwamish Waterway remedial investigation. Data and analysis report: porewater sampling of Lower Duwamish Waterway. Prepared for Lower Duwamish Waterway Group. Windward Environmental LLC, Seattle, WA.

Windward. 2006b. Lower Duwamish Waterway remedial investigation. Memorandum to Lower Duwamish Waterway Group regarding LDW outfall overlay update. Draft final dated October, 2006. Windward Environmental LLC, Seattle, WA.

Windward. 2007. Lower Duwamish Waterway remedial investigation. Data report: Round 3 surface sediment sampling for chemical analyses. Prepared for Lower Duwamish Waterway Group. Windward Environmental LLC, Seattle, WA.

Windward, DOF. 2006. Terminal 117 upland area soil investigation field sampling and data report. Prepared for the Port of Seattle. Windward Environmental LLC and Dalton, Olmsted & Fuglevand, Inc., Seattle, WA.

Windward, DOF, Onsite. 2003. Lower Duwamish Waterway Superfund site, Terminal 117 early action area. Task 1: Summary of existing information and data gaps analysis report. Prepared for the Port of Seattle. Windward Environmental LLC, Dalton, Olmsted & Fuglevand, Inc., and Onsite Enterprises, Inc., Seattle, WA.

Windward, DOF, Onsite. 2005a. Lower Duwamish Waterway Superfund site, Terminal 117 early action area. T-117 sediment, soil and water field sampling, cruise and data report. Final. Prepared for the Port of Seattle. Windward Environmental LLC, Dalton, Olmsted & Fuglevand, Inc., and Onsite Enterprises, Inc., Seattle, WA.

Windward, DOF, Onsite. 2005b. Lower Duwamish Waterway Superfund site, Terminal 117 early action area. Terminal 117 engineering evaluation/cost analysis. Prepared for the Port of Seattle. Windward Environmental LLC, Dalton, Olmsted & Fuglevand, Inc., and Onsite Enterprises, Inc., Seattle, WA.

Windward, DOF, Onsite. 2005c. Lower Duwamish Waterway Superfund site, Terminal 117 upland area. T-117 upland soil - June 2005 field sampling and data report. Prepared for the Port of Seattle. Windward Environmental LLC, Dalton, Olmsted & Fuglevand, Inc., and Onsite Enterprises, Inc., Seattle, WA.

Windward, DOF, Onsite. 2005d. T-117 uplands soil sampling - August 2005 data memorandum. Prepared for the Port of Seattle. Windward Environmental LLC, Dalton, Olmsted & Fuglevand, Inc., and Onsite Enterprises, Inc., Seattle, WA.

Windward, ENSR, Integral, DOF. 2008. Terminal 117 Early Action Area. Revised engineering evaluation/cost analysis. Draft. Prepared for the Port of Seattle and the City of Seattle. Windward Environmental LLC, Seattle, WA; ENSR Corporation, Seattle, WA; Integral Consulting, Inc., Mercer Island, WA; and Dalton, Olmsted & Fuglevand, Inc., Seattle, WA.

Attachment 1. LDW Source Control Area Facility Tables

Acronyms and Abbreviations

Acronym	Definition
ac	acre
CSCSL	Confirmed and Suspected Contaminated Sites List
CSO	combined sewer overflow
E	east
Ecology	Washington State Department of Ecology
EPA	US Environmental Protection Agency
ID	identification
KC	King County
KCIA	King County International Airport
KCIWP	King County Industrial Waste Program
LDW	Lower Duwamish Waterway
No.	number
NPDES	National Pollutant Discharge Elimination System
PSCAA	Puget Sound Clean Air Agency
RI	remedial investigation
SCA	source control area
SD	storm drain
SPU	Seattle Public Utilities
TRI	toxic release inventory
UST/LUST	underground storage tank/leaking underground storage tank
W	west

Introduction

The tables included in this attachment include facility-specific information for adjacent properties associated with each of the 11 source control areas (SCAs) summarized in Appendix I. A facility table was also prepared for upland properties associated with the 11 SCAs if source tracing data were reported in source documents for a given SCA. The facility tables summarize information presented in the source documents for each SCA (see individual source document lists in Appendix I), the King County Parcel Viewer website (King County 2008), and a corridor study report for the Lower Duwamish Waterway(LDW) (EDR 2002).

1 DUWAMISH/DIAGONAL WAY SCA

Table 1-1. T-106 SW

FACILITY SUMMARY	
Address	1 S Idaho Street
Property Owner	Port of Seattle
Property Leasee/Operator	Container Care International (name changed to ConGlobal Industries)
Tax Parcel No.	7666700390[a]
Parcel Size	31.30 ac[a] (approximately 14 ac of the SW portion of parcel is T-106 SW)
Facility/Site ID	54918197 (Container Care ID No.), 17818733 (former Coastal Trailer Repair, Inc. ID No.)
EPA ID No.	WAD040197014
NPDES Permit No.	S03-001581
UST/LUST ID No.	nr
Listed on CSCSL	No
TRI No.	nr
KCIWP No.	nr
PSCAA ID	10438

Note: This property is currently referred to as T-106 (rather than T-106 SW).

[a] Parcel number and acreage includes both T-106SW and T-106W.

Table 1-2. T-108

FACILITY SUMMARY	
Address	4525 Diagonal Avenue S
Property Owner	Port of Seattle
Property Leasee/Operator	Container Care International (name changed to ConGlobal Industries)
Tax Parcel No.	7666700515 and 7666700510
Parcel Size	approximately 20 ac for both parcels
Facility/Site ID	2344
EPA ID No.	nr
NPDES Permit No.	SO3-010569 (ConGlobal Industries)
UST/LUST ID No.	None
Listed on CSCSL	yes; ID No.2344 (Chevron Seattle Terminal 4097)
TRI No.	nr
KCIWP No.	nr

Table 1-3. Federal Center South

FACILITY SUMMARY	
Address	4735 E Marginal Way S
Property Owner	U.S. Government
Property Leasee/Operator	General Services Administration
Tax Parcel No.	3573200975
Parcel Size	32.99 ac
Facility/Site ID	10233917
EPA ID No.	WA8470031891
NPDES Permit No.	nr
UST/LUST ID No.	10042
Listed on CSCSL	yes; ID No. 10233917
TRI No.	nr
KCIWP No.	nr
Listed in SPU Spills Database	yes

Table 1-4. UPRR Argo Fueling

FACILITY SUMMARY	
Address	4300 Colorado Ave S and 4700 Denver Ave S
Property Owner	Union Pacific Railroad Co.
Property Leasee/Operator	Union Pacific Railroad Co.
Tax Parcel No.	1824049008 and 7666207525
Parcel Size	11.11 ac
Facility/Site ID	21429717 (UPRR/Argo Yard) and 23236296 (Leo Fix Transfer and Storage Co Inc)
EPA ID No.	WAH000000992
NPDES Permit No.	nr
UST/LUST ID No.	1621 (Leo Fix Transfer and Storage Co Inc)
Listed on CSCSL	No
TRI No.	nr
KCIWP No.	668-03
Ecology's Spill List	IDs 554023 and 551354

2 SLIP 3 TO SEATTLE BOILER WORKS SCA

Table 2-1. SCS Refrigerated Services

FACILITY SUMMARY	
Address	303 South River Street
Property Owner	SCS Holding LLC
Property Leasee/Operator	SCS Refrigerated Services
Tax Parcel No.	5367204100
Parcel Size	3.58 acres
Facility/Site ID	34383748
EPA ID No.	nr
NPDES Permit No.	SO3005565
UST/LUST ID No.	nr
Listed on CSCSL	No
TRI No.	nr
KCIWP No.	nr
OTHER	nr

Table 2-2. Seattle Distribution Center

FACILITY SUMMARY	
Address	6701 East Marginal Way South
Property Owner	CLPF-Seattle Distribution Center LP
Property Leasee/Operator	Seattle Distribution Center
Tax Parcel No.	5367204080
Parcel Size	6.96 acres
Facility/Site ID	nr
EPA ID No.	nr
NPDES Permit No.	nr
UST/LUST ID No.	nr
Listed on CSCSL	No
TRI No.	nr
KCIWP No.	nr
OTHER	nr

Table 2-3. Glacier Marine Services

FACILITY SUMMARY	
Address	6701 Fox Avenue South
Property Owner	Seatac Marine Properties LLC
Property Leasee/Operator	Glacier Marine Services
Tax Parcel No.	0001800104 (north) 0001800128 (south)
Parcel Size	5.85 acres (north) 5.24 acres (south)
Facility/Site ID	22653378
EPA ID No.	WAD980977128 (inactive since 12/31/2004)
NPDES Permit No.	SO3000962
UST/LUST ID No.	11256
Listed on CSCSL	No
TRI No.	nr
KCIWP No.	nr
OTHER	nr

3 SEATTLE BOILER WORKS TO SLIP 4 SCA

Table 3-1. Crowley Marine Services

FACILITY SUMMARY	
Address	7400 8th Ave S
Property Owner	Crowley Marine Services
Property Leasee/Operator	Alaska Logistics
Tax Parcel No.	2136200641
Parcel Size	15.86 ac
Facility/Site ID	1940187 (Crowley Marine Services) and 63123962 (Alaska Logistics)
EPA ID No.	WAD981768377 (Crowley Marine Services; inactive), WAD988470647 (Alaska Logistics), WAD980981846 (Samson Tug and Barge)
NPDES Permit No.	WAR009728 (expired 5/31/08)
UST/LUST ID No.	nr
Listed on CSCSL	No
TRI No.	nr
KCIWP No.	nr

Table 3-2. Guimont Parcel (Dawn Food Products)

FACILITY SUMMARY	
Address	6901 Fox Avenue S
Property Owner	William P. Guimont
Property Leasee/Operator	Dawn Food Products, Inc.
Tax Parcel No.	00018000113
Parcel Size	5.42 acres
Facility/Site ID	57331171
EPA ID No.	nr
NPDES Permit No.	SO3000098 (inactive)
UST/LUST ID No.	nr
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	7043 (KC Discharge permit)
SIC Code	2045: Prepared Flour Mixes/Doughs

Table 3-3. Puget Sound Truck Lines

FACILITY SUMMARY	
Address	7303 8th Avenue S (Puget Sound Truck Lines), 7401 8th Avenue S (Phil's Finishing Touch)
Property Owner	R&A Properties, LLC (Parcel 0681), Puget Sound Truck lines (Parcel 0670)
Property Leasee/Operator	Puget Sound Truck Lines
Tax Parcel No.	2136200681, 2136200670
Parcel Size	3.83 acres, 2.50 acres
Facility/Site ID	41684823 (Puget Sound Truck Lines), 26468911 (Phil's Finishing Touch)
EPA ID No.	WAD173274499 (inactive), WAD982653271 (inactive)
NPDES Permit No.	WAR000949, SO3000949D
UST/LUST ID No.	7820
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	nr
SIC Code	7538 (General Automotive Repair Shops), 4231 (Terminal Maintenance Facilities for Motor Freight Transportation), 7532 (Top, Body, and Upholstery Repair Shops and Paint Shops)

Table 3-4. Seattle Boiler Works

FACILITY SUMMARY	
Address	500 S Myrtle Street
Property Owner	Frederick J. Hopkins Family Trust
Property Leasee/Operator	Seattle Boiler Works
Tax Parcel No.	001800091
Parcel Size	4.40 acres
Facility/Site ID	17577864
EPA ID No.	nr
NPDES Permit No.	SO3002208
UST/LUST ID No.	8147
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	nr
SIC Code	3499: Fabrication of metal products

Table 3-5. Seattle City Light

FACILITY SUMMARY	
Address	7551 8th Avenue S
Property Owner	Sandra L. Campbell
Property Leasee/Operator	Seattle City Light
Tax Parcel No.	2136200666
Parcel Size	0.27 acres
Facility/Site ID	nr
EPA ID No.	nr
NPDES Permit No.	nr
UST/LUST ID No.	nr
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	nr
SIC Code	nr

Table 3-6. Seattle Iron and Metals Corporation

FACILITY SUMMARY	
Address	601 S Myrtle Street, 620 S Othello Street
Property Owner	Shalmar Group
Property Leasee/Operator	Seattle Iron and Metals Corporation
Tax Parcel No.	213620076, 2924049089
Parcel Size	8.22 acres, 1.44 acres
Facility/Site ID	12153465 (Myrtle Street property), 94727791 (Seattle Iron and Metals), 9872313 (whitehead Company), 6368989 (All Alaskan Seafoods)
EPA ID No.	WAH000010678
NPDES Permit No.	WA0031968A (Individual), SO3003645 (General- to be canceled)
UST/LUST ID No.	9634 (Whitehead Company), 10855 (Manson Construction)
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	nr
VCP ID	NW0093

Table 3-7. Former Sternoff site

FACILITY SUMMARY	
Address	7201 East Marginal Way S.
Property Owner	Ellis Garage, LLC
Property Leasee/Operator	CDL Recycle
Tax Parcel No.	2136200075
Parcel Size	1.85 acres
Facility/Site ID	2057
EPA ID No.	WAH000023432 (inactive)
NPDES Permit No.	nr
UST/LUST ID No.	nr
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	nr
SIC Code	33: Primary Metal Industries

4 SLIP 4 SCA

Table 4-1. Boeing Plant 2

FACILITY SUMMARY	
Address	1135 S Webster St, 7700 and 7755 E Marginal Way S
Property Owner	The Boeing Company
Property Leasee/Operator	The Boeing Company
Tax Parcel No.	0022000005
Parcel Size	37.45 ac[a]
Facility/Site ID	2100
EPA ID No.	WAR000482
NPDES Permit No.	SO3000482D, WAR000482
UST/LUST ID No.	2100
Listed on CSCSL	Yes; facility ID 2100
TRI No.	98108BNGRS77
KCIWP No.	nr
PSCAA ID No.	21147

[a] The Slip 4 SCA includes 17.5 acres of the northwestern portion of the parcel; the rest of the parcel is discussed in the Boeing Plant 2/Jorgensen Forge SCA.

Table 4-2. Crowley Marine Services

FACILITY SUMMARY	
Address	7400 8th Ave S
Property Owner	Crowley Marine Services
Property Leasee/Operator	Alaska Logistics
Tax Parcel No.	2136200641
Parcel Size	15.86 ac
Facility/Site ID	1940187 (Crowley Marine Services) and 63123962 (Alaska Logistics)
EPA ID No.	WAD981768377 (Crowley Marine Services; inactive), WAD988470647 (Alaska Logistics), WAD980981846 (Samson Tug and Barge)
NPDES Permit No.	WAR009728 (expired 5/31/08)
UST/LUST ID No.	nr
Listed on CSCSL	No
TRI No.	nr
KCIWP No.	nr

Table 4-3. First South Properties

FACILITY SUMMARY	
Address	7343 E Marginal Way S
Property Owner	First South Properties
Property Leasee/Operator	Emerald Services
Tax Parcel No.	2924049043
Parcel Size	5.27 ac
Facility/Site ID	nr
EPA ID No.	WAD058364647
NPDES Permit No.	SO3002641C (Cedar Grove Composting, expired 9/20/07)
UST/LUST ID No.	nr
Listed on CSCSL	2462 (NFA granted; listing was for Evergreen Marine Leasing, a former tenant)
TRI No.	nr
KCIWP No.	7725-02 (Emerald Services)

Table 4-4. Georgetown Steam Plant

FACILITY SUMMARY	
Address	6605 13th Avenue S
Property Owner	Seattle City Light
Property Leasee/Operator	Seattle City Light
Tax Parcel No.	7006700570
Parcel Size	7.29 ac
Facility/Site ID	6487827
EPA ID No.	nr
NPDES Permit No.	nr
UST/LUST ID No.	63485131
Listed on CSCSL	6487827
TRI No.	nr
KCIWP No.	nr

Table 4-5. King County International Airport (northern drainage basin)

FACILITY SUMMARY	
Address	multiple street addresses along Perimeter Road S
Property Owner	King County
Property Leasee/Operator	multiple tenants on KCIA site, including The Boeing Company at NBF
Tax Parcel No.	2824049007
Parcel Size	564.80 ac[a]
Facility/Site ID	2051
EPA ID No.	WAD980986848
NPDES Permit No.	SO3000343D
UST/LUST ID No.	2051
Listed on CSCSL	2051 (NFA)
TRI No.	nr
KCIWP No.	nr
PSCAA ID	21407

[a] Parcel acreage includes the portion leased by The Boeing Company as NBF.

Table 4-6. North Boeing Field

FACILITY SUMMARY	
Address	7400 E Marginal Way S
Property Owner	The Boeing Company and King County
Property Leasee/Operator	The Boeing Company
Tax Parcel No.	2824049007 (parcel owned by King County), 2924049106 and 2924049066 (owned by The Boeing Company)
Parcel Size	approximately 130 ac of the 565-ac KCIA parcel no. 2824049007
Facility/Site ID	2117
EPA ID No.	WAD980982037
NPDES Permit No.	SO3000226D, WA0000868, and WAR000226
UST/LUST ID No.	2753918
Listed on CSCSL	No
TRI No.	98108THBNG7500E
KCIWP No.	550-02
PSCAA ID	21147
RCRA LQG	RCRA ID No. WAD980982037

5 BOEING PLANT 2/JORGENSEN FORGE SCA

Table 5-1. Boeing Plant 2

FACILITY SUMMARY	
Address	7755 E Marginal Way S, 1135 S Webster Street
Property Owner	Boeing
Property Leasee/Operator	Boeing
Tax Parcel No.	0001600020, 3324049002, 2824049009, 2185000005, 0022000005, 2924049056, 2924049112, 0022000195
Parcel Size	29.99 acres, 28.65 acres, 8.02 acres, 6.07 acres, 37.5 acres, 0.23 acres, 1.61 acres, 0.5 acres
Facility/Site ID	2100
EPA ID No.	WAD009256819
NPDES Permit No.	SO3000482D
UST/LUST ID No.	Not listed
Listed on CSCSL	No
TRI No.	98108BNGRS7755E
KCIWP No.	7811-01
SIC code	3728

Table 5-2. Jorgensen Forge

FACILITY SUMMARY	
Address	8531 E Marginal Way S
Property Owner	Jorgensen Forge Corporation
Property Leasee/Operator	Jorgensen Forge Corporation
Tax Parcel No.	0001600023
Parcel Size	21.6 acres
Facility/Site ID	2382
EPA ID No.	WAD000602813
NPDES Permit No.	SO3003231C
UST/LUST ID No.	nr
Listed on CSCSL	No
TRI No.	98108RLMJR8531E
KCIWP No.	nr

Table 5-3. KCIA

FACILITY SUMMARY	
Address	6505 Perimeter Road S (portion in EAA-4), 7277 Perimeter Road S, 6518 Ellis Avenue
Property Owner	King County
Property Leasee/Operator	King County
Tax Parcel No.	2824049007
Parcel Size	564.77
Facility/Site ID	2387398
EPA ID No.	WAD980986848
NPDES Permit No.	SO3000343D
UST/LUST ID No.	None within the Boeing Plant 2/Jorgensen Forge SCA drainage basin
Listed on CSCSL	nr
TRI No.	None
KCIWP No.	4109-01

6 BOEING ISAACSON/CENTRAL KCIA SCA

Table 6-1. Boeing Isaacson

FACILITY SUMMARY	
Address	8541 and 8625 E Marginal Way S
Property Owner	The Boeing Company
Property Leasee/Operator	The Boeing Company
Tax Parcel No.	0001600014
Parcel Size	9.84 ac
Facility/Site ID	1138721 (Boeing Isaacson Property) and 2218 (Boeing Isaacson Thompson)
EPA ID No.	WAD980836159 (inactive)
NPDES Permit No.	SO3000148
UST/LUST ID No.	nr
Listed on CSCSL	Yes
TRI No.	nr
KCIWP No.	nr

Table 6-2. Boeing Thompson

FACILITY SUMMARY	
Address	8541, 8701, 8770, and 8811 E Marginal Way S
Property Owner	The Boeing Company
Property Leasee/Operator	The Boeing Company
Tax Parcel No.	0007400033
Parcel Size	19.35 ac
Facility/Site ID	83767996 (Boeing Thompson), 4274402 (Boeing Thompson Site), and 2218 (Boeing Isaacson Thompson)
EPA ID No.	WAD980982912
NPDES Permit No.	SO3000148
UST/LUST ID No.	10410
Listed on CSCSL	Yes
TRI No.	nr
KCIWP No.	nr
Listed on RCRA-LQG	Yes

Table 6-3. KCIA (central drainage basin)

FACILITY SUMMARY	
Address	8700 East Marginal Way S and 6771 and 7299 Perimeter Rd S
Property Owner	King County
Property Leasee/Operator	Various tenants
Tax Parcel No.	0001600019, 0001600049, 3324049011, 0007400032, 5422600160, and 2824049007
Parcel Size	585.92 ac (for all parcels combined)
Facility/Site ID	2387398
EPA ID No.	WAH000031371 (Inactive)
NPDES Permit No.	SO3000343 (KCIA Maintenance Facility and runways)
UST/LUST ID No.	nr
Listed on CSCSL	Multiple airport tenant facilities are listed on the CSCSL
TRI No.	nr
KCIWP No.	nr

7 SLIP 6 SCA

Table 7-1. Boeing Developmental Center (northern drainage area)

FACILITY SUMMARY	
Address	9725 East Marginal Way South
Property Owner	The Boeing Company
Tax Parcel No./Size	5624201032 (25.78 acres)
	5624201038 (3.78 acres)
	5624201036 (1.63 acres)
Facility/Site ID	2101
EPA ID No.	WAD093639946
NPDES Permit No.	SO3000146D
UST/LUST ID No.	10408
Listed on CSCSL	Yes
TRI No.	98108BNGDV9725E
KCIWP	526-04
Other	nr

Table 7-2. Former PACCAR site

FACILITY SUMMARY	
Address	8801 East Marginal Way South
Property Owner	Merrill Creek Holdings, LLC
Property Lessee/Operator	Insurance Auto Auction, Inc.
Tax Parcel No.	5422600060
Parcel Size	24.30 acres
Facility/Site ID	2072
EPA ID No	WAD009249509
NPDES Permit No.	SO3008681A (IAAI)
UST/LUST ID No.	8218 / 552588
Listed on CSCSL	Yes
TRI No.	98108KNWRT8801E
KCIWP	nr
Other	nr

Table 7-3. Former Rhone-Poulenc site

FACILITY SUMMARY	
Address	9229 East Marginal Way South
Property Owner	Container Properties (West Parcel)
	Museum of Flight (East Parcel)
Property Lessee/Operator	IAAI (West Parcel)
Tax Parcel No.	5422600010 (West Parcel)
	5422600020 (East Parcel)
Parcel Size	13.15 acres (West Parcel)
	6.47 acres (East Parcel)
Facility/Site ID	2150
EPA ID No.	WAD009282302
NPDES Permit No.	SO3008681A (West Parcel)
UST/LUST ID No.	Not Listed
Listed on CSCSL	Yes
TRI No.	98108RHNPL9229E
KCIWP	7789-01 (West Parcel)
Other	nr

Table 7-4. King County International Airport (south-central drainage basin)

FACILITY SUMMARY	
Address	7277 Perimeter Road South (KCIA)
	6518 Ellis Avenue (KCIA Maintenance Facility)
	6505 Perimeter Road South (Parcel within Slip 6)
Property Owner	King County
Tax Parcel No.	2824049007
Parcel Size	564.77 acres
Facility/Site ID	2387398 (KCIA)
	2051 (KCIA Maintenance Facility)
EPA ID No.	WAH000031371 (inactive)
	WAD980986848 (KCIA Maintenance Facility)
NPDES Permit No.	SO3000343 (KCIA Maintenance Facility and runways)
UST/LUST ID No.	8341 (KCIA Maintenance Facility)
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	4109-01 (Transportation Facility Operations)
Other	nr

8 NORFOLK CSO/SD SCA

Table 8-1. Arco Gas Station

FACILITY SUMMARY	
Address	9834 Martin Luther King Jr Way S, 9830 Martin Luther King Way S (former)
Property Owner	John Eastey
Property Leasee/Operator	nr
Tax Parcel No.	0323049008
Parcel Size	2.95 acre
Facility/Site ID	29429665
EPA ID No.	nr
NPDES Permit No.	nr
UST/LUST ID No.	Listed (under 9840 Martin Luther King Way S)
Listed on CSCSL	Listed (under 9840 Martin Luther King Way S)
TRI No.	nr
KCIWP No.	nr

Table 8-2. Boeing Developmental Center

FACILITY SUMMARY	
Address	9725 East Marginal Way South
Property Owner	The Boeing Company, East Marginal Associates, Mellon Trust of Washington-Desimone
Property Leasee/Operator	The Boeing Company
Tax Parcel No.	0003400028, 562401032,5624201036, 5624201038, 0423049183, 0423049016, 0003400048, 0003400026, 5624200990
Parcel Size	2.25 acres, 25.78 acres, 3.25 acres, 3.78 acres, 0.81 acres, 3.07 acres, 1.38 acres, 3.88 acres, 14.21 acres
Facility/Site ID	2101
EPA ID No.	WAD093639946
NPDES Permit No.	SO3000146D
UST/LUST ID No.	10408
Listed on CSCSL	Yes
TRI No.	98108BNGDV9725E
KCIWP	526-04

Table 8-3. Boeing Military Flight Center

FACILITY SUMMARY	
Address	10002 E Marginal Way S
Property Owner	The Boeing Company
Property Leasee/Operator	The Boeing Company
Tax Parcel No.	0003400021
Parcel Size	24.6 acres
Facility/Site ID	7711519
EPA ID No.	WAD988475943
NPDES Permit No.	SO3000150D (Stormwater general permit)
UST/LUST ID No.	nr
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	363-02

Table 8-4. King County International Airport (southern drainage basin)

FACILITY SUMMARY	
Address	7277 Perimeter Road S, 6518 Ellis Avenue, 6505 Perimeter Road S
Property Owner	King County
Property Leasee/Operator	King County International Airport
Tax Parcel No.	2824049007
Parcel Size	564.77 acres
Facility/Site ID	nr
EPA ID No.	nr
NPDES Permit No.	SO3000343D
UST/LUST ID No.	Listed
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	nr

9 GLACIER BAY SCA

Table 9-1. Alaska Marine Lines

FACILITY SUMMARY	
Address	5615 W Marginal Way SSW
Property Owner	Alaska Marine Lines
Property Leasee/Operator	Alaska Marine Lines
Tax Parcel No.	1924049026
Parcel Size	13.8 acres
Facility/Site ID	nr
EPA ID No.	RCRA WA0000062323
NPDES Permit No.	SO3-001365D
UST/LUST ID No.	On LUST database; no ID provided
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	459-02

Table 9-2. Chemithon Corporation

FACILITY SUMMARY	
Address	5430 W Marginal Way SW
Property Owner	Chemithon Corporation
Property Leasee/Operator	Chemithon Corporation
Tax Parcel No.	1924049098
Parcel Size	2.66 acres
Facility/Site ID	nr
EPA ID No.	RCRA WAD009244898
NPDES Permit No.	SO3-000033D
UST/LUST ID No.	nr
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	nr
PSCAA No.	13182

Table 9-3. Duwamish Shipyard

FACILITY SUMMARY	
Address	5658 W Marginal Way SW
Property Owner	Duwamish Shipyard, Inc.
Property Leasee/Operator	Duwamish Shipyard, Inc.
Tax Parcel No.	1924049028
Parcel Size	4.93 acres
Facility/Site ID	nr
EPA ID No.	RCRA WAD009244997
NPDES Permit No.	WA0030937C
UST/LUST ID No.	On LUST database; no ID provided
Listed on CSCSL	YES
TRI No.	nr
KCIWP No.	nr
METRO Waste Discharge Permit:	7704-01 (effective 10/16/00); 7704-02 (effective 10/19/05)
Clean Air Act ID No.	5303300106
PSCAA No.	10654

Table 9-4. Glacier Northwest

FACILITY SUMMARY	
Address	5900 W Marginal Way SW
Property Owner	Glacier Northwest, Inc.
Property Leasee/Operator	Glacier Northwest, Inc.
Tax Parcel No.	1924049029
Parcel Size	18.2 acres
Facility/Site ID	nr
EPA ID No.	RCRA WAD151474368 (cement terminal)
EPA ID No.	RCRA WAH000007773 (truck stop)
NPDES Permit No.	WAG-50-3347 (Sand and Gravel – effective 12/04/01, cancelled 01/25/06)
UST/LUST ID No.	nr
Listed on CSCSL	Yes
TRI No.	nr
KCIWP No.	510-02
PSCAA ID No.	11872

Table 9-5. Former MRI Corporation site

FACILITY SUMMARY	
Address	600 W Marginal Way SW
Property Owner	Port of Seattle
Property Leasee/Operator	Polar Supply
Tax Parcel No.	5367202505 (as part of Terminal 115 property)
Parcel Size	1.88 acres (under lease from the Port of Seattle)
Facility/Site ID	nr
EPA ID No.	nr
NPDES Permit No.	nr
UST/LUST ID No.	nr
Listed on CSCSL	Yes
TRI No.	nr
KCIWP No.	7067

10 TROTSKY INLET SCA

Table 10-1. Boyer Towing

FACILITY SUMMARY	
Address	7201 Second Avenue S
Property Owner	Boyer Towing, Inc
Property Leasee/Operator	nr
Tax Parcel No.	6871200045, 6871200620, 6871200811
Parcel Size	0.13 acres, 0.79 acres, 0.27 acres
Facility/Site ID	None
EPA ID No.	nr
NPDES Permit No.	nr
UST/LUST ID No.	nr
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	nr

Table 10-2. Douglas Management Company

FACILITY SUMMARY	
Address	7100 Second Avenue SW (Alaska Marine lines)
Property Owner	Douglas management Company
Property Leasee/Operator	Alaska Marine Lines
Tax Parcel No.	2924049090
Parcel Size	3.09
Facility/Site ID	None
EPA ID No.	nr
NPDES Permit No.	SO3-002471 (stormwater discharge permit for Alaska Marine Lines)
UST/LUST ID No.	nr
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	nr

Table 10-3. Trotsky

FACILITY SUMMARY	
Address	7152 First Avenue S
Property Owner	Industrial Container Services, LLC
Property Leasee/Operator	Herman and Jacqueline Trotsky
Tax Parcel No.	292409108, 2924049030, 2924049004
Parcel Size	1 acre, 5.09 acres, 1.04 acres
Facility/Site ID	nr
EPA ID No.	WAD000066084
NPDES Permit No.	nr
UST/LUST ID No.	nr
Listed on CSCSL	Listed
TRI No.	nr
KCIWP No.	7130
PSCAA Air permit No.	11683

Table 10-4. Wells Trucking and Leasing

FACILITY SUMMARY	
Address	7265 Second Ave. S.
Property Owner	Boyer Towing
Property Leasee/Operator	Wells Trucking and Leasing
Tax Parcel No.	6871200750
Parcel Size	0.62 acres
Facility/Site ID	nr
EPA ID No.	nr
NPDES Permit No.	nr
UST/LUST ID No.	nr
Listed on CSCSL	nr
TRI No.	nr
KCIWP No.	nr

11 TERMINAL-117 SCA

Table 11-1. Terminal 117

FACILITY SUMMARY	
Address	8700 Dallas Ave S, 98108
Property Owner	Port of Seattle
Property Leasee/Operator	Port of Seattle
Tax Parcel No.	0001600044
Parcel Size	2.39 acres
Facility/Site ID	2202
EPA ID No.	WAR000010413
NPDES Permit No.	nr
UST/LUST ID No.	nr
Listed on CSCSL	Yes
TRI No.	nr
KCIWP No.	nr

Table 11-2. South Park Marina

FACILITY SUMMARY	
Address	8604 Dallas Ave S, 8544 Dallas Ave S (marina), 1415 S Thistle Street (ricks master marine), 8510 Dallas Ave S (tire factory)
Property Owner	South Park Marina
Property Leasee/Operator	South Park Marina
Tax Parcel No.	0001600001, 2185600025, and 2185600070
Parcel Size	1.96 acres, 1.39 acres, and 0.38 acres
Facility/Site ID	44653368
EPA ID No.	WAD988513248
NPDES Permit No.	WAG030045
UST/LUST ID No.	nr
Listed on CSCSL	No
TRI No.	nr
KCIWP No.	nr

Table 11-3. Basin Oil

FACILITY SUMMARY	
Address	8661/8701 Dallas Ave S
Property Owner	Basin Oil Co Inc
Property Leasee/Operator	Basin Oil Co Inc
Tax Parcel No.	7884100110 and 7884100145
Parcel Size	0.38 acres and 0.12 acres
Facility/Site ID	83476734
EPA ID No.	WAD988477501
NPDES Permit No.	SO3-002273
UST/LUST ID No.	nr
Listed on CSCSL	Yes
TRI No.	nr
KCIWP No.	nr

Table 11-4. Boeing South Park

FACILITY SUMMARY	
Address	1420 S Trenton St, 98108
Property Owner	The Boeing Company
Property Leasee/Operator	The Boeing Company
Tax Parcel No.	7883608601
Parcel Size	27.73 acres
Facility/Site ID	60381981
EPA ID No.	WAD 980982672 (SQG and LQG)
NPDES Permit No.	SO3001009
UST/LUST ID No.	nr
Listed on CSCSL	No
TRI No.	nr
KCIWP No.	nr

References

EDR. 2002. Corridor study report, lower Duwamish River, Seattle, WA. Environmental Data Resources, Inc., Southport, CT.

King County. 2008. King County Parcel Viewer web page [online]. King County GIS Center, Seattle, WA. Available from: http://www.metrokc.gov/gis/index.htm.