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
Wastewater Treatment Division

Seattle Public Utilities

KING COUNTY AND SEATTLE PUBLIC UTILITIES SOURCE CONTROL PROGRAM FOR THE LOWER DUWAMISH WATERWAY

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EXECUTIVE SUMMARY

The King County Wastewater Treatment Division and Seattle Public Utilities (SPU) are working together to reduce the amount of pollution discharged to public storm drains and sanitary/combined sewers that discharge to the Lower Duwamish Waterway, or LDW. The purpose of this source control program is to reduce the potential for waterway sediment to become recontaminated following cleanup. This work is a first step in finding active or possible sources of contaminants and then correcting the source.

This report describes the status of source control activities completed by King County and SPU from January 2005 through June 2005 as part of the Lower Duwamish Waterway Superfund cleanup. During this reporting period, King County and SPU completed the following activities:

- Conducted initial and follow-up inspections in the Diagonal Avenue South combined sewer overflow/storm drain (CSO/SD) service area, the Slip 4 early action site basin, and other areas draining to the former Slip 5 and Slip 6.
- Placed sediment traps in the Diagonal Ave S CSO/SD and Slip 4 storm drain systems and collected sediment samples from catch basins at business sites and public rights-of-way to aid pollutant source tracing.
- Inspected and collected samples in the Georgetown flume (discharges to Slip 4) to find out whether the flume is an active source of chemicals of concern to the waterway sediment.
- Conducted air monitoring at four locations in the LDW drainage basin to assess whether atmospheric deposition is a potential source of phthalates in stormwater runoff.
- Removed sediment from the Norfolk-ML King Way storm drain system.
- Conducted additional cleanup to control PCBs found in street dirt and yards next to the T117 early action site (Dallas Avenue South cleanup project).

Business Inspections

Inspections are being conducted under existing King County and Seattle code authorities. King County has primary authority to regulate industrial waste discharges to separated and combined sanitary sewers, moderate risk hazardous waste, and stormwater discharges in the unincorporated areas of King County. With the exception of stormwater discharges to the combined sewer, SPU has primary authority to regulate stormwater discharges in Seattle. King County and Seattle share authority to regulate stormwater discharges to the combined sewer.

By June 30, 2005, inspectors had completed 912 business inspections, 636 full on-site inspections and 276 screening inspections. Problems with spill prevention and control were most common (59 percent) followed by stormwater (26 percent), hazardous waste (14 percent), and industrial waste (1 percent).

Source Tracing

Source tracing sampling is designed to find sources by strategically collecting samples at key locations within the drainage/combined sewer service areas. Source tracing during this period

focused on sediment samples from in-line samples, from sediment traps installed in the storm-drain system, and from catch basins at businesses ("on-site") and in the public right-of-way.

Results of sediment samples were compared with the state sediment management standards (SMS). Although the SMS do not apply to storm drain sediments, they are used in this report to provide a rough indication of the storm drain sediment quality. The SMS establish two levels:

- Sediment quality standards (SQS): Concentrations below the SQS are expected to have no adverse effects on biological resources and no significant human health risk.
- Cleanup screening level (CSL): Minor effects level used to identify areas of potential concern.

Comparison of storm drain sediment from catch basins, sediment traps, and inline samples to SMS is considered conservative. If source sediment samples are below the sediment management standards, there is little chance of sediment offshore of the outfalls from becoming recontaminated to these levels. An exceedance of a sediment management standard, however, does not necessarily show that the sediment offshore of the outfall will exceed the standards, because particulates discharged from storm drains will mix with sediment in the waterway.

General observations and comparisons based on samples collected since January 2003

- Arsenic concentrations did not exceed the SQS in any of the samples. This finding suggests that storm drains are probably not a significant source of arsenic to the waterway sediment.
- Contaminant concentrations were generally higher in samples collected from on-site catch basins than in right-of-way samples.
- Although total petroleum hydrocarbons (TPH-oil) were frequently detected in the source sediment samples, polynuclear aromatic hydrocarbons (PAH) were found at relatively low concentrations. Sediment management exceedances usually occurred in onsite catch basin samples collected at gas stations and heavy equipment maintenance facilities (20 percent of the samples). PAH exceedances were less frequent in right-of-way samples (2 percent) and inline sediment samples (15 percent).
- Polycholorinated biphenyls (PCBs) were frequently detected, but rarely exceeded the SQS, except for inline sediment samples collected from the storm drains discharging to Slip 4.
- Bis(2-ethylhexyl)phthalate (BEHP) poses the most serious concern for recontamination in waterway sediment after cleanup. Concentrations frequently exceed the SMS in all types of sediment samples collected. The lowest BEHP concentrations are usually found in samples collected from catch basins in low- to medium-traffic streets (8 percent are greater than 3 times the CSL).

Phthalate Source Study

Phthalates, particularly BEHP, are chemicals of concern in most of the early action sites in the LDW. Their presence in the environment is an emerging issue of national and international scope and is beyond any one agency's capability to solve alone. In 2003 King County and SPU

joined with the City of Tacoma to test various commonly used products and materials to help find the source of these chemicals. This testing found only low levels of phthalates in liquid products but high levels of phthalates, particularly BEHP, in some solid products used in vehicles, including brake pads, serpentine belts, and tires. These solid products may be a source of phthalates to the waterway through either atmospheric deposition or direct deposition of worn product particles onto roadway surfaces and later wash off in stormwater runoff. Because of this finding, the phthalate source study continued with emphasis on evaluating whether atmospheric deposition contributes significant amounts of phthalates to sediments in the LDW.

Four rounds of samples were collected from January 2005 through May 2005 at four sampling stations in the LDW drainage area, three stations in the Duwamish valley and a fourth on Beacon Hill. The most significant finding is that BEHP concentrations were 0.75 to 3 times greater in the Duwamish valley stations than the Beacon Hill station.

As a quality control check, these results were compared with other studies. The results compared well with studies conducted within the same airshed and with other regions. The source control team will continue air deposition testing for the next year to evaluate the reproducibility of results and to do correlations with other atmospheric measurements (for example, particulate concentrations).

Spill Kit Incentive Program

As an incentive to improve on-site spill prevention and cleanup practices, SPU in 2004 began a program offering free spill kits to local businesses that make, store, use, or transport liquids on-site. The program is being administered by the Resource Venture, a program of the Greater Seattle Chamber of Commerce and the Environmental Coalition of South Seattle (ECOSS).

A total of 189 businesses located throughout the LDW study area received spill kits during this reporting period. During the next reporting period, the spill kit program will focus on the Norfolk basin to coincide with business inspection efforts.

Residential Outreach Project

Planning began in this reporting period for a community outreach strategy to empower residents in the Lower Duwamish study area to do their part to help prevent recontamination of sediments in the Duwamish Waterway. Activities in the planning stage include natural yard-care workshops, grant workshops, and distribution of car wash kits to charities.

Next Steps

King County and SPU inspectors will have a continuing presence in the Diagonal/Duwamish and Slip 4/Slip 5 drainage areas, focusing on higher-priority businesses. Inspections will also expand into other areas to support continuing and future early action area cleanups. Results from earlier inspections will be reviewed to identify sites that should be reinspected. Reinspections will be conducted by the jurisdiction with lead authority (that is, the King County Industrial Waste Program for industrial wastewater discharges and SPU for stormwater discharges). LDW source control inspections are scheduled to start in the Norfolk basin in August 2005.

Source tracing efforts will continue to focus on catch-basin and in-line sediment sampling to track sources of contaminants to the waterway sediment.

Wet-dry atmospheric deposition samples at the four stations in the LDW will continue with the addition of stations outside the urban area to serve as background.

INTRODUCTION

This report describes the status of source control activities completed by King County and Seattle Public Utilities (SPU) from January 2005 through June 2005 as part of the Lower Duwamish Waterway (LDW) Superfund cleanup. Most of the work during this reporting period focused on the East Waterway to support ongoing sediment remediation activities conducted by the Port of Seattle. The East Waterway is not part of the LDW Superfund site. This report describes only the work completed in the LDW.

Source control activities conducted during this reporting period are summarized below:

- Conducted initial inspections and follow-up inspections at businesses in the Diagonal Ave S CSO/SD service area, Slip 4 early action site and Slip 5/6.
- Deployed sediment traps in the Diagonal Ave S CSO/SD and Slip 4 storm drain systems, and collected sediment samples from catch basins on business sites and in public rights-of way to assist in pollutant source tracing.
- Inspected the Georgetown flume (discharges to Slip 4) to identify active pipes discharging to the flume and collected sediment samples to determine whether the flume is an ongoing source of chemicals of concern to the waterway sediment.
- Conducted air monitoring at four locations in the LDW to assess whether atmospheric deposition is a potential source of phthalates in stormwater runoff.
- Removed sediment from the Norfolk-MLK Way storm drain system.
- Conducted additional cleanup to control PCBs found in street dirt and yards adjacent to the T117 early action site (Dallas Ave S cleanup project).

This progress report is organized by geographic area. The first section provides an overall summary of work completed during the January 1, 2005 to June 30, 2005 reporting period and describes Lower Duwamish Waterway wide activities such as the phthalate source study. Subsequent sections describe source control activities in each of the 5 geographic areas where work occurred this reporting period.

OVERVIEW OF LOWER DUWAMISH WATERWAY-WIDE SOURCE CONTROL ACTIVITIES

To support Lower Duwamish Waterway (LDW) sediment remediation efforts, King County and SPU are working together to reduce the amount of pollution discharged to public storm drains and sanitary/combined sewers that discharge to the waterway. The purpose of this source control program is to reduce the potential for waterway sediment to become recontaminated to levels of concern following cleanup. King County and SPU are key members of the Lower Duwamish Source Control Working Group because each manages a portion of the public stormwater and wastewater systems that discharge to the Lower Duwamish Waterway.

King County operates the large interceptor sewers that convey municipal and industrial wastewater to the treatment plant located at West Point and the storm drain system in unincorporated King County. Seattle operates the local sanitary/combined sewers that collect wastewater and route it to the King County interceptor system, as well as the storm drains within the City of Seattle. The sanitary/combined sewer and storm drain service areas that discharge to the Lower Duwamish Waterway are shown in Figure 1. The sanitary/combined sewer and storm drains serve an area of about 19,800 and 9,100 acres, respectively.

As shown in Figure 2, a number of both public and private outfalls discharge to the LDW. Outfalls can generally be divided into the following categories.

- Public storm drains. Public storm drain systems collect and convey stormwater runoff from roadways and upland properties to the waterway.
- Private storm drains. Waterfront properties are generally served by private onsite drainage systems that discharge directly to the waterway. These systems are generally smaller than public storm drains and are owned and maintained by the private property owner.
- Combined sewer overflows (CSO). CSOs are located on the combined sewer system to release excess flows that occur during large storm events. Combined sewers collect both stormwater runoff and municipal/industrial wastewater. During large storm events, the capacity of the collection pipes can be exceeded due to the large amount of stormwater runoff entering the system. Overflow points are provided to prevent stormwater and wastewater from backing up and flooding roadways and local properties. CSOs can discharge directly to the waterway via a dedicated outfall pipe or via an outfall that is shared with a nearby storm drain system.
- Emergency overflows. Like CSOs, emergency overflows are relief points in the sanitary/combined sewer system. However, emergency overflows are not related to storm events. Instead, these overflows function to relieve backups that occur as a result of a pump station failure or obstruction in the conveyance system.
- Unknown outfalls. A number of piped outfalls of unknown origin discharge to the LDW. These outfalls are most likely private storm drains that serve waterfront properties, but may also include other systems such as industrial discharges.

Business Inspections

King County Industrial Waste and SPU are co-leads in the joint King County-Seattle program to inspect businesses in areas that discharge to the LDW through either the City-owned storm drain system or the combined sanitary/storm sewer system. Early action sites have the highest priority and within each early action site, inspections focus first on the separated storm drain basin followed by the combined sewer service area. The goal is to complete the business inspections before sediment cleanup begins. Separated storm drain basins are prioritized because storm drains discharge to the LDW on a regular basis (i.e., every time it rains), whereas combined sewer overflows discharge much less frequently, typically only during large storm events. The following agencies are participating on this project:

- King County Industrial Waste (KCIW): Wastewater Treatment Division.
- Seattle Public Utilities (SPU)
- King County Local Hazardous Waste Management: Water and Land Resources Division (KCHW)
- King County Local Hazardous Waste Management: Seattle-King County Public Health (KCPH).

Inspectors that worked on the project during the January 2005 through June 2005 reporting period are listed in below:

Seattle Public Utilities
Tasha Bassett
Ellen Stewart
Tanya Treat
Ryean-Marie Tuomisto
Savina Uzunow

King County Hazardous Waste
Sue Hamilton
Steve Joyce
Lisa Niehaus
Ann Peacock
Cheri Grasso

King County Industrial Waste
Arnaud Girard
Dave Haberman
Jim Sifford

ECOSS
Kevin Burrell[a]

a. ECOSS is providing technical support to businesses via SPU's spill kit program.

Inspections are being conducted under existing King County and Seattle code authorities. King County has primary authority in the industrial waste and hazardous waste areas, and stormwater discharges in unincorporated King County. SPU has primary authority to regulate stormwater discharges within the City limits. King County and Seattle share code authority to regulate stormwater discharges to the combined sewer. Because of overlapping and different authorities between the City and County regarding discharges to combined areas, project staff developed specific guidance for inspecting businesses in the combined areas. The goal for inspecting stormwater dischargers in combined areas is to minimize discharge of chemicals of concern to the combined sewer by preventing the accidental or deliberate discharge of concentrated products or wastes to the combined sewer. Inspection procedures are described in Appendix A.

Summary for the January 2005-June 2005 Reporting Period

A total of 10 initial inspections (9 full inspections and one screening inspection) and 27 follow-up inspections were completed between January 1, 2005 and June 30, 2005 in the LDW project area. Inspection locations are shown in Figure 3. A list of all sites inspected is provided in Appendix B, Table B-1.

Corrective actions were required at 8 of the 9 sites where full inspections were conducted this reporting period (see Table B-2 in Appendix B for details). As of June 30, 2005, 3 of these sites have made the required changes. A breakdown of all corrective actions requested within each program area (i.e., stormwater, industrial waste, hazardous waste, and spill prevention) is provided in Appendix B, Table B-3 and a list of numbers of corrective actions at each site is provided in Table B-4. A detailed list of corrective actions requested for each site is provided in Table B-5.

As of June 2005, inspectors have completed 912 business inspections (636 full inspections and 276 screening inspections. Table 1 summarizes the percentage of total corrective actions completed in the Lower Duwamish Waterway by individual program area for all inspections completed to date (March 2003 to June 2005). Problems with spill prevention and control are most common (42 percent) followed by stormwater (38 percent), hazardous waste (18 percent), and industrial waste (2 percent). The most frequently requested corrective actions are summarized in Table 2. Inadequate maintenance of onsite drainage facilities (57 percent of the sites where corrective actions were required) is the most common corrective action, followed by lacking proper spill prevention/cleanup materials (48 percent), inadequate spill cleanup materials present on site (41 percent), and inadequate employee training on spill prevention/cleanup procedures (39 percent). Corrective actions requested at all of the sites inspected to date are listed in Appendix B, Table B-6.

Illicit Connections and Discharges

One illicit connection to the Georgetown flume was discovered during this reporting period. In addition, two illicit discharges were discovered (one in Slip 5 and one in the Diagonal/Duwamish basin. Details are provided under the sections for each geographic area.

Industrial Wastewater Discharge Authorizations

All business inspections include a review of wastewater/process water production and disposal. Businesses discharging wastewater to the sanitary sewer without proper authorization from King County are referred to KCIW for additional review and issuance of a discharge authorization, as necessary. KCIW can issue four types of discharge authorizations depending on the type of business, the volume and characteristics of wastewater, and the potential risk to the wastewater collection and treatment system:

- Significant discharge: >25,000 gallons per day or federally regulated facility
- Major discharge: Generally 5,000 – 25,000 gallons per day and facility is not a federally regulated industry
- Minor discharge: Generally 1,000 – 5,000 gallons per day and facility is not a federally regulated industry
- Letter of authorization: Generally <1,000 gallons per day and facility is not a federally regulated industry.

All of the sites inspected during this reporting period had the proper authorization to discharge to the sanitary sewer, as appropriate. No sites were referred to KCIW for review and issuance of a discharge authorization.

Source Tracing

Source tracing and identification sampling activities are being performed to support the source control efforts. Source tracing sampling is designed to identify sources by strategically collecting samples at key locations within the drainage/combined sewer service areas. Source identification sampling focuses on product testing to determine whether specific products contain chemicals that are a concern for waterway sediments.

Samples are collected at the following locations to identify sources of the chemicals of concern in the waterway sediment:

- Key manholes in the sanitary/combined sewer (wastewater)
- In-line sediment traps installed in the storm drain system (sediment)
- Onsite catch basins (sediment)
- Catch basins in the public right-of-way (sediment)
- Inline sediment collected from maintenance holes on the storm drain trunk lines (sediment).

With the exception of the key manhole samples, sediment rather than whole water samples are being collected. Sediment samples offer a number of advantages. First, because sediment is the affected media in the waterway, analysis of sediment source material is key to understanding how pollutants are transported to the waterway. Second, sediment that accumulates in the drainage system provides a measure of pollutant contributions over a longer time period (what has been deposited since the system was last cleaned), whereas water samples provide only a snapshot of a single storm event. Also, unlike whole water samples, sediment samples do not usually present detection limit problems for the analytical laboratory. Contaminants present in the sediment can usually be quantified, which makes it easier to evaluate and interpret the sample results. Finally, sediment samples are generally easier and less expensive to collect than whole water samples.

There are no regulatory standards for catch basin sediment, inline sediment, and sediment trap samples. Results were compared to the state sediment management standards (SMS) and the Washington State Model Toxics Control Act (MTCA) Method A cleanup standards. Although these standards do not apply to storm drain sediments, they are used in this report to provide a rough indication of the storm drain sediment quality. The SMS establish two levels:

- Sediment quality standards (SQS): Concentrations below the SQS are expected to have no adverse effects on biological resources and no significant human health risk.
- Cleanup screening level (CSL): Minor effects level used to identify areas of potential concern.

Comparison of storm drain sediment collected from catch basins, manholes, and sediment traps to SMS is considered conservative. If source sediment samples are below the SMS, there is little

chance of sediment offshore of the outfalls becoming recontaminated to these levels. However, an exceedance of a SMS does not necessarily indicate that the sediment offshore of the outfall will exceed standards, because sediment discharged from storm drain disperses in the receiving environment and mixes with sediment from other sources before depositing.

Total petroleum hydrocarbon (TPH) results from catch basin samples are compared to the MTCA cleanup levels to aid in assessing options for sediment disposal once it is removed from the catch basin.

Key Manhole Samples

No key manhole samples were collected during this reporting period. Samples collected during previous reporting periods did not contain sufficient concentrations of chemicals of concern to warrant additional sampling.

Sediment Trap Samples

In-line sediment traps consist of a small bracket mounted inside the collection system pipe that holds a wide-mouth sample bottle. The traps are installed for a period of 4 to 6 months to passively collect suspended particulate that passes by the site. Traps have been installed in the storm drain systems that discharge to Diagonal/Duwamish and Slip 4 early action sites, but at this time, results are only available for the Diagonal/Duwamish traps. Sampling results are displayed in Table 3 and sampling locations are shown in Figure 4. Key findings are summarized below:

- PCBs are infrequently detected and no samples exceed the sediment management standards.
- With the exception of zinc, metals concentrations are generally low. Zinc exceeded the SQS in about 70 percent of the samples and exceeded the CSL at Station ST1 during the first round of sampling. Only 1 of the 3 samples collected at ST2 and 1 of the 2 samples collected at both ST5 and ST6 exceeded the SQS. None of the other metals exceeded the SQS concentrations.
- BEHP continues to be the primary contaminant of concern in the Diagonal Ave S CSO/SD. Concentrations have exceeded the CSL in all samples collected to date from Stations ST2 (3 samples), ST3 (3 samples), and ST4 (1 sample). No exceedances were observed in the single sample collected from Station ST7. The two samples collected to date at Station ST5 (56-68 mg/kg OC) exceeded only the SQS. The approximately 300-acre drainage basin upstream of station ST5 is predominately residential. The basin at station ST7 (approximately 200 acres) contains a mixture of residential and industrial properties.
- Polynuclear aromatic hydrocarbon (PAH) concentrations are generally low. Only HPAH compounds exceeded the SQS or CSL, and only in 4 of the 16 samples collected to date (Stations ST2 and ST6).

Construction Projects

Sediment discharged from construction activities can affect the amount and quality of sediment collected in the traps. There were 48 major construction sites in the Lower Duwamish Waterway

that had active grading permits between January 2005 and June 2005 (Table 4). Major sites are defined as those with a cost of greater than $5M reported to the Seattle Department of Planning and Development (DPD). Six sites are located in the storm drain portion of the Diagonal Ave S CSO/SD service area, the largest of which is Sound Transit's Light Rail transit facility located on Airport Way S and four are located in other drainage basins that discharge to the LDW (Norfolk, 7th Ave S, 1st Ave S, and SW Idaho St). The remaining 38 sites are located in the combined sewer service area and would not have impacted any of the samples.

Catch Basin Samples

Catch basin samples are grab samples of sediment that has accumulated in the catch basin sump. A catch basin is a storm drain structure that contains a sump to capture sediment and other debris before it can enter the collection system. Because many pollutants present in urban stormwater runoff tend to adhere to sediment, catch basins can also trap pollutants. The quality of sediment that accumulates in catch basins provides a measure of the quality of the stormwater runoff discharged to the drainage system since the catch basin was last cleaned. Catch basins must be cleaned on a regular basis to maintain their capacity to trap sediment and associated pollutants and prevent these materials from discharging to the downstream receiving water body.

During this reporting period, sediment samples were collected from 25 onsite (6 in the overall Lower Duwamish Waterway basin and 19 in the East Waterway basin), and 2 right-of-way catch basins (in the Diagonal/Duwamish and the overall LDW basins). Sample locations are shown in Figure 4. To date, a total of 49 onsite and 41 right-of-way catch basin samples have been collected in the Lower Duwamish Waterway study area. Results for all samples collected to date are provided in Tables 5 and 6.

In addition, sediment and soil samples were collected from 40 locations in the public right-of-way and adjacent properties near the T117 early action site. Samples included catch basin sediment, street dust, and soil samples from the public right-of-way and adjacent yards. Results for these samples are described in the section on T117.

Onsite Catch Basins

Onsite catch basin samples have been collected at sites of interest identified during the business inspections or simply at sites where sufficient sediment was available for chemical analysis. Most inspections during this reporting period were outside the LDW, in the East Waterway. Consequently, of the 25 onsite catch basin samples collected during this reporting period, only 6 are located in the LDW study area (Figure 4). EWW data are included in Table 5 for informational purposes, but are not included in the summary of key findings below (for all onsite catch basin samples collected to date):

- Arsenic (<10 – 40 mg/kg) was detected in about 48 percent of the LDW samples. Concentrations were all below the sediment management standards.
- Copper (30-6,300 mg/kg) and lead (10-2,010 mg/kg) exceeded the sediment standards in 6 (12 percent) and 7 (15 percent) of the LDW samples collected, respectively. All of the copper exceedances were above the cleanup screening level (CSL). For lead, five of the samples exceeded the CSL and seven exceeded the sediment quality standard (SQS). Most exceedances occurred in samples collected from automotive-related facilities (e.g.,

auto repair, gas station, and vehicle wash facilities). Other sites where samples exceeded standards included a manufacturing, a metal finishing, and a medical facility.

- Mercury (<0.06-1.82 mg/kg) was detected in about 71 percent of the samples, but exceeded the sediment management standards (SQS or CSL) in only 7 of the samples (15 percent).
- Zinc (55-2,720 mg/kg) exceeded the CSL in 9 samples (21 percent) and exceeded the SQS in 32 samples (67 percent)
- TPH-oil (52-77,000 mg/kg) exceeded the MTCA Method A cleanup level in 73 percent of the samples. The highest TPH-oil concentrations were measured at a vehicle steam-cleaning pad (71,000 mg/kg) and an oil recycling facility (77,000 mg/kg). TPH-diesel concentrations (15-34,000 mg/kg) were consistently lower than the oil levels and exceeded the MTCA cleanup level in about 36 percent of the samples.
- PAH compounds exceeded the SQS in only 10 of the onsite catch basin samples (20 percent). Elevated levels of PAHs were typically found in catch basins at heavy equipment maintenance facilities and gas stations.
- PCBs were detected in about 67 percent of the LDW samples at concentrations ranging from 16-6,600 μg/kg PCBs, but only two samples exceeded the CSL and four samples exceeded the SQS. Of the 31 samples where PCBs were detected, 29 percent were less than 0.1 μg/kg DW and 81 percent were less than 0.5 μg/kg DW.
- BEHP (10-2,700 mg/kg OC) exceeded the sediment management standards in all but 12 of the 43 samples collected. Most samples exceeded the CSL; 1 sample exceeded only the SQS. With the exception of the sample collected from the steam cleaning pad (2,700 mg/kg OC), the concentration of BEHP in most samples ranged from about 100-1,000 mg/kg OC.

Right-of Way Samples

Right-of-way samples have been collected from catch basins located in a wide variety of roadways to evaluate whether contaminant levels are related to traffic density. Sample locations are shown in Figure 4 and results are presented in Table 6. Results from the 2 samples collected during this reporting period were similar to those from the previous reporting period. Zinc, TPH-oil, and BEHP are the contaminants that most frequently exceeded the sediment management standards (or MTCA Method A for TPH). Key findings for all samples collected to date are summarized below:

- With the exception of zinc, metals concentrations rarely exceeded the sediment management standards. None of the samples exceeded the SQS for copper and only two of the 39 samples collected to date (0.87 and 1.17 mg/kg) have exceeded the SQS for mercury. Mercury was detected in less than half of the samples. Lead concentrations exceeded the CSL in 3 samples. Arsenic was detected in 34 percent of the samples, but did not exceed the sediment management standards. Concentrations ranged from 6-30 mg/kg. Zinc exceeded the SQS in 12 samples (29 percent), but none of the samples exceeded the CSL.

- TPH-oil (480-11,000 mg/kg) exceeded the MTCA Method A cleanup levels in about 60 percent of the samples. One sample collected from an industrial roadway (3,500 mg/kg) and one from a low traffic roadway (6,400 mg/kg) exceeded the MTCA cleanup level for TPH-diesel.
- PAH concentrations were generally low in the right-of-way catch basin samples. Only one sample (RCB38) exceeded an SQS for PAHs (fluoranthene and fluorene).
- PCBs were detected in about 68 percent of the samples and 2 percent exceeded the SQS. Concentrations generally ranged from 0.02 to 300 μg/kg DW (0.2 to 6.7 mg/kg OC). One sample (RCB37), located on S Stevens St east of Airport Way S (322 mg/kg OC), exceeded the CSL for PCBs. This and adjacent catch basins were cleaned in June 2005. SPU is currently working with adjacent property owners to investigate possible sources of PCBs in this area.
- Over 60 percent of the right-of-way samples exceeded either the CSL or the SQS for BEHP. The highest BEHP concentrations (460 and 502 mg/kg OC) occurred in two samples, one collected from an industrial roadway (RCB 1) and one from a high traffic arterial (RCB 36). BEHP concentrations were generally lower in samples collected from low to medium traffic roadways (15-110 mg/kg OC) compared to the higher traffic arterials (23-502 mg/kg OC). BEHP concentrations in freeway samples (18-277 mg/kg OC) were within the range observed in the high traffic arterial samples (23-502 mg/kg OC).

Inline Sediment Samples

Inline sediment samples are grab samples collected from manholes located on the drainage mainline and represent contributions from the entire drainage basin upstream of the sampling location. Inline sediment samples are usually collected prior to installing a sediment trap or prior to cleaning the drain to characterize the chemical quality of sediment in the storm drain system.

During this reporting period, SPU collected inline 24 sediment samples from various locations in the Diagonal Ave S CSO/SD, 7th Ave S storm drain in South Park, Slip 4 SD, Slip 4 EOF/SD (formerly called the Slip 4 CSO/SD), Georgetown flume, and the Norfolk-Martin Luther King Way, Jr., storm drain systems. Locations of all inline sediment samples collected to date are shown in Figure 4 and data are summarized in Table 7. Key findings are summarized below:

- With the exception of the Slip 4 drains (Georgetown flume, Slip 4 EOF/SD, and Slip 4 SD), PCB concentrations were generally low (below the SMS) in most of the drainage systems that were sampled. However, the samples from the drains discharging to Slip 4 (5 to 2,800 mg/kg OC) frequently exceeded the SMS for PCBs.
- BEHP concentrations exceeded the SMS in most drains (<1 to 900 mg/kg OC), but were generally lower in the Slip 4 drains (2 to 76 mg/kg OC).
- Arsenic and copper concentrations were below the SMS in all samples.
- Zinc exceedances of SMS occurred in all of the drains that were sampled, but were highest in the Norfolk-MLK Way (90 to 1,200 mg/kg) and Slip 4 drains (54 to 1,100 mg/kg).

Source Sediment Comparisons

Source to source comparisons are complicated by the limited number of samples collected and possible biases introduced by the different sampling strategies employed for each source type. For example, onsite catch basin samples were collected primarily where problems were suspected either because of the kinds of activities conducted onsite or because of specific problems identified during business inspections. SQS exceedances for each source type are summarized in Table 8. General observations and comparisons are described below:

- Arsenic concentrations did not exceed the SQS in any of the samples collected to date, which indicates that storm drains are probably not a significant source of arsenic to the waterway sediment.
- Contaminant concentrations are generally higher in samples collected from onsite catch basins compared to right-of-way samples. As shown in Table 8, onsite catch basin samples exhibit the most SQS exceedances for copper (12-22 percent), lead (15 percent), mercury (9-12 percent), zinc (67-76 percent), TPH-oil (72-81 percent), and PCBs (9-20 percent). SQS exceedances in right-of-way samples are infrequent, particularly for samples collected from low traffic streets where no exceedances were observed for arsenic, copper, mercury, and PCBs, and only 46 percent of the samples exceeded the MTCA Method A cleanup level for TPH-oil.
- Although TPH-oil is frequently detected in the source sediment samples (6 to 81 percent of samples), PAH compounds are found at relatively low concentrations (individual PAH compounds generally ranged from <1 to 50 mg/kg OC). Two of 41 right-of-way catch basins exceeded a SQS for a single PAH compound each (fluoranthene and fluorene) and 10 of 49 onsite catch basin samples exceeded CSL for multiple HPAH compounds. Sediment management exceedances generally occurred at gas stations and heavy equipment maintenance facilities. In addition, sediment collected from one fast food restaurant also exceeded the CSL for PAH compounds. Similarly, 8 of 52 inline sediment samples exceeded an SQS for 1 or more PAH compounds. Only 1 station exceeded a CSL (for multiple HPAH compounds).
- PCBs are frequently detected (54 to 88 percent of samples), but rarely exceed the SQS (in less than 10 percent of the onsite catch basin samples and less than 5 percent of the right-of-way catch basin and sediment trap samples). Sediment collected from storm drains discharging to Slip 4 (Georgetown flume and King County Airport storm drain) contained the highest PCB concentrations (71 percent exceed the SQS). Figure 5 shows the relative distribution of PCB concentrations (mg/kg DW) measured in each type of source sediment sample. Onsite catch basins and catch basins in the Slip 4 drains contain the highest PCB concentrations (17 and 21 percent greater than 0.5 mg/kg DW, respectively and 9 and 19 percent greater than 1 mg/kg DW, respectively).
- BEHP poses the most serious concern for recontamination in waterway sediment after cleanup. Concentrations frequently exceed the sediment management standards in all of the samples collected (72 percent, 63 percent, 88 percent, and 63 percent in the onsite catch basins, right-of-way catch basins, sediment traps, and inline sediment samples, respectively (Table 8).

  BEHP concentrations are generally higher in the onsite catch basin samples (10 to 1,000 mg/kg OC) than in the right-of-way samples (12 to 300 mg/kg OC). This difference is

illustrated in Figure 6, which shows the relative distribution of BEHP concentrations measured in each type of source sample. As shown in Figure 6, BEHP concentrations in 37 percent of the onsite samples are greater than 3 times the CSL (24 percent are greater than 5 times the CSL), compared to only about 12 to 14 percent in the right-of-way and inline sediment samples (5 percent are greater than 5 times the CSL). Sediment trap samples also exhibit relatively high PCB concentrations (38 and 13 percent of the samples are greater than 3 times the CSL and 5 times the CSL, respectively). The lowest BEHP concentrations are generally found in samples collected from catch basins on low to medium traffic streets (8 percent are greater than 3 times the CSL).

Phthalate Source Study

Phthalates, particularly bis(2-ethylhexyl)phthalate (BEHP), are contaminants of concern in the majority of the early action sites in the Lower Duwamish Waterway. Phthalates are a class of industrial compounds commonly used as softeners in plastics, as solvents, as oil in vacuum pumps and electric capacitors and transformers, and as carriers for fragrances and pesticides. They have also been reported in personal care products (Houlihan et. al., 2002). BEHP is the most prevalent phthalate in the Duwamish sediments, and is a contaminant of concern at the majority of the early action sites, including the Duwamish/Diagonal, former Slip 5 at river mile 3.8, Slip 4, Trotsky, and Norfolk sites. BEHP is also frequently detected in stormwater and catch basin samples (USEPA 1983; Herrera 1998; Tacoma 1990; Tacoma 1999; Tacoma 2002).

Because they are a regional concern extending beyond the Duwamish Waterway, King County and SPU joined with the City of Tacoma in 2003 to test various commonly used products and materials to help identify the source of these chemicals. The intent of that testing was to use information about the phthalate content of common consumer products in conjunction with the source tracing efforts to identify specific sources of phthalates to the storm drains and the sanitary sewer. In addition, project staff hoped to identify specific products low in phthalates that they could recommend as replacement products to businesses and residents.

The results of the first round of product testing were reported in the previous progress report (King County and SPU, 2004). Testing of a variety of liquid and solids products found only low levels of phthalates in liquid products, but high levels of phthalates, particularly BEHP in brake pads, serpentine belts, and tires. These solid products may be a source of phthalates to the waterway via either atmospheric deposition or direct deposition of worn product particles onto roadway surfaces and subsequent wash off in stormwater runoff. The literature review also suggests that some vehicle fuel products, such as diesel, contain BEHP that may be released into the atmosphere in the exhaust (California Air Resources Board, 1997). Atmospheric deposition is suggested by the results from sampling phthalates on the Tacoma Dome roof.

Atmospheric Deposition Sampling

Based on the results from the product testing, the phthalate source study continued with emphasis on evaluating whether atmospheric deposition contributes significant amounts of phthalates to sediments in the Lower Duwamish through either direct deposition on the waterway or via stormwater runoff. The Phathalate Committee, consisting of staff from King County, Seattle Public Utilities, and City of Tacoma provided oversight for the investigations. The January 2005 Progress Report described methods selection and development. Passive deposition

samplers, which consist of a stainless steel bowl that drains into a glass bottle to collect both wet and dry deposition, were constructed and tested during this reporting period. A typical sampler is shown in Figure 7. This progress report provides the first results from these wet/dry deposition samplers. The complete technical memorandum including discussion of sampler preparation, installation and retrieval, analysis methods, results, and a comparison of data with phthalate air sampling elsewhere is included in Appendix C.

Staff from King County Industrial Waste collected Phase 1 samples and delivered them to the King County Environmental Laboratory for analysis. Four rounds of samples were collected from January 2005 through May 2005 at four sampling stations in the Lower Duwamish drainage area (Figure 8), three in the Duwamish Valley and one on Beacon Hill. The four stations (with owner/operator) are listed below:

- Beacon Hill (Washington State Department of Ecology)
- Duwamish (Puget Sound Clean Air Agency)
- Georgetown (Washington State Department of Ecology)
- South Park Community Center (Seattle Parks Department).

Stations were selected to collect neighborhood-scale air deposition samples from different portions of the Lower Duwamish drainage area.

Table 9 presents calculated air deposition flux results corrected for blank contamination. Calculation of air deposition flux is a useful tool for evaluating the rate at which mass of a particular chemical is depositing on a terrestrial surface through the air pathway. The units of air deposition flux are mass per area per time (mass/area/time). The air deposition flux values calculated on Table 9 are in units of micrograms per meter squared per day ($\mu g/m^2/day$).

The results from Rounds 1, 2, and 4 are the most useful since the samplers were in the field for 26, 36, and 22 days, respectively. Round 3 samplers were in the field for only seven days of high rainfall (1.6 in), which allowed less opportunity for particulate mass to accumulate in the sampler. Analytical results are limited to the seven carcinogenic PAH, pyrene, benzo(g,h,i)perylene, and the six phthalate compounds. Analytical recoveries for the lower molecular weight PAH compounds (below pyrene-d10) were insufficient for inclusion in this analysis. Dry particulate material was observed in the stainless steel sample collectors (i.e., did not wash into the sample bottle during rainfall events). Therefore, wipe tests were conducted for some of the sampling rounds to collect the material that adhered to the sample bowl, thus providing a measure of total wet-dry deposition that accumulated during the sampling period.

Because BEHP concentrations were typically lowest at the Beacon Hill station, ratios of the BEHP concentration at the other 3 stations relative to the Beacon Hill station were developed to facilitate comparisons (Table 10). Results are summarized below:

- For Round 1, the results for PAH, benzyl butyl phthalate, and bis(2-ethylhexyl)phthalate at the Duwamish, Georgetown, and South Park Stations were approximately two to three times greater than the Beacon Hill Station.
- For Round 2, the results for PAH, benzyl butyl phthalate, and bis(2-ethylhexyl)phthalate at the Duwamish, Georgetown, and South Park Stations were approximately three to five times greater than the Beacon Hill Station. However, associated recoveries for the deuterated monitoring compounds added to the samplers were all less than 10 percent at

Beacon Hill. A review of the field notes for this site found that a small portion of aluminum foil was missing from the sampler apparatus when it was retrieved leading to the possibility that photodegradation decreased aqueous concentrations for this sample. Therefore, the Round 2 ratios for the three Duwamish Valley stations should be considered biased high.

- For Round 3, the limited results for PAH, benzyl butyl phthalate, and bis(2-ethylhexyl)phthalate at the Duwamish, Georgetown, and South Park Stations were approximately equal to two-times (1x to 2x) those of the Beacon Hill Station.
- For Round 4, the results for PAH, benzyl butyl phthalate, and bis(2-ethylhexyl)phthalate at the Duwamish, Georgetown, and South Park Stations were approximately 0.75 to 2 times greater than the Beacon Hill Station.

BEHP concentrations at the three Duwamish Valley stations (Duwamish, Georgetown, and South Park) were greater than Beacon Hill during the winter sampling events (Rounds 1 and 2) than during the spring sampling events (Rounds 3 and 4). This finding is consistent with historic PSCAA data showing atmospheric particulate concentrations trending higher during fall/winter months than during spring/summer months. The amount of atmospheric particulates can be important because the carcinogenic PAH and larger molecular weight phthalates preferentially adsorb to the particulate phase. However, at this time, there is insufficient data to correlate atmospheric particulate concentrations to PAH concentrations.

As a quality control check Phase 1 results were compared with other studies. The LDW sample results (see Appendix C, Table C-4) compared well with studies conducted within the same airshed (i.e., Georgia Basin [Belzer, 2004] and Ecology studies) and with other regions (i.e., Great Lakes and Roskilde Fjord [Denmark] studies [Vikelsoe et al. 2001]). PAH values observed in LDW samples (0.006 to 0.28 $\mu g/m^2$/day) were comparable to the average values reported for the Georgia Basin airshed (0.004 to 0.36 $\mu g/m^2$/day). The BEHP values in the LDW (0.23 to 3.5 $\mu g/m^2$/day) were higher than the Georgia Basin average values (0.3 to 0.6 $\mu g/m^2$/day), but were comparable with the results from the Denmark study (0.068 to 2.16 $\mu g/m^2$/day). Further air deposition testing will allow the source control efforts to evaluate the reproducibility of results and to perform correlations with existing atmospheric measurements (e.g., particulate concentrations).

Miscellaneous Source Control Activities

Surface Water Quality Complaints

As shown in Table 11, between January 2005 and June 2005 SPU inspectors responded to 34 surface water quality complaints in the Lower Duwamish Waterway basin (20 complaints in the storm drain basin and 14 complaints in the combined sewer service area). Complaints are registered either from SPU's hotline number for citizens, or from internal or external agencies. The most common complaint involved automobile related fluids such as gasoline, diesel, oil, and battery acid (17). The remaining complaints involved a variety of materials including wash water, sewage, and general flooding. Twenty-seven of these complaints were resolved successfully, but the source of the problem could not be found for the other seven complaints, because the inspectors could not find any visible spill of material when responding to the complaint.

Spill Kit Incentive Program

A total of 189 businesses, located throughout the LDW study area, received spill kits during this reporting period (Table 12**)**. During the next reporting period, the spill kit program will focus on the Norfolk basin to coincide with business inspection efforts.

In 2004, SPU began a program offering free spill kits to local businesses that manufacture, store, use, or transport liquids as an incentive to improve onsite spill prevention and cleanup practices. The kits contain two absorbent booms, sorbent pads, and a drain cover, as well as personal protective equipment. The program is being administered by the Resource Venture, a program of the Greater Seattle Chamber of Commerce and the Environmental Coalition of South Seattle (ECOSS). Participating businesses fill out a standard spill response plan available online at www.resourceventure.org/spillkit.htm and receive a standard spill kit or a rebate coupon for up to 60 percent off a customized spill kit. The spill plan contains information about business activities that have the potential to contaminate stormwater, contact names for staff responsible for responding to spills, and basic instructions about spill notification, response, cleanup, and disposal procedures. After the spill plan is completed, ECOSS delivers a spill kit to the business, offers technical assistance, and provides a laminated copy of the spill plan, facility map showing where the spill kit is stored, and a diagram showing how to dispose of hazardous and non-hazardous materials. The incentive program is available to all qualifying businesses in the City.

Business Outreach

King County developed source control posters to be distributed to businesses inspected as part of the Lower Duwamish Waterway source control program. The posters, which contain information about best management practices to control pollutants discharged to the sanitary sewer and storm drain systems, are currently undergoing internal review and are expected to be ready for distribution during the next reporting period. The purpose of the posters is to build on the work done during the inspections and to serve as an ongoing reminder to businesses that their activities can affect the Duwamish Waterway.

Residential Outreach Project

King County and SPU plan to implement a community outreach strategy to empower residents in the Lower Duwamish study area to do their part to help prevent recontamination of sediments in the Duwamish Waterway. The following list describes several community outreach projects with planning underway.

1. **Natural Yard Care workshops.** King County plans to begin residential outreach by targeting yard care practices in the Top Hat neighborhood of the Hamm Creek Watershed. The county studied non-point source pollution in this area in 1996 and 1998 Data from that research will provide a baseline for measuring the effectiveness of three Natural Home and Yard Care trainings being held this fall. Participants will learn what behaviors they need to adopt in their home and yards to protect water quality and understand the role they play in maintaining the health of their children and the Duwamish River.
2. **Grants Workshops**. The Grant Exchange is a clearinghouse of grant and technical assistance programs offered by the King County. Goals include protecting and enhancing the environment, increasing community stewardship, and providing expertise and

consultation to projects. The county is offering two Grant Exchange workshops in fall 2005. The South Park Community Center grant workshop will target non-English speaking people in the Lower Duwamish study area. Past grant recipients will set up displays and describe completed projects as examples of projects that are eligible for funding. Participants will be eligible to receive "instant grantification" if they choose to apply for grant funding during the workshop. The second grant workshop will be held in partnership with the Middle Green Coalition and target a broader, predominantly English speaking audience.

3. **Charity car wash kits.** Charity car wash kits divert soapy water and oils from vehicles away from stormwater run-off to wastewater treatment plants. King County is currently promoting Charity Car Wash Kit availability via the Web and a press release. At the Grants Workshop in South Park the county will provide grants for the kits and demonstrations on how to use them. A "how to use the kit" poster and handouts will be created for this event. The county is also loaning two kits to the Environmental Coalition of South Seattle (ECOSS), a member of the Duwamish River Cleanup-Up Coalition (DRCC). ECOSS will loan kits to the Duwamish community and train borrowers to use them properly. SPU also has charity car wash kits available to the public, one is currently located at Camp Long in West Seattle and one is at the Environmental Learning Center at Carkeek Park.

4. **Duwamish River Festival:** Primary sponsors for this August 13, 2005 event are the EPA, Ecology and DRCC. Both SPU and King County source control staff plan to participate and provide posters and demonstrations. King County source control outreach for this event include Wheels to Water shuttle enhancing citywide transit access to the event, with a special focus on serving the South Park and Georgetown neighborhoods. Natural Yard Care and Grant Exchange staff (see above) plan to provide information about these programs in both English and Spanish. A life-sized Bert the Salmon, symbolizing water quality and its link to the salmon survival will be present. The county will hand out Bert the Salmon Baseball cards describing the benefits of using charity car wash kits and other educational materials to the public.

DIAGONAL/DUWAMISH EARLY ACTION SITE

The Diagonal Ave S CSO/SD is the largest outfall in the Diagonal/Duwamish early action site. The combined sewer service area in the Diagonal Ave S CSO/SD system encompasses about 4,900 acres and the storm drain basin covers about 2,600 acres (Figure 9). Both systems share the same outfall. There are 7 separate combined sewer overflow points in the system, Seattle operates 6 and overflows from the King County system discharge to the Diagonal system at one location. Overflow locations within the Diagonal system are shown on Figure 9.

Locations on Figure 9 where the combined sewer service and storm drain service systems overlap are known as partially separated areas. In these areas, stormwater runoff can discharge to either the separated storm drain system or the combined system, depending how the individual storm drain inlets are plumbed.

Land use in the Diagonal service area is a mix of residential, commercial, and industrial properties. As shown in Figure 10, the western portion of the basin is predominately industrial and the eastern side is mostly residential. Commercial areas are generally located along the major transportation corridors, (e.g., Rainier Ave S and Beacon Ave S). Land use in the basin is summarized in Table 13.

Business Inspections

One new business was inspected in the Diagonal Ave S CSO/SD system between January 1, 2005 and June 30, 2005. In addition, 39 follow-up inspections were conducted to confirm that corrections requested during previous reporting periods had been completed. A list of sites inspected during this reporting period is provided in Appendix B, Table B-1. Summaries of inspections completed during this reporting period and since the source control program began in March 2003, are provided in Appendix B, Table B-2. Corrective actions requested during this reporting period are listed in Appendix B, Table B-4 (summarized by regulatory program area) and Table B-5 (lists individual corrective actions).

To date, staff have completed inspections at 817 sites (552 full inspections and 265 screening inspections). Inspection locations are shown in Figure 11. Corrective actions have been required at 360 of the 552 sites where full inspections were conducted (65 percent). Summaries of all corrective actions requested to date (organized by basin and regulatory program area) are provided in Appendix B, Table B-3. As of June 30, 2005 all of the sites where corrective actions were requested had achieved compliance.

Table 1 summarizes the percentage of total corrective actions requested by individual program area in the Diagonal Ave S CSO/SD basin for all inspections completed to date (March 2003 to June 2005). Problems with stormwater (39 percent) are most common, followed by spill prevention and control (38 percent), hazardous waste (21 percent), and industrial waste (2 percent). The most frequently requested corrective actions are summarized in Table 2. Inadequate maintenance of onsite drainage facilities (62 percent of the sites where corrective actions were required) is the most common corrective action, followed by lacking proper spill prevention/cleanup materials (44 percent), inadequate spill cleanup materials present on site (41 percent), and inadequate employee training on spill prevention/cleanup procedures (36 percent).

Corrective actions requested at all of the sites inspected to date are listed in Appendix B, Table B-6.

Key Findings

No significant sources of contaminants to the waterway were found during the business inspections. Instead, as described above, many small problems/corrective actions were identified at numerous businesses throughout the Diagonal Ave S CSO/SD basin. Key findings related to illicit connections and discharges, unauthorized discharges of industrial wastewater to the sanitary sewer, and presence of elevated levels of contaminants in onsite catch basin samples are described in the following sections.

Illicit Connections and Discharges

One illicit discharge was discovered in the Diagonal Ave S CSO/SD system during this reporting period (trash compactor waste discharge). The site has been asked to replumb the trash compactor area to the sanitary sewer.

SPU is continuing to work with Ralph's Concrete and Pumping where an illicit discharge was discovered during the June 2004 reporting period. Ralph's generally routes water used to rinse concrete trucks through a series of settling trays, trenches, and drums, and then recycles the water back into the concrete trucks. However, SPU discovered that Ralph's occasionally discharges excess concrete wastewater into the public right-of-way and the wastewater then enters the Diagonal drainage system at catch basins on Poplar Place S. SPU issued a Notice of Violation (NOV) to Ralph's on December 15, 2003 and referred the problem to Ecology on May 12, 2004 after 2 additional violations occurred. In December 2004, the City of Seattle filed a lawsuit in Seattle Municipal Court to enforce the NOV. Several pre-trial settlement hearings have occurred in an effort to gain compliance. King County approved plans for a pretreatment facility in March and issued a permit to discharge to the sanitary sewer on June 13, 2005. Ralph's is applying for City permits to construct the necessary site and drainage improvements. Once the permits are issued, Ralph's can begin constructing a new system to store, process, and treat their washwater before discharging to the sanitary sewer. Permission to discharge is conditioned on construction of the pretreatment plan according to approved plans and successful completion of preoperative inspection.

Source Sampling and Identification

In-Line Sediment Traps

Traps are installed at 7 sites in the Diagonal Ave CSO/SD system (Figure 12). Station locations were selected to isolate individual subbasins within the larger storm drain system. During this reporting period, sediment traps were removed and redeployed in March. A total of four rounds of sediment trap samples have been collected to date:

- Round 1: February 2003 – August 2003
- Round 2: August 2003 – February 2004
- Round 3: February 2004 – August 2004
- Round 4: August 2004 – March 2005.

SPU plans to continue to deploy traps over the next 2-3 years to track changes in suspended particulate quality that may occur as a result of source control activities. SPU is working to modify trap installations to improve sediment capture. Results from all four rounds of samples are discussed in the overview section (see Table 3).

Catch Basin Samples

Onsite Catch Basins

No onsite catch basin samples were collected in the Diagonal Ave S CSO/SD system during this reporting period. CB 19, which was sampled during the previous reporting period and contained elevated concentrations of metals (copper, lead, mercury, and zinc), TPH, and BEHP, was cleaned on April 19, 2005.

Right-of-Way Catch Basins

Sediment samples were collected from one catch basin in the public right-of-way during this reporting period (see Figure 13 and Table 6). ROW24 contained elevated concentrations of BEHP (389 mg/kg OC) and TPH heavy oil (14,000 mg/kg). Additional sampling was also conducted in the roadways around RCB37, which was found to contain elevated concentrations of PCBs during a previous reporting period (17.5 mg/kg DW). Subsequent testing conducted in August 2004 found elevated PCBs in other catch basins within the right-of-way and in adjacent parking lots (1.6 –7.0 mg/kg). SPU cleaned all catch basins in the public right-of-way in June 2005 and is working with adjacent property owners to identify possible sources.

Inline Sediment Samples

Diagonal Ave S CSO/SD

SPU collected a number of inline sediment samples from the Diagonal Ave S CSO/SD as part of drain cleaning activities conducted in 2002-2004. Sampling locations are shown in Figure 14 and sample results are summarized in Table 7. Chemicals exceeding SQS are summarized below:

- Lead and mercury: S Dakota St and Denver Ave S laterals (CSL)
- Zinc: S Dakota St, Duwamish Ave S, and Denver Ave S laterals (SQS only)
- PCBs: S Dakota St lateral (SQS only)
- BEHP: Mainline at multiple locations and S Dakota St, Duwamish Ave S, 1st Ave S, and Denver Ave S laterals (CSL and SQS exceedances).

Cleaning operations were completed in 2004 and verified by video inspection in early 2005.

Other Drains in Diagonal/Duwamish

In June 2005, SPU attempted to collect sediment samples from the S Nevada St and Diagonal Ave S storm drains that discharge to the Diagonal/Duwamish early action site. All the manholes in the right-of-way on S Nevada St were clean and could not be sampled. The last manhole upstream of the outfall was covered by a container and could not be inspected. Manholes on the Diagonal Ave S storm drain were located inside a locked fence and could not be accessed for sampling. During the next reporting period, SPU will coordinate with the two property owners involved to obtain access to sample the Diagonal and Nevada St drains.

Source Control Actions

Diagonal Ave S CSO/SD Cleaning

As reported in the previous progress report, the Diagonal Ave S CSO/SD mainline (between 1st Ave S and 4th Ave S and at Colorado Ave S), the SW Dakota St lateral (from S Industrial Way to 1st Ave S), and the downstream sections of the 1st Ave S lateral and the Denver Ave S lateral were cleaned between 2002 and 2004 (see Figure 14). SPU video-inspected the SW Dakota lateral in February 2005 to verify that sediment removal was complete. No further cleaning is needed.

SLIP 4 EARLY ACTION SITE

The combined sewer service area in the Slip 4 basin encompasses about 6,200 acres and the storm drain basin covers about 467 acres. There are no storm-related combined sewer overflow discharges to Slip 4. The City (pump station 44) and King County (East Marginal Way pump station) both maintain emergency overflows on pump stations that discharge to Slip 4, but these pump stations overflow infrequently. The City pump station has not overflowed in the past 5 years (when the City started maintaining pump station records) and the King County pump station has not overflowed in the last 20 years. Both pump stations are equipped with emergency generators. Because discharges from the combined sewer service area are infrequent, source control work in Slip 4 focused on the separated drainage system.

Areas draining to Slip 4 are shown in Figure 15. Four public storm drains (Slip 4 SD, Slip 4 EOF/SD, Georgetown flume, and the I-5 storm drain) and ten private storm drains discharge to Slip 4. Land use in the basin is primarily industrial/commercial. The Slip 4 SD, which drains the northern portion of the King County Airport, encompasses a large portion of the Slip 4 drainage area (290 acres). Emergency overflows from City pump station 44 also now discharge to this drain. The drainage system at the airport has been modified numerous times. In about 1985, runoff from approximately 90 acres at the north end of the airport that used to discharge to the Slip 4 EOF/SD was diverted to the Slip 4 SD (Striplin 2004). This diversion also included the emergency overflow from City pump station 44. The Slip 4 EOF/SD now drains only about 3 acres on the north end of the airport.

The Georgetown flume, constructed in the early 1900s, originally discharged cooling water from the Georgetown Steam Plant to the Duwamish Waterway. Cooling water discharges to the flume stopped in the 1960s when the steam plant was shut down (Striplin 2004). Prior to about 1985, numerous storm drains and pipes from adjacent properties were also plumbed to the flume. At one time, runoff from an estimated 90 acres in the north end of the airport (North Boeing Field) as well as industrial wastewater discharged to the flume. In 1985-1987, Seattle City Light plugged all pipes entering the flume, except one 15-inch pipe from a Boeing yard (Striplin 2004). The flume now drains an estimated 3 acres and also continues to receive industrial stormwater discharges from Boeing.

The I-5 drain collects runoff from approximately 1.5 miles of I-5 (80 acres), 22 acres of single family residential property located east of I-5, and 1-2 acres on the north end of the King County airport. The small private drains that discharge to Slip 4 also serve mostly industrial and commercial areas immediately adjacent to the slip (approximately 50 acres).

Business Inspections

Five new businesses were inspected in the Slip 4 basin between January 1, 2005 and June 30, 2004 (1 screening visit and 4 full site inspections). In addition, 9 follow-up inspections were conducted to confirm that corrections requested during previous reporting periods had been completed. A list of sites inspected during this reporting period is provided in Appendix B, Table B-1. Summaries of inspections completed during this reporting period and since the source control program began in January 2003, are provided in Appendix B, Table B-2. Corrective actions requested during this reporting period are listed in Appendix B, Table B-4 (summarized by regulatory program area) and Table B-5 (lists individual corrective actions).

To date, a total of 55 sites (all of the airport tenants, not including Boeing-lease facilities) have been inspected (46 full inspections and 9 screening inspections). Inspectors have not been able to access Boeing facilities. Inspection locations are shown in Figure 16. Thirty-five (64 percent) of the sites where full inspections have been conducted required some type of corrective action (see Table B-2, Appendix B).). Summaries of all corrective actions requested to date (organized by basin and regulatory program area) are provided in Appendix B, Table B-3. By June 2005, 88 percent of the sites with corrective actions requested have made the changes that were required.

Table 1 summarizes the percentage of total corrective actions completed in the Slip 4 basin by individual program area for all inspections completed to date (March 2003 to June 2005). Problems with spill prevention and control (62 percent) are most common, followed by stormwater (26 percent), and hazardous waste (12 percent). The most frequently requested corrective actions are summarized in Table 2. Lack of a proper spill prevention/cleanup plan (73 percent of the sites where corrective actions were required) and inadequate employee training on spill prevention/cleanup procedures (67 percent) are the most common corrective action. Other common problems included lack of adequate spill control materials onsite (45 percent) and need for cleaning of onsite drainage facilities (39 percent). Corrective actions requested at all of the sites inspected to date are listed in Appendix B, Table B-6.

Source Tracing

Sediment Trap Samples

In March 2005, SPU installed sediment traps at the following (10) locations in the Slip 4 drainage basin (Figure 17):

- **T1** (MH 422): Slip 4/King County airport drain, downstream end of the north and central laterals combined.
- **T2 and T2A**: (MH356 and MH 482): Slip 4/King County airport drain, south lateral (downstream and upstream of Boeing lease property)
- **T3 and T3A** (MH361 and MH19C): Slip 4/King County airport drain, central lateral #1 (downstream and upstream of Boeing lease property).
- **T4 and T4A** (MH221A and MH229A): Slip4/King County airport drain, central lateral #2 (downstream and upstream of Boeing lease property)
- **T5 and T5A** (MH363 and MH178): Slip 4/King County airport drain, north lateral (downstream and upstream of Boeing lease property)
- **T6**: I-5 storm drain located at the intersection of S Hardy St and Airport Way S.

Traps will be removed in August 2005 and re-deployed for the winter season.

Inline Sediment Samples

Prior to installing the sediment traps, inline sediment samples were collected from four stations in the Slip 4 EOF/SD and the Slip 4 SD (serves the north end of the King County Airport) drains wherever sufficient sediment was present for chemical analysis. Sampling locations are shown in Figure 17 and data are summarized in Table 7. Sample splits were provided to The Boeing Company. Table 7 includes the results for both split samples. Unlike other storm drains

sampled in the LDW, sediment collected from the Slip 4 drains frequently exceeded the CSL for PCBs. PCB concentrations ranged from 310 to 31,000 μg/kg DW (7.1 to 2,800 mg/kg OC). Only 1 sample (one split from the Slip 4 SD at Manhole 363) did not exceed the CSL. Mercury (1 station) and zinc (2 stations) also exceeded the SQS in the Slip 4 SD. In addition, BEHP concentrations (25 to 76 mg/kg OC), although exceeding SQS, were generally lower than the concentrations found in other drains in the LDW.

Georgetown Flume Investigation

During this reporting period, SPU initiated an investigation to evaluate the condition of the flume and identify ongoing discharges to the flume. Activities completed include:

- Surveyed and mapped the locations of all pipes (active and inactive) entering the flume.
- Inspected and evaluated the condition of the flume.
- Collected sediment samples at select locations along the flume.

The flume consists of a combination of pipes and wood or concrete-lined flumes that run about 2,500 feet across the north end of the King County Airport from the Georgetown steam plant to Slip 4. Flume features are summarized below:

- Steam plant to Station 250 (ft): 60-inch tunnel
- Station 250 to 370: concrete-lined flume
- Station 370 to 830: twin 42-inch pipes
- Station 830 to 2,075: wood-lined flume
- Station 2,075 to 2,500 (Slip 4): 72-inch CMP pipe.

The open sections of the flume were visually inspected and two of the piped sections were video-inspected in April 2005. The tunnel section could not be video-inspected due to high water levels. SPU is evaluating whether the tunnel can be de-watered to allow video inspection. The condition of each section of the flume is described in Table 14.

Of the 25 pipes entering the flume, only 6 appear to be active (Figure 18). The rest have been capped or plugged. Information on the uncapped pipes is provided in Table 15. One illicit connection, a 3-inch ABS plastic pipe from a wash sink, floor drain, and laundry at an adjacent motel was found during the inspection. The motel's septic system does not have adequate capacity to handle the flow from the laundry and connection to the sanitary sewer would be expensive. The motel has stopped discharging to the flume. The wash sink was moved to another location that is plumbed to the septic system and the floor drain has been plugged. The outlet from the laundry has also been plugged and they now send laundry offsite for cleaning.

Sediment samples were collected along the flume at 5 roughly equally spaced transects and in the vicinity of 5 pipes (4 active and 1 plugged pipe). Sampling locations are shown in Figure 19 and sample results are provided in Table 7.

Lead and zinc concentrations exceeded the SQS at Station P3, the 15-inch pipe entering the south side of flume at the downstream end of the tunnel section (501 mg/kg and 766 mg/kg, respectively). This pipe is now plugged, but was active when City Light surveyed the flume in

1985. It collected runoff from about 1.5 acres of industrial property in the northeast corner of the King County Airport. Zinc concentrations also exceeded the CSL in the sample collected at the upstream end of the flume (T4), in the condenser pit at the steam plant (1,130 mg/kg). TPH-oil concentrations were also elevated at this location (9,700 mg/kg) and in the ditch located on the east side of S Myrtle St (3,000 mg/kg, Station P5).

PCB concentrations exceeded the SQS at multiple locations along the flume. Sample results are summarized in Table 7. The highest concentration (92 mg/kg or 1,700 mg/kg OC, Aroclor 1254) was observed in the flume adjacent to the 15-inch pipe entering the south side of the flume at the downstream end of the tunnel (Station P3). The transect located about 650 feet downstream of this pipe (T3) also contained elevated concentrations of PCBs (3.9 mg/kg or 170 mg/kg OC, Aroclor 1254).

Other flume samples (T4, T5, P1, P2) exceeded the SQS for PCBs, but contained a mixture of Aroclor 1248, 1254, and 1260 or Aroclor 1254 and 1260. The ditch on the east side of S Myrtle St exceeded the SQS for PCBs, but contained only Arcolor 1260 (1.5 mg/kg or 22 mg/kg OC). Samples collected from the two transects located in the lower end of the flume (T1 and T6, below S Myrtle St) were below 1 mg/kg PCBs (0.33 and 0.4 mg/kg, respectively) and did not exceed the SQS.

Catch Basin Samples

No catch basin samples were collected in Slip 4 this reporting period. King County Airport has cleaned the catch basins around the maintenance building that were found to contain elevated levels of copper (5,660-6,6320 mg/kg), zinc (3,420-3,530 mg/kg), and BEHP (90-290 mg/kg OC) during the last reporting period. In addition, the airport is working to install outlet traps on appropriate catch basins.

FORMER SLIP 5 AND SLIP 6

Source control activities during this reporting period also covered areas on the King County Airport that drain to the LDW at the location of the former Slip 5 (early action site at river mile 3.8) and Slip 6. Inspectors were already working on the airport property for the Slip 4 early action site, therefore King County and SPU elected to inspect all of the airport tenants and facilities at one time. The middle portion of the airport (237 acres) drains to the LDW at the location of the former Slip 5 (which has been filled) via a 48-inch diameter storm drain. This outfall also serves as the emergency overflow for City pump station 45 on the City's sanitary sewer system. Pump station 45 has not overflowed in the last 5 years, since the City started maintaining pump station records. The southern portion of the airport (approximately 70 acres) drains to Slip 6 via a 24-inch diameter storm drain.

Business Inspections

One new business was inspected in the Slip 5 and 6 basins between January 1, 2005 and June 30, 2004. In addition, 6 follow-up inspections were conducted to confirm that corrections requested during previous reporting periods had been completed. A list of sites inspected during this reporting period is provided in Appendix B, Table B-1. Summaries of inspections completed during this reporting period and since the source control program began in January 2003, are provided in Appendix B, Table B-2. Corrective actions requested during this reporting period are listed in Appendix B, Table B-4 (summarized by regulatory program area) and Table B-5 (lists individual corrective actions).

To date, a total of 34 sites have been inspected in Slip 5/6 (32 full inspections and 2 screening inspections). Inspection locations are shown in Figure 20. Corrective action(s) were required at 13 of the 34 sites where full inspections were conducted. As of June 2005, 12 of the sites where corrective actions were requested (92 percent) have achieved compliance.

Table 1 summarizes the percentage of total corrective actions completed in the Slip 5/6 basin by individual program area for all inspections completed to date (March 2003 to June 2005). Problems with spill prevention and control (76 percent) are most common, followed by stormwater (15 percent), and hazardous waste (9 percent). The most frequently requested corrective actions are summarized in Table 2. Lack of a proper spill prevention/cleanup plan (92 percent of the sites where corrective actions were required) is the most common corrective action. Other common problems included lack of adequate spill control materials onsite (62 percent), inadequate employee training on spill prevention/cleanup procedures (46 percent) and improper storage of hazardous products and waste material (23 percent). Corrective actions requested at all of the sites inspected to date are listed in Appendix B, Table B-6.

Illicit Connections and Discharges

One illicit discharge was discovered in the Slip 5 basin during this reporting period (washwater from an airplane wash area). King County Airport has asked the facility to stop washing airplanes at this location and the business has covered the catch basin with a steel plate.

Source Tracing

No catch basin samples were collected in Slips 5 and 6 during this reporting period. The two catch basins sampled during last reporting period that contained elevated concentrations of chemicals (CB40 and CB41b) have not yet been cleaned. The airport is investigating lease agreements to determine who is responsible for cleaning CB40 and there was not enough material remaining in CB41b after the sample was collected to warrant cleaning.

TERMINAL 117 EARLY ACTION SITE

The Terminal 117 (T117) early action site is located in the South Park neighborhood on the west side of the Lower Duwamish Waterway just south of the 16th Ave S Bridge. The upland areas draining to T117 are located in an area of South Park that lacks a formal drainage system. Because the streets were in poor condition, stormwater runoff typically ponded in the right-of-way or ran off onto adjacent properties. The total area draining to the T117 early action site is estimated at about 5 acres (Figure 21) and consists of the now vacant Terminal 117 property owned by the Port of Seattle (former Malarkey Asphalt site), 3 small residential properties, an oil recycling facility that is in the process of being demolished (Basin Oil), a chocolate factory, and about 3 blocks of roadway (S Donovan St, 17th Ave S, and Dallas Ave S). The South Park marina is located on the waterfront on the north side of the T117 early action site and the Boeing South Park facility is located on the south side of T117. Surface runoff from these two properties discharges to the Duwamish Waterway via private storm drains.

Until recently, most of the runoff from the approximately 1.8-acre upland area either entered a catch basin at the south end of the Port's T117 property or sheet flowed across T117 and entered the Port's drainage system that discharges to the Duwamish Waterway. As a result of an interim source control action completed by the City of Seattle in December 2004, runoff from most upland areas outside of the Port property is now collected and discharged to the City's combined sewer system. Runoff from a portion of the hillside along the south side of S Donovan St continues to discharge to the Port's drainage system.

Source Control Actions

Dallas Ave S Interim PCBs Cleanup

During this reporting period, SPU conducted additional work to contain PCBs present in the 16th Ave S street right-of-way and properties at 8601 and 8609 17th Ave S and 8603 Dallas Ave S. PCBs were originally discovered in August 2004, as part of routine source sampling efforts conducted to identify potential sources to the T117 early action site. An interim cleanup action was completed in December 2004 (see previous progress report for details) to contain the PCBs present in the rights-of-way along Dallas Ave S, 17th Ave S, and S Donovan St. Work in the yards and private properties was delayed until after the wet season to minimize disruption to the property owners.

Locations for all samples collected to date are shown in Figures 22 and 23 and results are summarized in Table 16. Concentrations in street dirt were as high as 9.2 mg/kg PCBs DW (found in a catch basin located on 17th Ave S). Soil beneath the roadway contained as much as 66 mg/kg PCBs DW and soil collected from the public right-of-way immediately adjacent to the roadway contained up to 93 mg/kg PCBs DW. The cleanup level in soil for unrestricted use under the Washington State Model Toxics Control Act is 1 mg/kg PCBs.

In June 2005, a total of 790 tons (approximately 525 CY) of PCB-contaminated soil was removed from the properties at 8601 and 8609 17th Ave S, and 8603 Dallas Ave S, as well as along the west edge of 16th Ave S between Dallas Ave S and S Cloverdale St. Cleanup along 16th Ave S was conducted because PCBs were found in street dust along the edge of the pavement in March 2005 as part of additional site characterization work conducted by SPU.

Verification samples were collected from the bottom of the excavated area to confirm that PCBs were below the MTCA 1 mg/kg cleanup level. Verification samples consisted of composites comprised of 9 grab samples collected from approximately 12-foot by 12-foot grids. Verification samples were screened in the field using an Ensys™ PCB test kit prior to backfill and submitted to an analytical laboratory for confirmation. Only 1 of the 51 confirmation samples (4 mg/kg) exceeded the state cleanup level. SPU will re-excavate this area in early August to remove the remaining PCB-contaminated soil. Locations and descriptions of interim cleanup actions completed to date are shown on Figure 24.

The temporary stormwater collection system installed in December 2004 remains in place and all runoff from the 1.8 acre site is discharged to the combined sewer. SPU obtained a discharge authorization from King County Industrial Wastewater to discharge to the sewer system. The treatment system was removed in April 2005 after stormwater sampling confirmed that PCBs in runoff were below the discharge limits specified in the discharge authorization with King County Industrial Waste. Sample results are summarized in Table 17. SPU continues to collect monthly stormwater samples as required by King County. Since April, PCBs have not been detected (at 0.1 μg/L detection limit) in any of the stormwater samples.

In March 2005, SPU collected sediment samples from 3 of the 5 new catch basins installed in the roadway during the December 2004 interim cleanup, where there was sufficient sediment to analyze (two catch basins located at the northeast end of 17th Ave S and one on Dallas Ave S across from south entrance to the Basin Oil property. All three samples contained PCBs (1260) at concentrations greater than 1 mg/kg (3.9 to 23 mg/kg). It is not clear whether the PCB-contaminated soil entered the catch basins during the December 2004 cleanup/construction activities or from adjacent soils that were not capped/removed during the interim cleanup project. SPU cleaned all of the new catch basins in June 2005 and will resample these catch basins in the next 6-12 months (after sufficient sediment has accumulated) to determine whether PCBs are present.

The temporary stormwater collection system will remain in place until the final cleanup is completed. SPU is currently working to develop a cleanup plan for the public right-of-way. Final cleanup is currently scheduled to occur in 2007.

NORFOLK EARLY ACTION SITE

LDW source control work is scheduled to start in the Norfolk basin August 2005. However, in early 2005 SPU began developing a capital improvement project (CIP) to correct drainage problems in the drainage system in the Norfolk-Martin Luther King, Jr. Way S subbasin (Norfolk-MLK Way). The Norfolk-MLK Way system serves approximately 224 acres of mixed residential, commercial, and industrial property on the southeast end of the LDW surface drainage basin.

As part of this CIP project, accumulated sediment was removed from the piped section of the drainage system and samples were collected to evaluate disposal options. As of July 2005, 1,900 of the 2,200 LF scheduled to be cleaned to restore system capacity has been completed. The remaining 300 LF will be cleaned in August 2005. Cleaning and sampling locations are shown in Figure 24 and sample results are summarized in Table 7. Zinc (90 to 1,200 mg/kg) and BEHP (119 to 406 mg/kg OC) were the only to chemicals that exceeded SQS. TPH-oil (200 to 7,600 mg/kg) also exceeded the MTCA Method A cleanup levels at most of the sampling stations.

NEXT STEPS

King County and SPU intend to continue the joint business inspection and source tracing efforts to support the Lower Duwamish Waterway Superfund investigation. SPU and King County Industrial Waste are planning an outreach program to reach businesses in the Diagonal/Duwamish Basin. Potential outreach activities include educational seminars and posters mailed to all businesses inspected. The intent is to provide ongoing reminders to businesses of how their practices can affect the Duwamish Waterway.

Business Inspections

The joint business inspection program has been successful in reaching businesses that discharge to the LDW via the publicly-owned storm drain or the combined sewer systems. King County and SPU will have a continuing presence in the Diagonal/Duwamish and Slip 4, 5, and 6 areas, focusing on higher priority businesses and will also expand into other areas to support ongoing and future early action area cleanups.

Diagonal/Duwamish

Inspectors will complete follow-up inspections in the Diagonal/Duwamish early action area to ensure that problems found during previous inspections are corrected. Some businesses in the area (those that were inspected during the early part of the first reporting period) have not been inspected in over a year. Results from previous inspections will be reviewed to identify sites that should be re-inspected. Re-inspections will be conducted by the jurisdiction with lead authority (i.e., KCIW for industrial wastewater discharges and SPU for stormwater discharges).

Slip 4

The Boeing Company owns most of the sites remaining to be inspected in the Slip 4 early action area. Boeing has not allowed county and city inspectors to inspect their facilities and has requested that only Ecology inspectors or other inspectors with direct permit authority inspect Boeing facilities. King County and SPU will support Ecology to facilitate these inspections. The County and City will also conduct follow up inspections at the other businesses in Slip 4 to ensure that all required corrective actions are implemented.

Terminal 117

SPU inspectors will conduct a joint inspection with Ecology at the South Park marina. Runoff from the marina discharges directly to the waterway.

Other Areas in the LDW

King County, SPU, and other members of the Lower Duwamish source control work group are developing a work plan to coordinate future source control activities. The goals are to support upcoming early action site cleanups by ensuring that the source control work is underway on schedule with cleanup activities, to schedule future work that may be needed outside the existing early action sites, and to identify resources needed for future source control efforts. During the

next reporting period, inspectors will begin working in other early action areas in the Lower Duwamish Waterway:

- Norfolk early action site
- Early action site at river mile 3.8 in the vicinity of the former Slip 5 (areas outside the King County Airport that have not yet been inspected)
- Trotsky early action site.

Source Sampling

Source Tracing

Source tracing efforts will continue to focus on catch basin and in-line sediment sampling to track sources of contaminants to the waterway sediment. Work planned for the next reporting period includes:

- Continue sampling the 7 sediment trap installations in the Diagonal Ave S CSO/SD system and the 10 traps installed in the Slip 4 basin.
- Begin resampling select onsite catch basins in the Diagonal/Duwamish early action site to assess whether source control actions have been effective in reducing pollutants discharged to the storm drain system. Catch basins were typically cleaned as part of the source control work identified during previous inspections. It has been 1-2 years since the first round of onsite samples were collected and these catch basins should now contain sufficient sediment for chemical analysis.
- Collect sediment samples from the other public storm drains discharging to the Lower Duwamish Waterway in the vicinity of the Diagonal/Duwamish early action site (S Nevada St and the Diagonal Ave S storm drains) to determine whether these drainage systems may be contributing contaminants to the waterway sediment. Sampling was not successful during this reporting period. SPU will coordinate with property owners to gain access to the manholes on these lines.
- Begin source sampling/tracing in the areas draining to the Norfolk early action area.

Phthalate Source Study

King County will continue collecting wet-dry atmospheric deposition samples at the four stations in the LDW and at other stations outside the urban area to serve as background. The City of Tacoma has also agreed to participate in the effort by collecting atmospheric deposition samples along with the stormwater runoff samples from one drainage basin in the Thea Foss Waterway. Tacoma routinely collects stormwater samples from the 7 major city-owned storm drains in the Thea Foss Waterway to support ongoing Superfund cleanup activities. Phthalates, particularly BEHP, are a chemical of concern in waterway sediment. It is anticipated that coordinating atmospheric deposition and stormwater runoff sampling will help to develop an understanding of how BEHP enters the waterway.

Site-Specific Source Control Actions

Dallas Ave Cleanup

SPU has hired a consultant to develop cleanup and site restoration plans for the road rights-of-way along Dallas Ave S, S Donovan St, and 17th Ave S. During the next reporting period, SPU will begin developing plans for the final cleanup. Cleanup will be conducted under SPU's capital improvement program. Work will involve evaluating cleanup options, working with regulatory agencies, and completing the internal business plan needed to obtain funding for the project. Final cleanup in the right-of-way is currently scheduled to occur in 2007.

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TABLES

Table 1. Corrective actions requested by program area.
March 2003 - June 2005[a]

	Percent of Total Corrective Actions				
	Stormwater	Spill Prevention/Cleanup	Hazardous Waste	Industrial Waste	Total # of Corrective Actions
Diagonal CSO/SD	39	38	21	2	1,155
Slip 4	26	62	12	0	98
Slip 5/6	15	76	9	0	34
East Waterway	40	46	12	1	327
Other Duwamish	31	50	19	0	26
Overall	38	42	18	2	1,640

a. All inspections completed to date for the Lower Duwamish Waterway source control program.

Table 2. Most frequent corrective actions requested.
March 2003 - June 2005[a]

Corrective Action	Percentage of sites with corrective action					
	Diagonal CSO/SD	Slip 4	Slip 5/6	EWW	Other Duwamish	Overall
Drainage facility needs cleaning	62	39	8	54	20	57
Facility lacks proper spill prevention/cleanup plans/procedures	44	73	92	48	100	48
Inadequate spill cleanup materials available onsite	41	45	62	39	80	41
Inadequate employee traininag on spill prevention/cleanup practices	36	67	46	40	80	39
Improper storage of hazardous products and waste materials	25	15	23	13	40	22
Improper hazardous waste disposal	19	15	0	8	0	16
Improper outdoor storage of non-hazardous materials/products	13	15	0	5	80	12
Total number of sites	365	33	13	119	5	535

a. All inspections completed to date for the Lower Duwamish Waterway source control program.

Table 3. Diagonal Ave CSO/SD Sediment Trap Results.

	SQS	CSL	ST1 E Marginal/S Oregon	ST1 E Marginal/S Oregon	ST1 E Marginal/S Oregon	ST1 E Marginal/S Oregon	ST2 Airport Way/6th Ave S	ST2 Grab in pipe	ST 2 (bottle #1)	ST2 (bottle #2)	ST2 Airport Way/6th Ave S	ST2 Airport Way/6th Ave S
			Round 1	Round 2	Round 3	Round 4	Round 1		Round 2	Round 2	Round 3	Round 4
Date deployed			02/01/03	08/21/03	03/11/04	07/30/04	02/01/03				03/11/04	07/30/04
Date removed			08/21/03	02/18/04	07/30/04	03/14/05	08/21/03	08/21/03	03/11/04	03/11/04	07/30/04	03/09/05
TOC (percent)			17	10	7.81	8.17	4.5	2.1	4.6	3.5	7.46	8.42
Metals (mg/kg DW)												
As	57	93	10 U	10 U	20 U	**10**	7 U	30 U	50 U	8 U	10 U	9 U
Cu	390	390	**298**	**120**	**215**	**144**	**89.9**	**78**	**146**	**34.1**	**136**	**93.2**
Pb	450	530	**244**	**121**	**160**	**126**	**76**	**100**	**210**	**39**	**41**	**111**
Hg	0.41	0.59	**0.3**	**0.20**	**0.20**	**0.27**	0.06 U	0.02 U	0.4 U	0.07 U	0.1 U	0.08 U
Zn	410	960	1,050	**445**	**638**	**435**	**282**	**159**	**735**	**162**	**184**	**465**
LPAH (mg/kg OC)												
Acenapthene	16	57	11 U	**0.6** J	3 U	0.7 U	2 U	2 U	5 U	3 U	1 U	**10**
Acenaphthylene	66	66	11 U	**1.0**	3 U	0.7 U	2 U	2 U	5 U	3 U	1 U	1 U
Anthracene	220	1,200	11 U	**0.8** J	3 U	0.7 U	**6**	2 U	5 U	3 U	**2**	**23**
Fluorene	23	79	11 U	**0.8** J	3 U	0.7 U	**2**	2 U	5 U	3 U	1 U	**9**
Naphthalene	99	170	11 U	**1.0**	3 U	0.7 U	2 U	2 U	5 U	3 U	1 U	**2** J
Phenanthrene	100	4,480	**19**	**5.9**	**22**	**1.1**	**36**	**6**	**22**	**12**	**17**	**83**
HPAH (mg/kg OC)												
Benzo(a)anthracene	110	270	11 U	**3.4**	**11**	0.7 J	**24**	**5**	**18**	**8**	**10**	**56**
Benzo(a)pyrene	99	210	**35**	**11.0**	**29**	2.3 J	**60**	**10**	**65**	**25**	**27**	**143**
Benzo(b)fluoranthene[a]	230	450	**14**	**3.4**	**15**	1.0 J	**40**	**5**	**24**	**9**	**11**	**32**
Benzo(k)fluoranthene			**18**	**6.1**	**23**	**1.2**	**29**	**6**	**30**	**12**	**15**	**67**
Benzo(g,h,i)perylene	31	78	11 U	**1.0**	**2.8**	**0.7**	**2**	2 U	**5**	**3**	**1**	**5**
Chrysene	110	460	**14**	**6.3**	**15**	**0.5**	**40**	**6**	**24**	**9**	**11**	**49**
Dibenzo(a,h)anthracene	12	33	11 U	**3.7**	13 U	0.7 U	24 U	4 U	20 U	**9**	10 U	**45**
Fluoranthene	160	1,200	**11**	**2**	**9**	**0.8**	**3**	**2**	**10**	**5**	**5**	**23**
Indeno(1,2,3-c,d)pyrene	34	88	32 U	**9.5**	**31**	1.8 J	**53**	**10**	**30**	**13**	**21**	**101**
Pyrene	1,000	1,400	**11**	**1.7**	**8**	**0.6**	**5**	**2**	**10**	**6**	**5**	**24**
Phthalates (mg/kg OC)												
Bis(2-ethylhexyl)phthalate	47	78	**394**	**87**	**294**	**12.2** B	**400** E	**133**	**283**	**40**	**113**	**118**
Butylbenzylphthalate	4.9	64	**17**	**3.9**	**23**	0.7 U	**27**	2 U	**10**	**4.0**	1 U	**8**
Diethylphthalate	61	110	11 U	1.0 U	3 U	0.7 U	2 U	2 U	5 U	3 U	1 U	2 U
Dimethylphthalate	53	53	11 U	1.0 U	3 U	0.7 U	**2**	2 U	5 U	3 U	1 U	2 U
Di-n-butylphthalate	220	1,700	11 U	**1.3**	**5**	0.7 U	**2**	2 U	5 U	**3**	1 U	2 U
Di-n-octylphthalate	58	4,500	**21**	**7.1**	**22**	**1.0**	**8**	2 U	**19**	**4**	1 U	**3**
PCBs (mg/kg OC)	12	64										
Aroclor 1016			0.12 U	0.2 U	0.26 U	0.2 U	0.53 U	0.90 U	0.43 U	0.57 U	0.27 U	0.2 U
Aroclor 1242			0.12 U	0.2 U	0.26 U	0.2 U	0.53 U	0.90 U	0.43 U	0.57 U	0.27 U	0.2 U
Aroclor 1248			0.12 U	0.2 U	0.26 U	0.9 Y	0.53 U	0.90 U	**1.48** P	**1.71** P	0.27 U	**0.9**
Aroclor 1254			**0.50**	**2.3**	**0.85**	**2.4**	**2.13**	**1.71**	**0.98**	**0.60** J	**0.29**	**1.0**
Aroclor 1260			0.12 U	**6.3**	**1.04**	**2.3**	0.53 U	0.90 U	0.67	**0.40** J	0.27 U	1.1 Y
Aroclor 1221			0.24 U	0.2 U	0.26 U	0.2 U	1.09 U	1.81 U	0.43 U	0.57 U	0.27 U	0.2 U
Aroclor 1232			0.12 U	0.2 U	0.26 U	0.2 U	0.53 U	0.90 U	0.43 U	0.57 U	0.27 U	0.2 U
Total PCBs			**0.50**	**8.6**	**1.88**	**4.77**	**2.13**	**1.71**	**2.46**	**2.71**	**0.29**	**1.8**
TPH (mg/kg)	***MTCA A***											
Diesel		2,000	**620**	NA	**840**	**94**	**88**	**50**	**370**	87 U	**32**	**52**
Motor Oil		2,000	**1,100**	NA	**3,200**	**380**	**230**	**110**	2,400	**570**	**120**	**290**

Exceeds CSL or MTCA Method A Cleanup Level for unrestricted use

Exceeds SQS

a. SMS for total benzofluoranthenes

U = Chemical not detected at the reported concentration.

Y = Chemical not detected at the reported concentration. The reporting limit is raised due to chromatographic interference.

J = Estimated value. Concentration is below the laboratory's reporting limit for that compound.

Table 3. Diagonal Ave CSO/SD Sediment Trap Results.

	SQS	CSL	ST3 S Forest	ST3 S Forest	ST3 S Forest	ST4 MLK Wy/S Winthrop St	ST5 S College/Rainier	ST5 S College/Rainier	ST6 S Bush Pl/Rainier	ST6 S Bush Pl/Rainier	ST7 S Dakota/6th Ave S
			Round 1	Round 2	Round 4	Round 4	Round 1	Round 4	Round 1	Round 4	Round 2
Date deployed			02/01/03	10/13/03	07/30/04	07/30/04	02/01/03	07/30/04	02/01/03	07/30/04	10/13/03
Date removed			08/21/03	03/11/04	03/14/05	03/09/05	08/21/03	03/10/05	08/21/03	03/11/05	02/18/04
TOC (percent)			6.7	1.8	8.28	3.72	13	1.97	12	11.3	6.9
Metals (mg/kg DW)											
As	57	93	9 U	7 U	10 U	**8**	6 U	**14**	8 U	10 U	**9**
Cu	390	390	**138**	**69**	**164**	**52.7**	**136**	**32.5**	**231**	**100**	**62.6**
Pb	450	530	**128**	**102**	**156**	**64**	**175**	**29**	**200**	**122**	**61**
Hg	0.41	0.59	**0.07**	0.07 U	**0.2**	0.07 U	**0.10**	0.05 U	**0.25**	**0.13**	0.06 U
Zn	410	960	**653**	**433**	**662**	**418**	**479**	**164**	**944**	**399**	**262**
LPAH (mg/kg OC)											
Acenapthene	16	57	2 U	4 U	6 U	**3**	1 U	3 U	9 U	**2** J	1 J
Acenaphthylene	66	66	2 U	4 U	6 U	2 U	1 U	3 U	9 U	2 U	1 U
Anthracene	220	1,200	**3**	4 U	6 U	**6**	1 U	3 U	9 U	**6**	1 U
Fluorene	23	79	2 U	4 U	6 U	**5**	1 U	3 U	9 U	**3**	1 J
Naphthalene	99	170	**9**	4 U	6 U	**1** J	1 U	3 U	9 U	2 U	1 U
Phenanthrene	100	4,480	**16**	**11**	**31**	**32**	**4**	**9**	**49**	**42**	**4**
HPAH (mg/kg OC)											
Benzo(a)anthracene	110	270	**11**	**6**	**8**	**12**	**3**	**5**	**27**	**26**	**2**
Benzo(a)pyrene	99	210	24 U	**22**	**47**	**40**	**8**	**18**	**76**	**88**	**6**
Benzo(b)fluoranthene[a]	230	450	**5**	**7**	**11**	**13**	**4**	**7**	**39**	**27**	**2**
Benzo(k)fluoranthene			**15**	**11**	**18**	**16**	**4**	**9**	**42**	**35**	**3**
Benzo(g,h,i)perylene	31	78	2 U	**4**	**6**	**2**	**1**	**3** J	**9**	**3**	**1** J
Chrysene	110	460	**6**	**7**	**10**	**10**	**6**	**5**	**39**	**38**	**2**
Dibenzo(a,h)anthracene	12	33	2 U	6 U	**10**	12 U	4 U	6 U	**28**	**27**	2 U
Fluoranthene	160	1,200	**2**	**5**	**8**	**4**	**2**	**3**	**14**	**10**	**1**
Indeno(1,2,3-c,d)pyrene	34	88	24 U	**11** J	**29**	**30**	**7**	**11** J	**68**	**56**	**4** J
Pyrene	1,000	1,400	**2**	**4**	**7**	**4**	**4**	**3**	**16**	**12**	**1**
Phthalates (mg/kg OC)											
Bis(2-ethylhexyl)phthalate	47	78	**269** E	**256**	**193**	**89**	**68**	**56**	**350**	**115**	**35**
Butylbenzylphthalate	4.9	64	**30**	**7**	**12**	**6.5**	**3**	**10**	**28**	**9**	**3**
Diethylphthalate	61	110	2 U	4 U	6 U	2 U	1 U	3 U	9 U	2 U	1 U
Dimethylphthalate	53	53	**2**	**15**	6 U	2 U	**2**	3 U	**9**	2 U	1 U
Di-n-butylphthalate	220	1,700	2 U	4 U	6 U	**2.2**	**6**	3 U	9 U	**3**	1 U
Di-n-octylphthalate	58	4,500	**58** M	**23**	**16**	**4.8**	**3**	3 U	**31**	**6**	**3**
PCBs (mg/kg OC)	12	64									
Aroclor 1016			0.30 U	1.11 U	0.2 U	1 U	0.15 U	1 U	0.16 U	0.2 U	0.28 U
Aroclor 1242			0.30 U	1.11 U	0.2 U	1 U	0.15 U	1 U	0.16 U	0.2 U	0.28 U
Aroclor 1248			0.30 U	1.11 U	0.7 Y	1 Y	0.15 U	1 U	0.16 U	0.2 U	0.28 U
Aroclor 1254			**1.94**	**2.78**	0.2 U	**2.6**	**1.0**	**3.2**	**0.70**	0.5 Y	**1.4**
Aroclor 1260			0.30 U	**1.28** J	0.2 U	**3.0**	0.15 U	1 U	0.16 U	1.4 Y	0.28 U
Aroclor 1221			0.58 U	1.11 U	0.2 U	1 U	0.30 U	1 U	0.32 U	0.2 U	0.28 U
Aroclor 1232			0.30 U	1.11 U	0.2 U	1 U	0.15 U	1 U	0.16 U	0.2 U	0.28 U
Total PCBs			**1.94**	**4.06**	2.1 U	**5.6**	**1.0**	**3.2**	**0.70**	2.8 U	**1.4**
TPH (mg/kg)	***MTCA A***										
Diesel		2,000	**560**	**380**	**140**	**79**	**600**	**140**	NA	**140**	NA
Motor Oil		2,000	**1,400**	**1,200**	**640**	**330**	**1,200**	**750**	NA	**680**	NA

Table 4. Construction projects in the Lower Duwamish Waterway.
January - June 2005

Project	Basin	Address	Use
2301075	Combined sewer	00901 12TH AV	CONSTRUCT SECOND-STORY ADDITION, ALTER 1ST AND 2ND FLOORS
2301697	Combined sewer	02701 15TH AV S	GRADING ONLY FOR SITE REMEDIATION PER PLAN
2105164	Combined sewer	03213 HARBOR AV SW	PHASE II, CONSTRUCT 5 STORY PLUS BASEMENT MIXED USE
2302552	Combined sewer	06550 32ND AV SW	PHASE I HIGH POINT: MASSIVE GRADING AND CLEARING INCLUDING DRAINAGE
2208351	Combined sewer	03815 OTHELLO ST	CONSTRUCT & OCCUPY A FOUR-STORY MIXED USE
2301282	Combined sewer	07501 M L KING JR WY S	CONSTRUCT & OCCUPY 14 LOW INCOME BLDGS, 4 SRS, 5 APTS, 5 TOWNHOMES
2302571	Combined sewer	00710 ROY ST	FOUR DUPLEX TOWNHOMES, 2 12-UNIT APARTMENTS
2301283	Combined sewer	07610 40TH AV S	CONSTRUCT & OCCUPY 7 LOW INCOME HOUSING BLDGS (4 SFRS, 2 TOWNHOUSES, 1 APT BLDG)
2301836	Combined sewer	07405 ROCKERY DR S	CONSTRUCT & OCCUPY FOUR SFR'S, ONE TRIPLEX, 1 APT, 3 TOWNHOMES
2308300	Combined sewer	03642 33RD AV S	GRADING OF APPROXIMATELY 3500 CUBIC YARDS OF
2301837	Combined sewer	07643 ROCKERY DR S	CONSTRUCT & OCCUPY FOUR SINGLE-FAMILY RESIDENCES 2 TRIPLEXES 3 TOWNHOMES
2205112	Combined sewer	04515 M L KING JR WY S	CONSTRUCT 4-STORY MIXED USE BUILDING AS LOW-INCOME HOUSING
2207892	Combined sewer	00500 17TH AV	CONSTRUCTION ADDITION & SUBSTANTUAL ALTERATIONS
2303753	Combined sewer	04515 29TH AV S	CONSTRUCT 3 STORY APARTMENT (BLDG 79) AND 4 STORY APT COMMUNITY CENTER
2302636	Combined sewer	02916 COLUMBIAN WY	CONSTRUCT 4 STORY MIXED USE BUILDING AND OCCUP
2308375	Combined sewer	03512 JUNEAU ST	CONSTRUCT 26 UNIT APT. BUILDING W/ PARKING BELOW
2308483	Combined sewer	03701 KENYON ST	CONSTRUCT SCHOOL AND GYM ADDITION TO EXISTING GYM
2304855	Combined sewer	06107 FOUNTAIN ST	GRADING AND DRAINAGE FOR ACCESS ROAD PER PLAN
2307694	Combined sewer	06020 LANHAM PL SW	CONSTRUCT 9 BLDGS,6 TOWNHOUSE;3 APTS
2403517	Combined sewer	07605 39TH AV S	HOLLY PARK - GRADING (APPROX 11,000 C.Y.), ROCKERY AND DRAINAGE
2306712	Combined sewer	01702 24TH AV	DEMO SFR - EST USE WITH 2 DUPLEX TOWNHOMES
2305817	Combined sewer	07345 DELRIDGE WY SW	SUBSTANTIAL ALTERATION TO EXISTING RETAIL STORE;
2307693	Combined sewer	05910 32ND AV SW	CONSTRUCT 10 BLDGS,5 APT, 5 TOWNHOME,
2404074	Combined sewer	03801 HOLLY PARK DR	GRADING APPROX 3500 C.Y. OF BLOCK 5, HOLLY PARK
2307684	Combined sewer	05910 HIGH POINT DR SW	CONSTRUCT 20 BLDGS, 2-SFR, 7-APTS, 11 TOWNHOUSES
2307682	Combined sewer	06338 HIGH POINT DR SW	CONSTRUCT 14 BUILDINGS, 5 APTS, 9 DUPLEXES
2307681	Combined sewer	06327 HIGH POINT DR SW	CONSTRUCT 13 BLDGS; (10) TOWNHOUSES, 1 APT, 2 SFRS
2405843	Combined sewer	04418 SHELL ST	CUT AND FILL ON 4 LOTS AS PREPARATION TO CONSTRUCT HOUSE
2402223	Combined sewer	06025 LANHAM PL SW	CONSTRUCT & OCCUPY 36-UNIT APARTMENT, PER PLAN.
2307689	Combined sewer	06300 30TH AV SW	CONSTRUCT 15 BUILDINGS, (5)SINGLE FAMILY RESIDENCE 10 TOWNHOMES

Table 4. Construction projects in the Lower Duwamish Waterway.
January - June 2005

Project	Basin	Address	Use
2206001	Combined sewer	04408 DELRIDGE WY SW	CREATE 36 ARTIST STUDIO DWELLINGS FROM EXISTING SCHOOL
2401795	Combined sewer	03201 GRAHAM ST	LOW INCOME HOUSING: CONSTRUCT AND OCCUPY A 75 UNIT APARTMENT BUILDING
2206982	Combined sewer	03400 HARRISON ST	CONSTRUCT NEW K-5 GRADE PRIVATE SCHOOL, GYMNASIUM
2203437	Combined sewer	06901 SYLVAN WY SW	GRADE APPROXIMATELY 200,000 CUBIC YARDS OF MATERIAL INCL. REMEDIATION
2201799	Combined sewer	07322 RAINIER AV S	CONSTRUCT SIX RESIDENTIAL STRUCTURES COMPRISING 41 DWELLING UNITS
2407953	Combined sewer	06860 HOLLY PARK DR S	ESTABLISH TOWNHOUSE USE. CONSTRUCT 3-STORY TRIPLEX AND 3-STORY 4-PLEX
2408955	Combined sewer	04925 CORSON AV S	NEW PUBLIC SCHOOL CONVERT GYM TO CLASSRMS & PARTITN ALTS AT BLDG#1 &
2307518	Combined sewer	00901 12TH AV	SUBSTANTIAL ALT FOR CONVERT WAREHOUSE TO BLACKBOX THEATRE AND WORKSHOPS
2401079	Storm drain (Diagonal)	01423 31ST AV S	CONSTRUCT RETAINING WALL AND GRADE FOR DRIVEWAY;
2409565	Storm drain (Diagonal)	03100 AIRPORT WY S	GRADING TO CREATE ACCESS ROAD & PARKING INCLUDING
2401582	Storm drain (7th Ave S)	09401 MYERS WY S	CONSTRUCT JOINT TRAINING FACILITY (PHASE I SHORING, GRADING & FOUNDATION)
2107959	Storm drain (Diagonal)	03407 AIRPORT WY S	SOUND TRANSIT CONSTRUCT A FOUR-STORY OPERATIONS & MAINTENANCE FACILITY
2400594	Storm drain (Diagonal)	04401 4TH AV S	DEMOLISH EXISTING BUILDINGS. CONSTRUCT MIXED USE
2308462	Storm drain (Diagonal)	02302 YESLER WY	SEATTLE PUBLIC LIBRARY CONSTRUCT 7900SF 1-STORY + BASEMENT ADDITION
2308739	Storm drain (Diagonal)	03100 AIRPORT WY S	SUBST ALT. TO CHANGE USE FROM MFGRING TO WAREHOUSE
2206735	Storm drain (LDW)	06000 16TH AV SW	CONSTRUCT MULTISTORY CLASSROOM WITH LABS
2402063	Storm drain (LDW)	09400 OLSON PL SW	GRADING AND PAVING FOR CLUSTER DEVELOPMENT PER PLN
2400964	Storm drain (Norfolk)	02456 OTHELLO ST	CUT AND FILL APPROXIMATELY 400 CUBIC YARDS OF SOIL

Table 5. Onsite catch basin sediment sample results.

Source	Sample ID	Location	Date Sampled	Drainage Basin	As (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Zn (mg/kg)	TPH-Diesel (mg/kg)	TPH-Oil (mg/kg)	PCBs (ug/kg DW)	PCBs (mg/kg OC)	BEHP[a] (ug/kg DW)	BEHP[a] (mg/kg OC)
Auto repair	CB7	2006 Rainier Ave S	10/15/03	Diag/Duw	10 U	647	1,220	0.1	1,150	9,900	13,000	48	0.28	140,000	824
Auto repair	CB9	820 S Charlestown	01/22/04	Diag/Duw	20	177	105	0.06 U	294	50 U	300	97	3.59	2,200	81
Auto repair	CB13	1410 Airport Way S	01/23/04	Diag/Duw	12	96	127	0.09	432	51	300	690	20.9	4,500	136
Auto repair	CB19	5022 Rainier Ave S	02/12/04	Diag/Duw	25	405	1,530	1.82	1,170	3,800	16,000	289	2.63	53,000	482
Auto repair	CB45	6518 Ellis Ave. S	12/22/04	Slip 4	20	6,320	481	0.3	3,420	950	4,700	470	4.83	8,800	90
Auto repair	CB46	6518 Ellis Ave. S	12/22/04	Slip 4	20	5,660	396	0.2	3,530	1,900	4,600	680	6.54	30,000	288
Auto repair	CB53b	8603 Dallas Ave S	03/16/05	LDW	NA	NA	NA	NA	NA	NA	NA	6,300	NA	NA	NA
Gas station	CB10	852 Rainier Ave. S	01/22/04	Diag/Duw	8 U	87	96	0.07	250	930	2,000	17 U	0.11 U	1,500	10
Gas station	CB23	4800 Beacon Ave S	03/15/04	Diag/Duw	7	87	73	0.07 U	501	800	3,900	20 U	0.24 U	3,400	40
Gas station	CB26	2220 E Union St	03/15/04	Diag/Duw	20	184	699	1.7	1,470	8,700	29,000	940	3.62	64,000	246
Gas station	CB27a	2220 E Union St	03/15/04	Diag/Duw	10	92	109	0.1	396	5,200	22,000	141	1.66	33,000	388
Gas station	CB29	700 12th Ave	04/07/04	Diag/Duw	10 U	261	164	0.09 U	668	5,000	21,000	29 J	0.26 J	63,000	558
Grocery stores	CB15	2901 Rainier Ave S	02/09/04	Diag/Duw	9	142	476	0.06 U	98.3	380	3,900	19 U	0.48 U	380	10
Grocery stores	CB18	5041 Wilson Ave S	02/12/04	Diag/Duw	7	80	55	0.22	359	680	5,700	19 U	0.21 U	20,000	225
Grocery stores	CB25	3820 Rainier Ave S	03/15/04	Diag/Duw	10	187	152	0.2	912	2,900	15,000	39	0.24	120,000	750
Manufacturing	CB1	3414 4th Av S	08/21/03	Diag/Duw	10 U	161	125	0.3	1,100	NA	NA	160	0.62	19,000 B	100 B
Manufacturing	CB22	3711 S Hudson St	03/02/04	Diag/Duw	20 U	520	151	0.16	433	190	920	3,200	267	410	34
Manufacturing	CB31	3901 9th Ave S	05/06/04	Diag/Duw	20 U	186	231	0.12	590	200	670	128	3.47	460	12
Misc retail	CB12	3701 7th Ave S	01/23/04	Diag/Duw	10 U	181	97	0.1	603	41	270	41	0.61	6,600	99
Misc retail	CB16	4801 Rainier Ave S	02/09/04	Diag/Duw	9	56	63	0.1	237	670	2,900	51	1.06	11,000	229
Misc retail	CB20	4580 Beacon Ave S	02/12/04	Diag/Duw	10	184	277	1.16	754	2,300	8,900	194	1.94	99,000	990
Misc retail	CB28	1018 E Seneca St	03/26/04	Diag/Duw	10 U	254	327	0.2	677	440	3,100	18 J	0.13 J	14,000	103
Oil recycling	CB41	8661 Dallas Ave S	08/19/04	T117	20 U	134	428	0.11	711	72,000	77,000	350	2.59	84,000	622
Oil recycling	CB42	8661 Dallas Ave S	08/19/04	T117	20 U	173	98	0.08	830	3,900	17,000	140	2.42	41,000	708
Other	CB4	828 S Poplar Place	09/08/03	Diag/Duw	20 U	135	47	0.08 U	360	1,800	6,300	19 U	1.12 U	32,000	941
Other	CB5	828 S Poplar Place	09/10/03	Diag/Duw	20 U	147	51	0.2 U	412	2,600	9,200	20 U	0.27 U	67,000	447
Other	CB11	5005 3rd Ave S	01/23/04	Diag/Duw	40	325	445	0.68	3,940	370	2,100	255 P	4.11 P	6,200	100
Other	CB24	3515 S Alaska St	03/15/04	Diag/Duw	11	172	299	0.2	699	730	5,700	71 Y	0.92 Y	12,000	156
Other	CB30	910 Boylston Ave	04/30/04	Diag/Duw	11	79	2,010	0.84	257	620	2,800	259	3.15	11,000	134
Other	CB40	7585 Perimeter Rd S	08/04/04	Slip 5	6 U	92	90	0.61	271	600	2,300	6,600	154	5,500	185
Other	CB44	1015 S Myrtle St.	12/08/04	Slip 4	12	142	123	0.12	524	85	790	180	0.73	10,000	41
Other	CB48	6605 13th Ave S	02/02/05	Slip 4	12	52	343	0.32	657	98	210	250	15.9	88	6
Other	CB49	4209 W Marginal Way	02/04/05	LDW	7 U	NA	36	0.06 U	NA	NA	NA	NA	N/A	NA	NA
Other	CB50	4209 W Marginal Way	02/04/05	LDW	10 U	NA	47	0.09 U	NA	NA	NA	NA	N/A	NA	NA
Other	CB51	4209 W Marginal Way	02/04/05	LDW	10	NA	99	0.12	NA	NA	NA	NA	N/A	NA	NA
Other	CB52	4209 W Marginal Way	02/04/05	LDW	11	NA	127	0.13	NA	250	1,700	223	4.35	3,900	76
Restaurant	CB27b	950 E Madison St	03/26/04	Diag/Duw	20 U	137	88	0.1 U	537	6,600	9,400	68 J	0.47 J	140,000	596
Restaurant	CB32	3820 Rainier Ave S	05/24/04	Diag/Duw	20 U	194	131	0.2 U	874	770	3,000	20 U	0.10 U	34,000	164
Restaurant	CB38	2822 Rainier Ave S	06/25/04	Diag/Duw	7 U	66.2	54	0.08	209	960	3,300	220	3.44	5,000	78
Transportation	CB3	635 S Edmunds St	09/05/03	Diag/Duw	6 U	29.6	10	0.05 U	54.9	15	52	39 U	8.30 U	130	28
Transportation	CB8	5200 E Marginal Wy	11/04/03	Diag/Duw	13	275	205	0.10	603	2,000	4,500	1,000	10.9	71,000	772
Transportation	CB34	12100 E Marginal Wy	05/24/04	b	8 U	99	110	0.07 U	833	430	2,400	16	0.21 U	4,200	45
Transportation	CB35	12100 E Marginal Wy	05/24/04	b	8 U	79	87	0.1	382	4,000	2,700	20 U	0.22 U	11,000	123
Transportation	CB36	12100 E Marginal Wy	05/24/04	b	8 U	201	152	0.07 U	420	5,300	14,000	20 U	0.19 U	24,000	226
Transportation	CB33	3820 6 Ave. S	05/24/04	Diag/Duw	20	118	82	0.09	924	900	3,100	58	0.51	9,900	87
Transportation	CB37	North side Slip 4	06/22/04	Slip 4	20 U	173	250	0.08	1,220	180	650	20 U	0.42 U	1,600	34
Transportation	CB41b	SW Corner of KC Airport	09/10/04	Slip 6	8 U	92	232	0.17	740	8,000	19,000	51 U	0.50 U	3,300	33
Vehicle/equip wash	CB2	4429 Airport WY S	08/21/03	Diag/Duw	40 U	1,520	1,110	0.5	2,720	34,000	71,000	20 U	0.53 U	200,000 B	2,667 B
Vehicle/equip wash	CB21	3151 Rainier Ave S	03/20/04	Diag/Duw	8	194	97	0.06 U	305	1,900	4,900	19 U	0.40 U	17,000	354
Auto repair	CB58	2901 6th Ave S	03/03/05	EWW	100 U	3,260	280	0.34	660	2,200	6,100	200	2.98	16,000	238
Auto repair	CB59	3626 Colorado Ave S	03/03/05	EWW	40 U	5,010	600	0.18	1,070	1,800	6,900	760	10.4	19,000	260
Auto repair	CB60	1961 4th Ave S	03/17/05	EWW	11	303	170	0.08	939	12,000	30,000	320 Y	2.88 Y	160,000	1441
Auto repair	CB67	2513 11th Ave SW	03/30/05	EWW	9	154	48	0.06 U	312	1,400	6,000	100 Y	1.55 Y	18,000 B	279 B
Gas station	CB54	2461 4th Ave S	02/09/05	EWW	10	216	184	0.34	977	2,100	3,600	174 P	1.94	25,000	279

Table 5. Onsite catch basin sediment sample results.

Source	Sample ID	Location	Date Sampled	Drainage Basin	As (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Zn (mg/kg)	TPH-Diesel (mg/kg)	TPH-Oil (mg/kg)	PCBs (ug/kg DW)	PCBs (mg/kg OC)	BEHP[a] (ug/kg DW)	BEHP[a] (mg/kg OC)
Gas station	CB55	2461 4th Ave S	02/09/05	EWW	**10**	**263**	**183**	**0.29**	**950**	**520**	**2,600**	**114** P	**1.07**	**18,000**	**168**
Manufacturing	CB53	2535 Airport Way S	02/09/05	EWW	**12**	**480**	**177**	**0.1**	**828**	**230**	**1,000**	**51**	**1.40**	**14,000**	**386**
Manufacturing	CB57	2940 6th Ave S	03/03/05	EWW	**10**	**322**	**133**	**0.11**	**557**	**250**	**1,600**	**76**	**1.10**	**15,000**	**217**
Manufacturing	CB62	3623 E Marginal Way S	03/18/05	EWW	20 U	**452**	**354**	**0.19**	**1,320**	**1,600**	**6,000**	1,700 Y	28.7 Y	**23,000**	**388**
Manufacturing	CB66	3629 Duwamish Ave S	03/25/05	EWW	**13**	**217**	**498**	**0.28**	**814**	**6,800**	**19,000**	140 Y	1.22 Y	**22,000**	**191**
Manufacturing	CB68	1002 SW Spokane St.	04/28/05	EWW	10 U	**414**	**142**	0.1 U	**1,600**	**640**	**2,500**	**67**	**0.84**	**8,800** B	**111** B
Misc retail	CB63	S Hanford and E Marginal Way	03/18/05	EWW	**30**	**437**	**336**	**0.5**	**1,510**	**2,900**	**14,000**	**820**	**5.62**	**59,000**	**404**
Misc retail	CB64	S Hanford and E Marginal Way	03/18/05	EWW	**30**	**495**	**452**	**0.5**	**1,690**	**3,400**	**17,000**	**1,110**	**8.47**	**62,000**	**473**
Misc retail	CB65	3419 11th Ave SW	03/22/05	EWW	**10**	**602**	**207**	**0.27**	**869**	**950**	**3,900**	**2,110**	**24.3**	**19,000**	**218**
Other	CB56	1919 4th Ave S	02/09/05	EWW	**10**	**122**	**61**	**0.13**	**602**	**2,000**	**3,300**	**29**	**0.25**	**10,000**	**88**
Other	CB61	2445 3rd Ave S	03/18/05	EWW	**10**	**44**	**33**	**0.08**	**152**	**930**	**3,000**	**87**	**0.94**	**7,500**	**81**
Transportation	CB69	POS Terminal 18	05/25/05	EWW	10 U	**127**	**102**	**0.09**	**2,730**	**1,000**	**4,900**	**20** J	**0.12** J	**20,000**	**118**
Transportation	CB70	POS Terminal 18	05/25/05	EWW	**11**	**332**	**181**	**0.11**	1,880	**800**	**5,100**	**44**	**0.44**	**11,000**	**110**
Transportation	CB71	POS Terminal 18	05/25/05	EWW	**8**	**197**	**120**	**0.07**	1,370	**790**	**4,500**	**58** JP	**1.04** JP	**5,300**	**95**
SQS						390	450	0.41	410	NA	NA		12	NA	47
CSL						390	530	0.59	960	NA	NA		65	NA	78
MTCA Method A[c]						NA	250	2	NA	2,000	2,000	1,000	NA	NA	NA
MTCA Method A[d]						NA	1,000	2	NA	2,000	2,000	10,000			

Thea Foss basin (Tacoma)

Auto repair/supplies (7)	Mean	58,371
	Range	(2,600 - 340,000)
	Min	2,600
	Max	340,000
	General Tire	23,000
	Service Master	2,600
	Eagle Tire	340,000
	Maaco Autobody	7,200
	Osborne Cadillac	6,800 UJ
	Tacoma Dodge	19,000
	Pacific Motoring	10,000
Fast food (2)	Mean	74,000
	Range	(48,000 - 100,000)
	Min	48,000
	Max	100,000
	Jack in Box	48,000
	McDonalds	100,000
Vehicle/equip wash (1)		24,000
	Brown Bear	24,000
Misc retail (3)	Mean	14,100
	Range	(1,800 - 35,000)
	Min	1,800
	Max	35,000
	Keller plumbing	1,800
	Washington Floral	5,500
	American Linen	35,000
Manufacturing (6)	Mean	106,083
	Range	(9,100 - 580,000)
	Min	9,100
	Max	580,000
	Pickering	9,400
	Tacoma News	10,000
	Atlas Foundry	9,100

Table 5. Onsite catch basin sediment sample results.

Source	Sample ID	Location	Date Sampled	Drainage Basin	As (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Zn (mg/kg)	TPH-Diesel (mg/kg)	TPH-Oil (mg/kg)	PCBs (ug/kg DW)	PCBs (mg/kg OC)	BEHP[a] (ug/kg DW)	BEHP[a] (mg/kg OC)
						Totem Marina								580,000	
						United Pipe								13,000	
						Ideal Machine								15,000	

a. Bis(2-ethylhexyl)phthalate
b. Upstream of Lower Duwamish study area.
c. MTCA Method A soil cleanup level for unrestricted use.
d. MTCA Method A soil cleanup level for industrial use.
Exceeds SQS
Exceeds CSL or MTCA Method A Cleanup Level (TPH)

U = Chemical not detected at concentration shown.
Y = Chemical not detected at concentration shown.
Reporting limit raised due to background interference.
J = Concentration is less than the reporting limit.
P = High RPD on dual column analyses, without obvious interference.

Table 6. Right-of-way catch basin sediment sample results.

Road Type	Station ID	Date Sampled	Drainage Basin	As (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Zn (mg/kg)	TPH-Diesel (mg/kg)	TPH-Oil (mg/kg)	PCBs (ug/kg DW)	PCBs (mg/kg OC)	BEHP[a] (ug/kg DW)	BEHP[a] (mg/kg OC)
Freeway	RCB30	05/26/04	LDW	10 U	**46.2**	**20**	0.06 U	**171**	**130**	**630**	19 U	0.63 U	**3,200**	**107**
Freeway	RCB31	05/26/04	LDW	20 U	**185**	**157**	**0.07**	**552**	**150**	**660**	**117**	**4.74**	**1,100**	**18**
Freeway	RCB32	05/26/04	LDW	10 U	**97.5**	**126**	0.09 U	**305**	**150**	**690**	**138**	**1.82**	**21,000**	**277**
High traffic arterial	RCB2	02/22/04	Diag/Duw	**10**	**40.1**	**121**	0.07 U	**137**	**270**	**1,600**	**30**	**0.55**	**2,900**	**53**
High traffic arterial	RCB3	02/22/04	Diag/Duw	**7**	**48.8**	**78**	0.07 U	**179**	**200**	**1,400**	19 U	0.37 U	**2,400**	**46**
High traffic arterial	RCB7	03/03/04	Diag/Duw	**6**	**55.1**	**374**	0.06 U	**142**	**210**	**1,600**	20 U	0.83 U	**2,100**	**88**
High traffic arterial	RCB10	03/15/04	Diag/Duw	10 U	**183**	**109**	0.1 U	**589**	**630**	**4,600**	**54**	**0.96**	**28,000**	**280**
High traffic arterial	RCB11	03/15/04	Diag/Duw	10 U	**117**	**92**	0.07 U	**243**	**540**	**3,000**	19 U	0.14 U	**3,200**	**23**
High traffic arterial	RCB12	04/07/04	Diag/Duw	10 U	**112**	**77**	0.1 U	**384**	**540**	**3,000**	**50** J	**0.86** J	**5,600**	**96**
High traffic arterial	RCB13	04/07/04	Diag/Duw	**20**	**172**	**163**	**0.17**	**567**	**1,200**	**7,800**	**161**	**1.67**	**17,000**	**177**
High traffic arterial	RCB15	04/07/04	Diag/Duw	**10**	**157**	**145**	**0.2**	**781**	**1,400**	**9,100**	**303**	**3.68**	**18,000**	**219**
High traffic arterial	RCB17	04/16/04	Diag/Duw	**9**	**137**	**146**	**0.15**	**534**	**1,400**	**7,200**	**231**	**3.04**	**12,000**	**158**
High traffic arterial	RCB18	04/16/04	Diag/Duw	9 U	**229**	**137**	**0.13**	**575**	**1,700**	**8,500**	**248**	**2.51**	**14,000**	**141**
High traffic arterial	RCB19	04/16/04	Diag/Duw	7 U	**71.9**	**64**	0.05 U	**252**	**470**	**2,600**	**64**	**1.48**	**5,900**	**137**
High traffic arterial	RCB20	04/16/04	Diag/Duw	10 U	**164**	**206**	**0.2**	**759**	**1,800**	**11,000**	**187**	**1.31**	**24,000**	**168**
High traffic arterial	RCB21	04/16/04	Diag/Duw	7 U	**38.4**	**39**	0.07 U	**132**	**390**	**2,500**	19 U	0.31 U	**4,300**	**70**
High traffic arterial	RCB27	04/21/04	Diag/Duw	7 U	**159**	**111**	0.06 U	**335**	**560**	**2,400**	**22**	**0.37**	**12,000**	**201**
High traffic arterial	RCB33	06/30/04	Diag/Duw	10 U	**149**	**60**	0.06 U	**674**	**190**	**1,100**	**53**	**2.24**	**740**	**31**
High traffic arterial	RCB34	06/30/04	Diag/Duw	8 U	**134**	**89**	**0.08**	**488**	**1,200**	6,100	**114**	**0.63**	**16,000**	**152**
High traffic arterial	RCB35	06/30/04	Diag/Duw	8 U	**120**	**193**	**0.1**	**358**	**420**	2,100	**142**	**1.49**	**8,000**	**84**
High traffic arterial	RCB36	06/30/04	Diag/Duw	**15**	**751**	**152**	**1.17**	**505**	**1,800**	6,000	290 Y	3.03 Y	**48,000**	**502**
High traffic arterial	RCB37	06/30/04	Diag/Duw	7 U	**58.5**	**62**	0.06 U	**189**	**220**	1,200	**17,500** c	**322**	**8,300**	**153**
High traffic arterial	RCB39	06/30/04	Diag/Duw	7 U	**113**	**61**	0.06 U	**213**	**640**	3,500	**160**	**3.50**	**4,400**	**96**
High traffic arterial	RCB40	06/30/04	Diag/Duw	5 U	**70.4**	**99**	0.04 U	**207**	**140**	850	20 U	0.72 U	**980**	**35**
Industrial	RCB1	02/20/04	Diag/Duw	**9**	**112**	**1,370**	**0.87**	**364**	**3,500**	4,000	**670**	**6.70**	**46,000**	**460**
Industrial	RCB16	04/07/04	Diag/Duw	**12**	**154**	**105**	**0.19**	**698**	**1,400**	8,000	**293**	**4.13**	**14,000**	**197**
Industrial	RCB29	05/07/04	Diag/Duw	9 U	**134**	**106**	**0.26**	**334**	**130**	480	**68**	**1.53**	**1,400**	**32**
Industrial	RCB43	02/04/05	LDW	20 U	NA	**118**	**0.09**	NA	**190**	1,100	**158**	**2.06**	**920**	**20**
Low traffic mix	RCB8	03/03/04	Diag/Duw	**9**	**75.3**	**54**	0.07 U	**223**	**320**	3,000	**19**	**0.24**	**8,600**	**110**
Low traffic mix	ROW24	01/14/05	Diag/Duw	**9**	**84.4**	**19**	0.06 U	**185**	**6,400**	14,000	58 U	0.47 U	**18,000**	**389**
Low traffic res	RCB4	02/22/04	Diag/Duw	**30**	**167**	**245**	**0.30**	**851**	**460**	1,600	20 U	0.17 U	**3,600**	**30**
Low traffic res	RCB5	02/22/04	Diag/Duw	**30**	**66.6**	**197**	**0.32**	**362**	**260**	2,400	**40** J	**0.36** J	**2,400**	**22**
Low traffic res	RCB22	04/16/04	Diag/Duw	6 U	**97.2**	**65**	0.06 U	**176**	**230**	1,500	**21** J	**0.45** J	**3,100**	**66**
Low traffic res	RCB23	04/21/04	Diag/Duw	10 U	**81.6**	**180**	**0.12**	**277**	**690**	2,500	**45** J	**0.42** J	**8,700**	**81**
Low traffic res	RCB28	04/21/04	Diag/Duw	10 U	**76.9**	**131**	**0.2**	**313**	**140**	910	**36**	**0.29**	**4,100**	**33**
Medium traffic	RCB6	03/03/04	Diag/Duw	7 U	**46.4**	**46**	0.06 U	**176**	**380**	2,800	19 U	0.40 U	**4,000**	**85**
Medium traffic	RCB9	03/03/04	Diag/Duw	**10**	**42.5**	**53**	0.04 U	**151**	**160**	1,900	20 U	0.43 U	**970**	**21**
Medium traffic	RCB24	04/21/04	Diag/Duw	8 U	**41.4**	**316**	**0.31**	**226**	**400**	1,400	**25**	**0.34**	**1,100**	**15**
Medium traffic	RCB25	04/21/04	Diag/Duw	7 U	**53.1**	**25**	0.07 U	**120**	**290**	1,200	19 U	0.34 U	**1,900**	**34**
Medium traffic	RCB26	04/21/04	Diag/Duw	6 U	**40.2**	**136**	0.06 U	**84.7**	**1,800**	4,500	19 U	0.29 U	**1,300**	**20**
Medium traffic	RCB41	06/30/04	Diag/Duw	8 U	**83.2**	**120**	0.07 U	**223**	**260**	1,200	**133** J	**1.27** J	**2,800**	**27**
Thea Foss (Tacoma)														
Residential													4,825	
(8 samples)													(2,000 - 10,000)	
Commercial													21,000	
(5 samples)													(2,100 - 67,000)	
Industrial													13,250	
(14 samples)													(2,300 - 34,000)	
SQS					390	450	0.41	410	NA	NA	NA	12	NA	47
CSL					390	530	0.59	960	NA	NA	NA	65	NA	78
MTCA Level A[b]					NA	250	2	NA	2,000	2,000	1,000	NA	NA	NA
MTCA Level A[c]					NA	1,000	2	NA	2,000	2,000	10,000	NA	NA	NA

a. Bis(2-ethylhexyl)phthalate
b. MTCA Method A soil cleanup level for unrestricted use.
c. Cleaned 6/05.

c. MTCA Method A soil cleanup level for industrial use.
Exceeds SQS
Exceeds CSL or MTCA Method A Cleanup Level (TPH)

U = Chemical not detected at concentration shown.
Y = Chemical not detected at concentration shown. Reporting limit raised due to background interference.
J = Concentration is less than the reporting limit.

Table 7. Inline sediment sample results.

Sample ID	Location	Date Sampled	As (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Zn (mg/kg)	PH-Diesel (mg/kg)	TPH-Oil (mg/kg)	PCBs g/kg DW)	PCBs (mg/kg OC)	BEHP[a] (ug/kg DW)	BEHP[a] (mg/kg OC)
Norfolk-MLK Way drainage basin													
MH1[e]	Norfolk-MLK Way SD 36" outfall to ditch	10/01/03	**20**	**147**	**217**	**0.4**	**1,150**	**2,300**	**5,300**	**79**	**1.1**	**24,000**	**324**
MH2[e]	Dupe of MH1	10/01/03	**20**	**181**	**261**	**0.2**	**1,230**	**3,200**	**7,600**	**103**	**1.5**	**24,000**	**343**
MH3[e]	MH adjacent to wash pad at 9892 40th Ave S (36")	10/01/03	**10**	**153**	**183**	**0.2**	**1,060**	**2,200**	**5,000**	**82**	**1.0**	**25,000**	**309**
MH3[e]	MH adjacent to wash pad at 9892 40th Ave S (36")	03/16/05	**10**	**131**	**226**	**0.2**	**847**	NA	NA	**110**	**1.7**	**26,000**	**406**
MH4[e]	MH ML King Jr Wy S and driveway, NW corner	10/01/03	8 U	**55.7**	**79**	**0.09**	**416**	**1,400**	**2,900**	**43**	**0.9**	**5,600**	**119**
MH4[e]	MH ML King Jr Wy S and driveway, NW corner	03/16/05	8 U	**74.8**	**82**	**0.11**	**415**	NA	NA	**25**	**0.5**	**22,000**	**444**
MH5[e]	MH SE corner 9901 MLK Jr Way S	10/01/03	**8**	**73**	**66**	**0.06**	**357**	**1,800**	**3,600**	**43** J	**0.9**	**6,800**	**148**
MH5	Black sand/grit stored at 9901 MLK Jr Way S	10/01/03	**120**	**147**	**217**	**0.4**	**1,150**	NA	NA	NA	NA	**NA**	NA
MH6	Norfolk ditch opp. fueling pad at 9892 40th Ave S	10/01/03	**11**	**118**	**198**	**0.33**	**627**	**650**	**1,700**	NA	NA	NA	NA
MH7[e]	MH ML King Jr Wy S and S Norfolk St, NE corner	10/02/03	20 U	**51.1**	**51**	0.05 U	**127**	**88**	**300**	**25**	**1.1**	**680**	**31**
MH7[e]	MH ML King Jr Wy S and S Norfolk St, NE corner	03/16/05	6 U	**24.6**	**16**	0.05 U	**90**	NA	NA	19 U	1.6 U	**400**	**33**
Norfolk20	WSDOT pond: first cell	09/30/04	**10**	**149**	**245**	**0.18**	**651**	**140**	**580**	**108**	**2.0**	**720**	**13**
Norfolk21	WSDOT pond: head of swale (at outlet SPU drain)	09/30/04	7 U	**39.9**	**38**	**0.06**	**108**	**43**	**200**	**40**	**2.4**	20 U	1 U
South Park area													
RCB44	2nd Ave S ditch d/s of o/w separator at	04/13/05	**11**	**98.8**	**113**	**0.06**	**444**	**3,100**	**3,100**	**250**	**4.5**	**1,600**	**29**
RCB45	2nd Ave S ditch u/s of tidegate	04/13/05	**23**	**105**	**87**	**0.07**	**394**	**3,900**	**3,900**	**122**	**2.5**	**7,800**	**160**
MH20[g]	7th Ave S SD--MH at S Riverside St and S Holden St	04/13/05	**20**	**175**	**151**	**0.17**	**547**	**2,900**	**2,900**	**440**	**5.7**	**6,400**	**83**
MH21	7th Ave S SD--MH at 7th Ave S and S Monroe St	04/13/05	**30**	**148**	**130**	**0.2**	**515**	**3,100**	**3,100**	**190**	**2.1**	**3,800**	**43**
MH22	7th Ave S SD--MH at 8230 5th Ave S	04/13/05	**20**	**129**	**119**	**0.2**	**575**	**1,900**	**1,900**	**119**	**1.9**	**6,100**	**97**
Slip 4 drainage basin [d]													
MH100	MH100 on Slip 4 EOF/SD (24")	02/16/05	**20**	**88.9**	**134**	**0.2**	**377**	**88**	**380**	**1,820** P	**30**	**1,500**	**25**
MH100	MH100 on Slip 4 EOF/SD (24")	02/16/05	**20**	**102.0**	**142**	**0.2**	**411**	**40**	**190**	**1,980**	**30**	**2,000**	**30**
SL4-T4	MH221A on KC airport SD	02/16/05	**20**	**126**	**94**	**0.09**	**572**	**120**	**270**	**1,000**	**92**	**800**	**73**
SL4-T4	MH221A on KC airport SD	02/16/05	**12**	**38.5**	**50**	**0.09**	**332**	**120**	**210**	**1,490**	**149**	**760**	**76**
SL4-T5	MH363 on KC airport SD	02/16/05	**9**	**64.1**	**51**	**0.48**	**208**	**120**	**680**	**31,000** P	**2,793**	**430**	**39**
SL4-T5	MH363 on KC airport SD	02/16/05	**8**	**45.1**	**110**	**0.7**	**272**	**47**	**190**	**7,000**	**920**	**500**	**66**
SL4-T4A	MH229A on KC airport SD	02/16/05	**30**	**69.7**	**120**	**0.07**	**699**	**110**	**380**	**310** P	**7.1**	**1,300**	**30**
SL4-T4A	MH229A on KC airport SD	02/16/05	**30**	**85.5**	**155**	**0.07**	**1,130**	**200**	**1,000**	**5,600**	**144**	**2,200**	**55**
T1	Georgetown flume at head culv under E Marginal Wa	03/24/05	**11**	**63.2**	**99**	**0.1**	**218**	**36**	**140**	**330**	**8.4**	**2,000**	**51**
T2	Georgetown flume d/s culv under S Myrtle St	03/24/05	7 U	**18.5**	**14**	0.05 U	**54**	**21**	**99**	**66**	**4.6**	**140**	**10**
T5	Dupe of T2	03/24/05	7 U	**20.2**	**15**	0.05 U	**61**	**19**	**70**	**65**	**5.6**	**140**	**12**
T3	Georgetown flume 40' d/s twin pipe outlets	03/25/05	7 U	**54.6**	**263**	**0.41**	**180**	**84**	**460**	**3,900**	**173**	**580**	**26**
T4	Georgetown flume u/s end at steamplant	03/24/05	**40**	**314** J	**590** J	**1.7**	**1,130**	**2,300**	**9,700**	**3,740**	**43**	**210**	**2**
T6	Georgetown flume u/s E Marginal (MH100)	03/25/05	7 U	**79.6**	**61**	0.08	**240**	**120**	**670**	**400**	**15**	**2,000**	**75**
P1	Georgetown flume at 8" pipe 20' u/s S Myrtle St	03/25/05	7 U	**18**	**16**	0.05 U	**61**	**14**	**66**	**120**	**17**	**120**	**17**
P2	Georgetown flume at 8" pipe 85' u/s S Willow St	03/25/05	**13**	**56.6**	**69**	**0.18**	**238**	**63**	**360**	**780**	**32**	**560**	**23**
P3	Georgetown flume at 15" pipe (plugged) at d/s end tu	03/25/05	**20**	**133**	**501**	**1.0**	**766**	**250**	**1,100**	**92,000**	**1,746**	**2,100**	**40**
P4	Georgetown flume at 8" pipe 45' d/s S Myrtle St	03/24/05	6 U	**12.8**	**10**	0.06 U	**53**	**9**	**61**	**38.3**	**5.0**	**140**	**18**
P5	Georgetown flume--ditch on S Myrtle St	03/24/05	10 U	**95.1**	**73**	**0.08**	**195**	**1,600**	**3,000**	**1,500**	**22**	**3,800**	**55**
Diagonal Ave S CSO/SD drainage basin													
MP	Mouth of pipe	01/25/02	14 U	**38**	**130**	0.34 U	**220**	NA	NA	NA	NA	NA	NA
M1	Mainline W of E Marginal	01/25/02	12 U	**39**	**37**	0.31 U	**250**	**77**	**420**	62 U	16 U	**1,000**	**264**
M2	Mainline at E Marginal Way S	01/25/02	13 U	**43**	**140**	0.31 U	**240**	**63**	**560**	63 U	12 U	**860**	160
M2a	Dupe of M2	01/25/02	12 U	**33**	**33**	0.3 U	**200**	**69**	**430**	61 U	11 U	**5,100**	882

Table 7. Inline sediment sample results.

Sample ID	Location	Date Sampled	As (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Zn (mg/kg)	PH-Diesel (mg/kg)	TPH-Oil (mg/kg)	PCBs g/kg DW)	PCBs (mg/kg OC)	BEHP[a] (ug/kg DW)	BEHP[a] (mg/kg OC)
MH15	Mainline at E Marginal Way S	02/18/04	6 U	**32.7**	**15**	0.05 U	**155**	**85**	**390**	19 U	5 U	**630**	**49**
MH16	Dupe of MH 15	02/18/04	**17**	**49.6**	**27**	**0.1**	**233**	**80**	**380**	19 U	2 U	**580**	**60**
M3[f]	Mainline at Colorado Ave S	01/28/02	12 U	**34**	**18**	0.3 U	**170**	**82**	**420**	60 U	13 U	**670**	**125**
M4[f]	Mainline at 2nd Ave S	01/25/02	12 U	**24**	**47**	0.29 U	**280**	**37**	**360**	59 U	15 U	**330**	**86**
MH14[f]	Mainline at SCL yard	02/18/04	7 U	**28.9**	**119**	0.05 U	**119**	**62**	**380**	20 U	3 U	**390**	**62**
M5[f]	Mainline at 4th Ave S	01/28/02	11 U	**160**	**23**	0.28 U	**130**	28 U	**470**	56 U	9 U	**710**	**113**
T2[f]	Dakota lateral at 2nd Ave S	1/25/2002	**12**	**30**	**16**	0.3 U	**85**	**30**	**150**	60 U	11 U	**230**	**43**
T2b[f]	Dakota lateral at 4th Ave S	02/28/02	16 U	**81**	**130**	0.4 U	**230**	**680**	**2,700**	**940**	**35.6**	**3,800**	**144**
MH21[f]	Dakota lateral below 2nd Ave S	10/29/04	**22**	**269**	**4,910**	**1.75**	**463**	**370**	**1,200**	**91**	**2.2**	NA	NA
SED1[f]	Sediment removed (vactor pit sample)	11/01/04	**10**	**173**	**256**	**0.42**	**457**	**570**	**2,700**	**117**	**2**	**9,800**	**145**
SED2[f]	Sediment removed (vactor pit sample)	11/01/04	**8**	**106**	**147**	**0.12**	**332**	**400**	**2,100**	**140**	**2**	**5,300**	**94**
SED3[f]	Sediment removed (vactor pit sample)	11/01/04	9 U	**113**	**277**	**0.49**	**352**	**340**	**1,600**	**17**	**0.2**	**3,400**	**35**
T3a[f]	Duwamish lateral at RR	02/28/02	**23**	**280**	**200**	0.58 U	**460**	**6,300**	**9,100**	**380**	**5.2**	**8,900**	**121**
MH18[f]	Duw lateral at 6th and Snoqualmie	02/18/04	**9**	**152**	**538**	**1.02**	**293**	**390**	**1,900**	**470**	**4.9**	**3,100**	**33**
T6b[f]	Denver lateral at S Alaska St	02/28/02	14 U	**94**	**100**	0.36 U	**580**	180 U	**13,000**	**480**	**8.4**	**5,300**	**93**
MH17[f]	1st Ave S lateral at RR	02/18/04	**7**	**94.9**	**70**	**0.08**	**296**	**310**	**1,500**	20 U	0.5 U	**2,500**	**61**
T8b[f]	1st Ave S lateral at S Andover St	02/28/02	13 U	**56**	**120**	0.33 U	**410**	170 U	**2,300**	67 U	3 U	**5,500**	**278**
East Waterway basin													
MH30	SW Florida St SD (36") near outfall	05/25/05	**12**	**135**	**142**	**0.12**	**1,380**	**1,200**	**3,600**	**88**	**1.2**	**5,600**	**76**
MH31	SW Lander St SD (15") near outfall	05/25/05	**7**	**46.2**	**48**	**0.06**	**280**	150 U	**790**	**150**	**11**	**420**	**30**
SQS			57	390	450	0.41	410				12		47
CSL			93	390	530	0.59	960				65		78
MTCA Method A[b]								2,000	2,000	1,000			
MTCA Method A[c]								2,000	2,000	10,000			

Exceeds CSL or MTCA Method A
Exceeds SQS

U = Chemical not detected at reported concentration.
J = Estimated value. Measured concentration is below laboratory reporting limit.
P = High RPD for dual column GC analyses without obvious interference.

a. For non-restricted use.
c. For industrial soil.
d. Field splits collected at each station.
e. Sediment removed by SPU June-July 2005.
f. Sediment removed by SPU 2003-2005.
g. Other compounds detected: 2,4-dinitrotolune (29 mg/kg), n-nitrosodiphenylamine (24 mg/kg), and di-nbutylphthalate (37 B mg/kg).

Table 8. Source sediment comparisons.

	Sediment Quality Standard or MTCA Method A Exceedances (Percent)[a]						
	ROW CBs (low traffic)[b]	ROW CBs (high traffic)[c]	ROW CBs (all samples)	Onsite CBs LDW	Onsite CBs All[d]	Sediment Traps[e]	Inline Sediment[e]
Arsenic	0	0	0	0	0	0	0
Copper	0	0	0	12	22	0	0
Lead	8	5	7	15	15	0	6
Mercury	0	5	5	15	10	0	10
Zinc	8	43	29	70	76	69	41
TPH-oil	46	71	56	77	82	6	35
BEHP	38	81	63	67	76	88	63
PCBs	0	5	2	9	8	0	20[g]
Number of samples	13	21	41	45	63	16	51

CB = catch basin
BEHP = Bis(2-ethylhexyl)phthalate
LDW = Lower Duwamish Waterway

a. MTCA Method A for TPH-oil, SQS for all other parameters
b. Right-of-way catch basin in low-medium traffic streets
c. Right-of-way catch basin in high traffic arterials
d. Includes catch basins in East Waterway
e. 7 traps in the Diagonal Ave S CSO/SD drainage basin (4 rounds of samples)
f. Sediment collected from manholes located on a storm drain mainline or lateral.
g. Lower Duwamish study area/all samples collected, including East Waterway
h. All in Slip 4 drains.

Table 9: Atmospheric deposition samples (blank corrected results).

	Round 1				Round 2					Round 3				Round 4							
Station	**Beacon Hill**	**Duwamish**	**Duwamish**	**Duwamish**	**Beacon Hill**	**Duwamish**	**Duwamish**	**Georgetown**	**S. Park CC**	**Beacon Hill**	**Duwamish**	**Georgetown**	**S. Park CC**	**Beacon Hill**	**Beacon Hill**	**Duwamish**	**Duwamish**	**Georgetown**	**Georgetown**	**S. Park CC**	**S. Park CC**
Station ID	BW	CE	CE	CE	BW	CE	CE	DZ	SPCC	BW	CE	DZ	SPCC	BW	BW	CE	CE	DZ	DZ	SPCC	SPCC
Sample Type	Sample	Sample	Duplicate	Duplicate	Sample	Sample	Duplicate	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample
Start Date	1/20/2005	1/20/2005	1/20/2005	1/20/2005	2/15/2005	2/15/2005	2/15/2005	2/15/2005	2/15/2005	3/23/2005	3/23/2005	3/23/2005	3/23/2005	4/13/2005	4/13/2005	4/13/2005	4/13/2005	4/13/2005	4/13/2005	4/13/2005	4/13/2005
End Date	2/15/2005	2/15/2005	2/15/2005	2/15/2005	3/23/2005	3/23/2005	3/23/2005	3/23/2005	3/23/2005	3/30/2005	3/30/2005	3/30/2005	3/30/2005	5/5/2005	5/5/2005	5/5/2005	5/5/2005	5/5/2005	5/5/2005	5/5/2005	5/5/2005
Total Days	26	26	26	26	36	36	36	36	36	7	7	7	7	22	22	22	22	22	22	22	22
Sample Volume, L	3.10	3.03	3.08	3.08	2.40	2.30	2.32	2.59	2.49	5.92	5.79	6.15	6.05	4.93	4.93	4.07	4.07	5.10	5.10	5.12	5.12
PDS Collection Area, m²	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948
Air Deposition Flux (Calculated) (A)																					
Carcinogenic PAH (µg/m²/day)																					
Benzo(a)anthracene	0.026 (B)	0.066 (B)	0.072 (B)	**0.104 (C)**	***0.006 (B)***	0.017 (B)	0.020 (B)	0.033 (B)	0.034 (B)	-	0.039 (B)	0.068 (B)	0.060 (B)	0.015 (B)	0.047 (C)	0.035 (B)	0.056 (C)	0.034 (B)	0.068 (C)	0.021 (B)	0.036 (C)
Benzo(a)pyrene	0.032 (B)	0.079 (B)	0.093 (B)	**0.154 (C)**	***0.010 (B)***	0.026 (B)	0.027 (B)	0.044 (B)	0.038 (B)	-	-	0.057 (B)	0.057 (B)	0.033 (B)	0.069 (C)	0.060 (B)	0.084 (C)	0.043 (B)	0.080 (C)	0.022 (B)	0.038 (C)
Benzo(b)fluoranthene	0.050 (B)	0.146 (B)	0.150 (B)	**0.239 (C)**	***0.014 (B)***	0.045 (B)	0.045 (B)	0.071 (B)	0.064 (B)	0.050 (B)	0.058 (B)	0.098 (B)	0.097 (B)	0.063 (B)	0.097 (C)	0.089 (B)	0.111 (C)	0.075 (B)	0.110 (C)	0.059 (B)	0.086 (C)
Benzo(k)fluoranthene	0.040 (B)	0.113 (B)	0.130 (B)	**0.158 (C)**	***0.012 (B)***	0.033 (B)	0.042 (B)	0.058 (B)	0.050 (B)	0.048 (B)	0.054 (B)	0.070 (B)	0.081 (B)	0.037 (B)	0.069 (C)	0.037 (B)	0.060 (C)	0.037 (B)	0.070 (C)	0.023 (B)	0.052 (C)
Chrysene	0.072 (B)	0.170 (B)	0.192 (B)	**0.282 (C)**	***0.022 (B)***	0.066 (B)	0.069 (B)	0.093 (B)	0.085 (B)	-	0.133 (B)	0.087 (B)	0.099 (B)	0.041 (B)	0.072 (C)	0.090 (B)	0.123 (C)	0.071 (B)	0.113 (C)	0.054 (B)	0.077 (C)
Dibenzo(a,h)anthracene	***0.012 (B)***	0.033 (B)	0.038 (B)	0.050 (C)	-	-	-	0.016 (B)	0.017 (B)	0.022 (B)	-	**0.051 (B)**	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	0.030 (B)	0.077 (B)	0.090 (B)	**0.118 (C)**	***0.010 (B)***	0.025 (B)	0.026 (B)	0.042 (B)	0.036 (B)	0.045 (B)	-	0.070 (B)	0.071 (B)	-	-	-	-	-	-	-	-
Other PAH (µg/m²/day)																					
Benzo(g,h,I)perylene	0.050 (B)	0.125 (B)	0.141 (B)	**0.174 (C)**	***0.018 (B)***	0.046 (B)	0.052 (B)	0.060 (B)	0.051 (B)	0.042 (B)	0.074 (B)	0.056 (B)	0.067 (B)	-	-	-	-	-	-	-	-
Pyrene	0.080 (B)	0.221 (B)	**0.269 (B)**	**0.269 (C)**	***0.023 (B)***	0.100 (B)	0.092 (B)	0.115 (B)	0.086 (B)	0.066 (B)	0.226 (B)	0.152 (B)	0.119 (B)	0.054 (B)	0.114 (C)	0.103 (B)	0.161 (C)	0.082 (B)	0.153 (C)	0.060 (B)	0.104 (C)
Phthalates (µg/m²/day)																					
Dimethyl phthalate	0.021 (B)	0.033 (B)	0.035 (B)	**0.080 (C)**	-	0.019 (B)	-	***0.016 (B)***	0.020 (B)	-	-	-	-	0.020 (B)	0.020 (C)	0.029 (B)	0.029 (C)	0.018 (B)	0.018 (C)	0.030 (B)	0.043 (C)
Diethyl phthalate	0.125 (B)	0.091 (B)	0.085 (B)	**0.264 (C)**	0.025 (B)	0.053 (B)	0.035 (B)	-	0.044 (B)	0.212 (B)	-	0.255 (B)	-	0.134 (B)	0.134 (C)	0.128 (B)	0.128 (C)	***0.012 (B)***	***0.012 (C)***	0.163 (B)	0.224 (C)
Di-n-butyl phthalate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzyl butyl phthalate	0.224 (B)	0.441 (B)	0.479 (B)	0.937 (C)	***0.069 (B)***	0.268 (B)	0.227 (B)	0.161 (B)	0.373 (B)	-	0.416 (B)	0.482 (B)	**1.477 (B)**	0.190 (B)	0.190 (C)	0.382 (B)	0.382 (C)	0.119 (B)	0.236 (C)	0.427 (B)	0.579 (C)
Bis(2-ethylhexyl)phthalate	0.664 (B)	2.087 (B)	2.261 (B)	3.028 (C)	***0.227 (B)***	1.283 (B)	1.260 (B)	1.036 (B)	1.066 (B)	-	**3.538 (B)**	-	-	-	-	1.989 (B)	2.364 (C)	-	-	-	-
Di-n-octyl phthalate	-	-	-	-	-	-	-	0.247 (B)	-	-	0.592 (B)	**0.945 (B)**	-	0.117 (B)	0.117 (C)	0.095 (B)	0.095 (C)	0.208 (B)	0.346 (C)	***0.043 (B)***	0.098 (C)
Aqueous Total Solids																					
Total solids (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	20	20	63	63	12	12	23	23

Notes:

Only samples values greater than 3 times the blank are presented.

PAH - Polycyclic Aromatic Hydrocarbons

PDS - Passive Deposition Sampler

PM2.5 - Particulate smaller than 2.5 µm in diameter.

PM10 - Particulate smaller than 10 µm in diameter.

SPCC - South Park Community Center

TEOM - Tapered Element Oscillating Microbalance

Minimum Values in ***Bold Italics*** and Maximum Values in **Bold**

(A) - Blank-correction conducted by subtracting the uncorrected air deposition flux rate from the highest associated blank value.

(B) - Result From Aqueous Sample Only

{C} - Combined Result From Aqueous and Wipe Samples

(D) - Puget Sound Clean Air Agency (www.pscleanair.org)

(E) - Value from Puget Sound Clean Air Agency Station "DD" (South Park: 8201 10th Avenue S.; Seattle, WA)

Table 10. Atmospheric flux deposition measurements relative to Beacon Hill station.

	Round 1			Round 2					Round 3				Round 4							
Station	**Beacon Hill**	**Duwamish**	**Duwamish**	**Beacon Hill**	**Duwamish**	**Duwamish**	**Georgetown**	**S. Park CC**	**Beacon Hill**	**Duwamish**	**Georgetown**	**S. Park CC**	**Beacon Hill**	**Beacon Hill**	**Duwamish**	**Duwamish**	**Georgetown**	**Georgetown**	**S. Park CC**	**S. Park CC**
Station ID	BW	CE	CE	BW	CE	CE	DZ	SPCC	BW	CE	DZ	SPCC	BW	BW	CE	CE	DZ	DZ	SPCC	SPCC
Sample Type	Sample	Sample	Duplicate	Sample	Sample	Duplicate	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample
Start Date	1/20/2005	1/20/2005	1/20/2005	2/15/2005	2/15/2005	2/15/2005	2/15/2005	2/15/2005	3/23/2005	3/23/2005	3/23/2005	3/23/2005	4/13/2005	4/13/2005	4/13/2005	4/13/2005	4/13/2005	4/13/2005	4/13/2005	4/13/2005
End Date	2/15/2005	2/15/2005	2/15/2005	3/23/2005	3/23/2005	3/23/2005	3/23/2005	3/23/2005	3/30/2005	3/30/2005	3/30/2005	3/30/2005	5/5/2005	5/5/2005	5/5/2005	5/5/2005	5/5/2005	5/5/2005	5/5/2005	5/5/2005
Total Days	26	26	26	36	36	36	36	36	7	7	7	7	22	22	22	22	22	22	22	22
Sample Volume, L	3.10	3.03	3.08	2.40	2.30	2.32	2.59	2.49	5.92	5.79	6.15	6.05	4.93	4.93	4.07	4.07	5.10	5.10	5.12	5.12
PDS Collection Area, m²	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948	0.0948
Air Deposition Flux Ratios (A)																				
Carcinogenic PAH																				
Benzo(a)anthracene	1.00 (B)	2.55 (B)	2.78 (B)	1.00 (B)	2.96 (B)	3.35 (B)	5.65 (B)	5.85 (B)	-	-	-	-	1.00 (B)	1.00 (C)	2.36 (B)	1.19 (C)	2.27 (B)	1.45 (C)	1.38 (B)	0.77 (C)
Benzo(a)pyrene	1.00 (B)	2.48 (B)	2.93 (B)	1.00 (B)	2.72 (B)	2.78 (B)	4.56 (B)	3.86 (B)	-	-	-	-	1.00 (B)	1.00 (C)	1.85 (B)	1.21 (C)	1.31 (B)	1.16 (C)	0.66 (B)	0.54 (C)
Benzo(b)fluoranthene	1.00 (B)	2.91 (B)	2.98 (B)	1.00 (B)	3.17 (B)	3.23 (B)	5.04 (B)	4.57 (B)	1.00 (B)	1.18 (B)	1.98 (B)	1.94 (B)	1.00 (B)	1.00 (C)	1.40 (B)	1.14 (C)	1.19 (B)	1.13 (C)	0.94 (B)	0.89 (C)
Benzo(k)fluoranthene	1.00 (B)	2.82 (B)	3.24 (B)	1.00 (B)	2.78 (B)	3.51 (B)	4.85 (B)	4.17 (B)	1.00 (B)	1.12 (B)	1.44 (B)	1.68 (B)	1.00 (B)	1.00 (C)	0.99 (B)	0.87 (C)	0.98 (B)	1.02 (C)	0.61 (B)	0.75 (C)
Chrysene	1.00 (B)	2.35 (B)	2.66 (B)	1.00 (B)	3.06 (B)	3.17 (B)	4.31 (B)	3.91 (B)	-	-	-	-	1.00 (B)	1.00 (C)	2.20 (B)	1.70 (C)	1.75 (B)	1.56 (C)	1.31 (B)	1.07 (C)
Dibenzo(a,h)anthracene	1.00 (B)	2.79 (B)	3.23 (B)	-	-	-	-	-	1.00 (B)	-	2.29 (B)	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	1.00 (B)	2.58 (B)	2.99 (B)	1.00 (B)	2.48 (B)	2.54 (B)	4.05 (B)	3.48 (B)	1.00 (B)	-	1.54 (B)	1.57 (B)	-	-	-	-	-	-	-	-
Other PAH																				
Benzo(g,h,I)perylene	1.00 (B)	2.51 (B)	2.82 (B)	1.00 (B)	2.63 (B)	2.99 (B)	3.40 (B)	2.88 (B)	1.00 (B)	1.76 (B)	1.32 (B)	1.60 (B)	-	-	-	-	-	-	-	-
Pyrene	1.00 (B)	2.75 (B)	3.35 (B)	1.00 (B)	4.36 (B)	4.05 (B)	5.01 (B)	3.77 (B)	1.00 (B)	3.41 (B)	2.29 (B)	1.80 (B)	1.00 (B)	1.00 (C)	1.90 (B)	1.41 (C)	1.52 (B)	1.34 (C)	1.12 (B)	0.91 (C)
Phthalates													-	-	-	-	-	-	-	-
Dimethyl phthalate	1.00 (B)	1.55 (B)	1.64 (B)	-	-	-	-	-	-	-	-	-	1.00 (B)	1.00 (C)	1.45 (B)	1.45 (C)	0.90 (B)	0.90 (C)	1.50 (B)	2.15 (C)
Diethyl phthalate	1.00 (B)	0.73 (B)	0.68 (B)	1.00 (B)	2.14 (B)	1.44 (B)	-	1.78 (B)	1.00 (B)	-	1.20 (B)	-	1.00 (B)	1.00 (C)	0.96 (B)	0.96 (C)	0.09 (B)	0.09 (C)	1.22 (B)	1.67 (C)
Di-n-butyl phthalate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzyl butyl phthalate	1.00 (B)	1.97 (B)	2.14 (B)	1.00 (B)	3.87 (B)	3.28 (B)	2.33 (B)	5.39 (B)	-	-	-	-	1.00 (B)	1.00 (C)	2.01 (B)	2.01 (C)	0.63 (B)	1.24 (C)	2.25 (B)	3.04 (C)
Bis(2-ethylhexyl)phthalate	1.00 (B)	3.14 (B)	3.41 (B)	1.00 (B)	5.65 (B)	5.55 (B)	4.56 (B)	4.70 (B)	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-octyl phthalate	-	-	-	-	-	-	-	-	-	-	-	-	1.00 (B)	1.00 (C)	0.81 (B)	0.81 (C)	1.77 (B)	2.96 (C)	0.37 (B)	0.84 (C)

Notes:
(A) - All results are blank corrected. Blank-correction conducted by subtracting the uncorrected air deposition flux rate from the highest associated blank value.
(B) - Result From Aqueous Sample Only
(C) - Combined Result From Aqueous and Wipe Samples

Table 11. Surface water quality complaints in the Lower Duwamish Waterway.
January - June 2005

Date	Material	Location	Service Area	Status
4/20/2005	Acid from Car Battery	211 S Austin St	SD	Resolved
1/14/2005	Auto Fluids	4801 Rainier Av S	CSO	Resolved
1/27/2005	Auto Fluids	1922 S Stevens St	SD	Resolved
6/1/2005	Auto Fluids	1118 14th Av S	SD	Resolved
3/7/2005	Auto Fluids	3523 S Bennett St	SD	Unresolved
3/10/2005	Auto Fluids	9641 59th Av S	SD	Unresolved
1/19/2005	Carpet cleaning solution	2000 Waverly Pl N	CSO	Resolved
4/25/2005	Chemical	211 S Austin St	SD	Resolved
6/21/2005	Concrete Slurry	1122 Hiawatha Pl S	SD	Resolved
5/3/2005	Diesel	2535 Airport Way S	SD	Resolved
4/12/2005	Diesel	1st Av S & Duwamish	SD	Unresolved
4/6/2005	Gasoline	S Kenyon St & 10th Av S	SD	Unresolved
6/1/2005	Leaking oil	5911 Fauntleroy Ave SW	SD	Resolved
5/24/2005	Motorcycle oil	4815 Fauntleroy Way SW	CSO	Unresolved
2/15/2005	Oil	9229 10th Av S	SD	Resolved
3/11/2005	Oil	1103 26th Av S	SD	Resolved
4/21/2005	Oil	2753 S Washington St	CSO	resolved
5/24/2005	Oil	40th Av Sw & SW Juneau St	SD	Resolved
6/16/2005	Oil	4208 Rainer Ave S	CSO	Resolved
3/8/2005	Sediment	1st Av S & S Denver St	SD	Unresolved
4/28/2005	Sewage	2348 Yale Ave E	CSO	Resolved
4/6/2005	Smelly Slime	5940 36th Av SW	SD	Resolved
4/6/2005	Soap Suds	S Edmunds St & Rainier Av S	CSO	Resolved
3/18/2005	Soapy Water	S Edmonds St & Rainier Av S	CSO	Resolved
1/19/2005	Turbid water	804 MLK Jr Way S	CSO	Resolved
3/17/2005	Turbid water	2911 1st Av S	CSO	Resolved
4/27/2005	Turbid water	2705 1st Av S	SD	Resolved
6/15/2005	Turbid water	26th Ave S & McClellan St	SD	Resolved
4/19/2005	Used Oil	3624 Courtland Pl S	CSO	Resolved
5/19/2005	Wash water	94801 Rainier Av S	CSO	Resolved
5/20/2005	Wash water	4801 Rainier Av S	CSO	Resolved
01/13/05	Wastewater	7400 8th Av S	SD	Resolved
1/25/2005	Wastewater	7401 8th Av S	SD	Resolved
3/25/2005	Yellow Substance	1908 23rd Av S	CSO	Unresolved

34 SITES 7 UNRESOLVED, 27 RESOLVED

7 unresolved all because the complaint material was not found during inspection.

Table 12. Businesses that received spill kits during the January - June, 2005 reporting period.

SKIPP Business	Address	Area	Date Kit Delivered
QFC#849	2707 Rainier AV S	?	03/28/05
Larry's Volvo	6301 Beacon Ave. S	B. Hill	06/29/05
Beacon Hill Corp	2415 BEACON AV S	Beacon Hill	04/18/05
Goodbye Graffiti	2114 13TH AV S	Beacon Hill	04/18/05
Jefferson Park Golf Course	4101 Beacon AV S	Beacon Hill	02/25/05
Lioe's Automotive Service	2400 Beacon AV S	Beacon Hill	03/25/05
MJC Enterprises LLC	2424 Beacon AV S	Beacon Hill	04/18/05
Plantscapes	1127 Poplar PL S	Beacon Hill	03/25/05
Canterbury Ale & Eats	534 15TH AV E	Capitol Hill	04/05/05
Car Tender	1706 12TH AV	Capitol Hill	01/20/05
CC's Burgers	2600 E Union ST	Capitol Hill	02/07/05
Finfine Ethiopian Restaurant	2123 E UNION ST	Capitol Hill	04/01/05
First Call Plus of Washington	526 19TH AV E	Capitol Hill	12/21/04
Holy Names Academy	728 21ST AV E	Capitol Hill	02/24/05
King Fish Café	602 19TH AV E	Capitol Hill	03/17/05
Metro Auto Rebuild	1510 Melrose AV	Capitol Hill	01/17/05
Monsoon Restaurant	615 19TH AV E	Capitol Hill	04/27/05
Palermo Pizza & Pasta	350 15TH AV E	Capitol Hill	02/09/05
Pioneer Human Services	102 21ST AV E	Capitol Hill	03/17/05
QFC 804	415 15TH AV E	Capitol Hill	01/25/05
QFC#823	8532 15TH AV NW	Capitol Hill	03/28/05
QFC#847	1401 BROADWAY	Capitol Hill	03/28/05
Tana Restaurant	2518 E Cherry ST	Capitol Hill	04/01/05
Teriyaki and Wok	324 Broadway E	Capitol Hill	07/08/05
Tru Line Frame & Wheel	312 boren AV S	Capitol Hill	02/09/05
Union Gospel Mission	1808 18TH AV	Capitol Hill	01/20/05
Wood Specialties	1908 E Mercer ST	Capitol Hill	01/17/05
A Piece of Cake	514 S King	Chinatown	05/04/05
Asia BBQ	655A S Jackson	Chinatown	05/04/05
Four Seas Restaurant	714 S King St	Chinatown	05/05/05
Fu Lin Restaurant	512 S King Street	Chinatown	05/04/05
Gossip Expresso & Tea	651 S King St.	Chinatown	05/04/05
Green Village	516 6th Ave. S	Chinatown	05/05/05
Harbor City	707 S King st.	Chinatown	05/18/05
Hing Loon Restaurant	628 S Weller	Chinatown	05/05/05
Honey Court	516 Maynard Ave.	Chinatown	05/18/05
Hon's Restaurant	416 6th Ave S	Chinatown	05/04/05
Kwan On Wing Co.	679 S King St	Chinatown	05/04/05
Maxang	507 S Jackson	Chinatown	05/04/05
Nile Auto Repair	1622 E Yessler	Chinatown	06/01/05
Pearl Café	674 S Weller St.	Chinatown	05/04/05
Purple Dot Café	515 Maynard Ave. S	Chinatown	05/05/05
Spic n Span	652 S Dearborn	Chinatown	05/04/05
Trade Printing	515 7th Ave S	Chinatown	05/04/05
YummyHouseBakery	522 6th Ave S	Chinatown	05/05/05
Ambrosia Cafe	619 S King St.	Chinatown	05/05/05
Gom Hong	709 S King St.	Chinatown	05/18/05
Healthy Vegetasia	668 S King St.	Chinatown	05/04/05
Seventh Ave. Service	701 S Jackson St,	Chinatown	05/05/05
Tai Tong Restaurant	655 S King St.	Chinatown	05/04/05
A&A BBQ	663 S. Weller St.	Cinatown	05/18/05
Trade Printing	515 7th Ave. S	Cinatown	05/04/05
Amtrak Rail	187 S Holgate ST	Duwamish	12/20/04
Arco	7200 E MARGINAL WY S	Duwamish	04/05/05
Dresser-Rand Repair Center	225 S Lucile ST	Duwamish	01/20/05
Dukes Truck Repair	2401 Airport WY S	Duwamish	02/17/05
Int. Belt & Rubber supply	3685 Duwamish Ave S	Duwamish	05/16/05
Larry's Market	1001 S Myrtle ST	Duwamish	02/07/05
NorthStar Casteel	820 South Bradford Street	Duwamish	12/21/05
OB Williams	1939 1ST AV S	Duwamish	03/24/05

Table 12. Businesses that received spill kits during the January - June, 2005 reporting period.

SKIPP Business	Address	Area	Date Kit Delivered
Peco's BBQ Pit	2260 1ST AV S	Duwamish	01/28/05
Pettit Oil	2535 Airport WY S	Duwamish	04/22/05
Pho Bac 3	2851 S HANFORD ST	Duwamish	02/24/05
Pho Wild Garlic	6519 4TH AV S	Duwamish	12/30/04
Recession Repair	2535 Airport WY S	Duwamish	04/22/05
Schwartz Bros Bakery	619 S Nevada ST	Duwamish	01/26/05
Seattle Biodiesel	6333 1st Ave S.	Duwamish	Voucher
South Park Marina	8604 Dallas AV S	Duwamish	03/16/05
Stone Path Logistics	1932 6TH AV S	Duwamish	03/02/05
Stone Path Logistics	615 S Holgate ST	Duwamish	03/02/05
Stone Path Logistics	610 S Walker ST	Duwamish	03/02/05
Stone Path Logistics	2201 6TH AV S	Duwamish	03/02/05
Tire Distribution Systems	6311 Corgiat DR S	Duwamish	01/26/05
Western Cartage	3629 DUWAMISH AVE. S	Duwamish	05/05/05
Wing's Aloft	8467 Perimeter RD S	Duwamish	01/07/05
AM/PM Mini Mart	427 12TH AV	First Hill	12/14/04
Medgar Evers Pool	500 23RD AV	First Hill	12/21/04
Saba Ethiopian Restaura	110 12th Ave	First Hill	05/16/05
Universal Auto Body & Services	1209 E Fir ST	First Hill	12/30/04
Daimonji Restaurant	5963 Corson AV S	Georgetown	02/17/05
Goldie's	3924 Airport Way S	Georgetown	07/12/05
Ultrablock, Inc	1615 S Graham ST	Georgetown	12/08/04
Hidmo Restaurant	2000 S JACKSON ST	Jackson	12/14/04
Moonlight Café	1212 S JACKSON ST	Jackson	02/24/05
Pho Bac 1	1314 S Jackson ST	Jackson	02/24/05
Pho Bac 2	1240 S Jackson ST	Jackson	02/24/05
An Thinh Restaurant	1207 S Jackson ST	Little Saigon	04/29/05
Anthony's Beauty School	1237 S Jackson St	Little Saigon	04/29/05
Hoa's Fashion	1220 S Jackson St.	Little Saigon	04/29/05
Lyn Hair Salon	1042 S Jackson	Little Saigon	04/29/05
Nha Trang	1207 S Jackson	Little Saigon	05/04/05
Saigon Deli	1237 S Jackson St	Little Saigon	04/29/05
Thanh Vi	1046 S Jackson	Little Saigon	04/29/05
The Lemon Grass	514 12TH AV	Little Saigon	04/29/05
Thuan Kieu	1207 S Jackson	Little Saigon	05/04/05
Thuy Hair Studio	1212 S Jackson	Little Saigon	04/29/05
Vietnam House		Little Saigon	04/29/05
88 Restaurant & Deli	1043 S Jackson	Little Saigon	04/29/05
Minh Tam's Market	1040 S Jackson St.	Little Saigon	04/29/05
A Chau Café & Deli	6902 Rainier Ave S	Rainier	07/14/05
Affordable Auto Wrecking	9802 M.L. King Jr. Way S	Rainier	-
Asmgra LLC	6815 Rainier AV S	Rainier	12/14/04
Banadir	5212 Rainier AV S	Rainier	12/14/04
Billiar Karaoke Hoang	3220 S Hudson St.	Rainier	07/14/05
Caff Massawa Rest.	3312 Rainier AV S	Rainier	04/06/05
Champion Auto Body	7100 Rainier Ave S	Rainier	07/14/05
Chu Ming Tofu	6754 MLK Jr. Wy	Rainier	05/04/05
Clayton Volkswagen	5503 M L KING JR WY S	Rainier	03/04/05
Dynamic Automotive	7269 Rainier Ave. S	Rainier	05/23/05
Global Auto Repair	12817 M L KING JR WY S	Rainier	03/22/05
Hoang Lan	7119 M L KING JR WY S	Rainier	03/22/05
Hoang Linh	5300 Rainier Ave S	Rainier	05/25/05
Hong Nhi	6727 M L KING JR WY S	Rainier	04/01/05
Huong qeu Deli and Café	6715 M L KING JR WY S	Rainier	04/01/05
Import Used Car Sale	5203 Rainier AV S	Rainier	12/14/04
Japanese Amerocan Auto	6911 Rainier Ave S	Rainier	07/13/05
Jumbo Chinese Restauran	4208 Rainier Ave S	Rainier	05/25/05
Lakshmi Inc.	6230 Rainier Ave. S	Rainier	06/30/05
M&H Auto Body Shop	7000 Rainier Ave S	Rainier	07/14/05
Ma Ma Ethiopian	8115 Rainier AV S	Rainier	03/22/05

Table 12. Businesses that received spill kits during the January - June, 2005 reporting period.

SKIPP Business	Address	Area	Date Kit Delivered
M-D Auto Body/ Repair	7202 Rainier Ave S	Rainier	07/14/05
Mediterranean Market	2307 Rainier Ave. SW	Rainier	05/23/05
Mekong Rainier Supermar	3400 Rainier Ave S	Rainier	04/29/05
Mi La Cay	718 Rainier Ave S	Rainier	05/25/05
Midas	2107 23RD AV S	Rainier	02/09/05
Minh's Auto Repair	6905 Rainier AV S	Rainier	02/25/05
Minh's Restaurant	7101 M L KING JR WY S	Rainier	03/08/05
My Canh Restaurant	6021 M L KING JR WY S	Rainier	04/01/05
N&B Auto	6907 Rainier Ave S	Rainier	07/13/05
Pho An	2609 S McClellan St.	Rainier	05/25/05
Pho Bahn Mi Saigon	810 Rainier AV S	Rainier	04/07/05
Pho Ga	900 Rainier Ave S	Rainier	04/29/05
Pho Hoa	4732 Rainier Ave	Rainier	05/25/05
Pho My Chau	7101 M L KING JR WY S	Rainier	03/22/05
Pho Seattle	7127 M L KING JR WY S	Rainier	03/22/05
Pho Van	9150 Rainier AV S	Rainier	04/06/05
Phuoc Loc Tho Supermarket	6951 M L KING JR WY S	Rainier	02/24/05
Rainier Auto Body	6355 Rainier Ave S	Rainier	06/29/05
Rainier Photographic	8730 Rainier AV S	Rainier	12/07/04
Rainier Restaurant	6400 M L KING JR WY S	Rainier	04/01/05
S&M Auto Repair	6924 Rainier Ave S	Rainier	07/14/05
Saigon Dynasty	6040 M L KING JR WY S	Rainier	12/17/04
Sammy's Auto Service	9601 Renton AV S	Rainier	03/22/05
Seattle Best Cleaners	3219 MLK Wy S	Rainier	05/25/05
Tammy's Bakery	7101 M L KING JR WY S	Rainier	12/30/04
Than Auto	6901 Rainier AV S	Rainier	02/24/05
Thanh Thao	6012 M L KING JR WY S	Rainier	04/01/05
Tony's Bakery & Deli	6020 MLK Wy S	Rainier	04/29/05
Tuyet Hanh Fashion	3818 S Graham St.	Rainier	04/29/05
Van Loi Restaurant	3226 Rainier AV S	Rainier	02/24/05
Viet Market	6030 M L KING JR WY S	Rainier	12/17/04
West One	9001 Renton AV S	Rainier	03/22/05
Mimi's Bakery and Floral	4809 Beacon AV S	S. Seattle	04/06/05
South Seattle CC	6000 16th Ave SW	S. Seattle	07/15/05
Millwork Supply Co	2225 1ST AV S	S.Downtown	03/25/05
Lindmark Machine Works	49 S Spokane St.	So Seattle	06/20/05
Seaport Steel	3660 E Marginal Wy S	So. Seattle	07/05/05
AMF Metals	2959 Utah Ave S	SODO	06/15/05
Aqua Quip	3447 4th Ave. S	SODO	12/17/05
CF Resource	2752 6th Ave	SODO	05/25/05
Ederer Inc	2925 1st Ave S	SODO	07/08/05
Edward International Co.	1906 Occidental Ave. S	SODO	07/14/05
Emerald City Auto Repair	1943 4th ave so	SODO	05/25/05
First Ave Deli	3228 1ST AV S	SODO	03/28/05
Kings Transmission	2939 4TH AV S	SODO	12/17/04
Krispy Kreme	1900 1ST AV S	SODO	02/17/05
Magic Dragon	4601 6th Ave S	SODO	07/14/05
Nitze-Stagen	2401 Utah Ave	SODO	05/25/05
Northwest Shower door	3223 1st Ave S	SODO	06/15/05
Pittman Automotive Serv	465 S Holgate	SODO	05/26/05
PSF Industries	65 S Horton	SODO	06/20/05
Seattle Radiator Works	1902 Occidental Ave S	SODO	06/07/05
Washington Chain & Sup	2901 Utah Ave S	SODO	06/10/05
Southend Quality Car Care	8902 14TH AV S	South Park	02/09/05
Accucraft Collision Center	2600 15TH AV W	West Seattle	03/11/05
Center Tool Rentals	9444 Delridge WY SW	West Seattle	12/09/04
Coffee To A Tea	4541 California Ave SW	West Seattle	07/15/05
Ty's Auto Repair	9226 Delridge Way SW	West Seattle	07/13/05
Weston Automotive	8854 Delridge Way SW	West Seattle	07/13/05
Westwood Gas & Deli	9200 35TH AV SW	West Seattle	02/17/05

Table 12. Businesses that received spill kits during the January - June, 2005 reporting period.

SKIPP Business	Address	Area	Date Kit Delivered
Auto Hound Collision	771 Valley St.		06/29/05
Café Ibex	3219 MLK Way S		06/20/05
East Yesler Grocery	1902 E Yesler		06/20/05
Foulee Market	2050 S Columbia Way		05/04/05
Jackson Park Golf Cours	1000 NE 135th St		06/28/05
Lalibela Ethiopian Restaur	2800 E Cherry		05/16/05
Meskel Ethiopian Restaur	2605 E Cherry		05/16/05
Sam's Auto Clinic	2616 E Cherry		06/01/05
Swedish Automotive	7501 35th Ave SW		06/29/05

Table 13. Land use in the Diagonal Ave S CSO/SD service area.

Land Use	Storm drain service area (Ac)	Combined sewer service area (Ac)
Industrial	490	657
Commercial	233	412
Public right-of-way	991	1,432
Single-family residential	487	1,369
Multi-family residential	102	314
Schools	45	116
Open space	124	349
Vacant	128	251
Total	2,600	4,900

Table 14. Condition of Georgetown Flume.

Upstream Station (ft)	Downstream Station (ft)	Description	Condition
0	250	60-inch tunnel	Not inspected (to be video-inspected in 2005)
250	370	Concrete-lined flume	Not inspected (to be video-inspected in 2005)
370	830	Twin 42” concrete pipes	Pipes intact, 1 broken joint in each. Three plugged holes in south pipe (from south side)--possible pipe entry points + one PVC pipe (unplugged). Two plugged holes in north pipe (one from south, one from north).
830	1,295	Wood-lined flume	Flume generally intact. Standing water (3-9 inches) and 2-18 inches of sediment in flume
1,295	1,500	Wood-lined flume	Flume walls collapsed throughout. Sediment accumulations of 12-16 inches in flume
1,500	2,075	Wood-lined flume	Many boards on sidewalls rotted. Debris and about 9 inches of sediment in flume
2,075	2,230	72-inch CMP[a]	Pipe intact, some corrosion at joints and crown
2,230	2,475	72-inch CMP[b]	Not inspected (to be video-inspected in 2005)

a. To MH100 on west side of E Marginal Way S
b. From west side of E Marginal Way S to Slip 4

Table 15. Active pipes entering Georgetown flume.[a]

Pipe ID	Diameter (in)	Material	Entry Location[b]	Station[c]	Description
H-1	6 to 8	PVC	South	390	Found during video inspection of 42-inch twin pipes (south pipe)
G-2	8	Concrete	South	790	Discharge from Boeing (records indicate 100 gpm permitted)
F-1	4	Clay	North	970	Unknown
D-1	8	Concrete	North	1,460	Storm drain on west side of S Myrtle St
B-2	4	PVC	North	2,900	Unknown
B-3	3	ABS	North	2,900	Laundry discharge from motel (discharge has been discontinued)

a. Pipes that are not visibly capped or plugged.
b. Direction from which pipe enters flume.
c. Aproximate distance from upstream end of flume.

Table 16: Dallas Ave S and Vicinity Sample Results.

Map Label	Sample ID	Sample Date	Location	Sample Depth (ft)	TOC (%)	PCBs (ppm)
Dirt Collected From Roadway Surface and Catch Basins						
SD1	ROWT1	7/22/2004	W edge of Dallas Ave S at OWSEP1	0	0.78	0.26
SD2	ROWT2	7/22/2004	E edge of Dallas Ave S at entrance to T117	0	2.18	1.6
SD3	ROWT3	7/22/2004	CB on Dallas Ave S at NW corner of Port bldg at S end T117	0	7.37	7
SD4	ROWT4	7/22/2004	5-pt composite from storage area in ROW S of S Donovan St	0	2.82	2.2
SD5	ROWT5	7/22/2004	N edge of S Donovan St at SE corner of Basin Oil prop	0	1.84	4.8
SD6	ROWT6	7/22/2004	NW corner of S Donovan St and 17th Ave S	0	1.01	0.47
SD7	ROWT7	7/22/2004	5-pt composite along east edge of 17th Ave S between	0	3.36	6.1
SD8	ROWT8	7/22/2004	CB on west side of 17th Ave S at #8609	0	4.35	9.2
SD9	ROWT9	7/22/2004	2-pt composite N and S edge of Dallas Ave S and W of 17th Ave S	0	2.14	1.9
SD10	ROWT10	9/23/2004	Inlet at SE corner of 14th Ave S and S Trenton St	0	5.80	0.028
SD11	ROWT11	9/23/2004	Composite of street dust and dirt from inlet on S Cloverdale St on E side 14th Ave S	0	6.48	0.58
SD12	ROWT12	9/23/2004	Composite of street dust and dirt from inlet on S Donovan St just east of 14th Ave S	0	4.08	0.46
SD13	ROWT13	9/23/2004	Duplicate of 12	0	4.57	0.46
SD14	ROWT14	9/23/2004	Inlet at SE corner of 14th Ave S and Dallas Ave S	0	9.41	0.17
SD15	ROWT15	9/23/2004	Composite of street dust on N and S side of Dallas Ave S,	0	1.38	3.1
SD16	ROWT16	9/23/2004	CB sample at SE corner of 16th Ave S and S Cloverdale St	0	3.67	0.36
SD17	ROWT17	9/23/2004	Composite of street dust on N side of S Donovan St just west of 16th Ave S	0	2.59	0.34
SD18	ROWT18	9/23/2004	Catch basin at 17th Ave S and S Donovan St	0	2.88	0.36
SD19	ROWT19	10/26/2004	Road shoulder in front of 8523 Dallas Ave S	0	8.26	0.163
SD20	ROWT20	10/27/2004	Road shoulder across street from 8525 Dallas Ave S	0	1.04	1.3
SD21	ROWT21	10/27/2004	Road shoulder in front of 8519 Dallas Ave S	0	4.46	0.075
SD22	ROWT22	10/27/2004	Road shoulder in front driveway at 1437 S Donovan St	0	0.883	0.028
SD25	ROWT25	12/8/2004	CB at SE Corner of S Cloverdale St and 10th Ave S	0	9.15	0.04
SD25	ROWT26	12/8/2004	Dupe of SD25	0	9.30	0.039
SD27	ROWT27	12/8/2004	CB at SW Corner of S Sullivan St and 8th Ave S	0	8.35	<0.05
SD28	ROWT28	12/8/2004	CB at NE corner of S Sullivan St and 12th Ave S	0	5.67	<0.02
SD29	ROWT29	12/8/2004	CB at NW corner of S Cloverdale St and 12th Ave S	0	6.01	<0.039
SD30	ROWT30	12/8/2004	CB at SW corner of S Donovan St and 12th Ave S	0	7.44	0.82
SD51	TP51-031605	3/16/2005	Edge ROW on W side 16th Ave S (60' from Dallas)	0	NA	47
SD52	TP52-031605	3/16/2005	Edge ROW on W side 16th Ave S (12.5' from Dallas)	0	NA	86
SD53	CB53	3/16/2005	CB at boat storage yard on Dallas Ave S	0	NA	6.3
Soil Samples from Right-of-Way						
TP1	TP1-0.5	11/16/2004	Dallas Ave S at W edge 17th Ave S	0.5'		9.8
TP1	TP1-1.0	11/16/2004	Dallas Ave S at W edge 17th Ave S	1'		1.1
TP2	TP2-0.5	11/16/2004	Dallas Ave S and 17th Ave S	0.5'		7
TP2	TP2-1.0	11/16/2004	Dallas Ave S and 17th Ave S	1'		0.36
TP3	TP3-0.5	11/16/2004	17th Ave S at S edge Dallas Ave S	0.5'		4.7
TP3	TP3-1.0	11/16/2004	17th Ave S at S edge Dallas Ave S	1'		1.7
TP4	TP4-0.5	11/16/2004	17th Ave S at #8609	0.5'		38
TP4	TP4-1.0	11/16/2004	17th Ave S at #8609	1'		0.28
TP5	TP5-1.0	11/16/2004	17th Ave S at S edge #8609	1'		0.47
TP5	TP5-2.0	11/16/2004	17th Ave S at S edge #8609	2'		0.038
TP5	TP5-3.0	11/16/2004	17th Ave S at S edge #8609	3'		0.055
TP5	TP5-4.0	11/16/2004	17th Ave S at S edge #8609	4'		<0.04
TP5	TP5-5.0	11/16/2004	17th Ave S at S edge #8609	5'		<0.039
TP6	TP6-1.0	11/16/2004	Dallas Ave S at BO1	1'		12
TP6	TP6-2.0	11/16/2004	Dallas Ave S at BO1	2'		0.34
TP6	TP6-3.0	11/16/2004	Dallas Ave S at BO1	3'		0.1
TP7	TP7-1.0	11/17/2004	Dallas Ave S at BO2	1'		7.5
TP7	TP7-2.0	11/17/2004	Dallas Ave S at BO2	2'		0.59
TP7	TP7-3.0	11/17/2004	Dallas Ave S at BO2	3'		0.15
TP8	TP8-1.0	11/17/2004	Dallas Ave S at BO3	1'		11

Table 16: Dallas Ave S and Vicinity Sample Results.

Map Label	Sample ID	Sample Date	Location	Sample Depth (ft)	TOC (%)	PCBs (ppm)
TP8	TP8-2.0	11/17/2004	Dallas Ave S at BO3	2'		0.24
TP8	TP8-3.0	11/17/2004	Dallas Ave S at BO3	3'		0.045
TP9	TP9-1.0	11/17/2004	Dallas Ave S at S Donovan St	1'		18
TP9	TP9-2.0	11/17/2004	Dallas Ave S at S Donovan St	2'		21
TP9	TP9-3.0	11/17/2004	Dallas Ave S at S Donovan St	3'		<0.042
TP10	TP10-1.0	11/17/2004	CB at Dallas Ave S and S Donovan St	1'		2.6
TP10	TP10-2.0	11/17/2004	CB at Dallas Ave S and S Donovan St	2'		0.17
TP10	TP10-3.0	11/17/2004	CB at Dallas Ave S and S Donovan St	3'		0.046
TP10	TP10-4.0	11/17/2004	CB at Dallas Ave S and S Donovan St	4'		0.031
TP10	TP10-5.0	11/17/2004	CB at Dallas Ave S and S Donovan St	5'		0.031
TP11	TP11-1.0	11/17/2004	S Donovan St1	1'		1.9
TP11	TP11-2.0	11/17/2004	S Donovan St1	2'		0.15
TP11	TP11-3.0	11/17/2004	S Donovan St1	3'		0.082
TP12	TP12-1.0	11/17/2004	S Donovan St2	1'		46
TP12	TP12-2.0	11/17/2004	S Donovan St2	2'		7.6
TP12	TP12-3.0	11/17/2004	S Donovan St2	3'		0.36
TP13	TP13-1.0	11/17/2004	S Donovan St3	1'		18
TP13	TP13-2.0	11/17/2004	S Donovan St3	2'		0.81
TP13	TP13-3.0	11/17/2004	S Donovan St3	3'		0.2
TP14	TP14-1.0	11/17/2004	S Donovan St4	1'		0.41
TP14	TP14-2.0	11/17/2004	S Donovan St4	2'		0.12
TP14	TP14-3.0	11/17/2004	S Donovan St4	3'		0.059
TP15	17-C-0.5	11/3/2004	17th Ave S and S Donovan St center	0.5'		3.3
TP15	17-C-1.0	11/3/2004	17th Ave S and S Donovan St center	1'		5.5
TP16	17-C2-0.5	11/3/2004	17th Ave S @ 8617 center	0.5'		0.94
TP16	17-C2-1.0	11/3/2004	17th Ave S @ 8617 center	1'		0.16
TP17	17-C3-0.5	11/4/2004	17th Ave S road end center	0.5'		0.014
TP17	17-C3-1.0	11/4/2004	17th Ave S road end center	1'		0.016
TP18	17-E1-0.5	11/3/2004	17th Ave S @ 8620 east	0.5'		1.5
TP18	17-E1-1.0	11/3/2004	17th Ave S @ 8620 east	1'		0.94
TP19	17-E2-0.5	11/3/2004	17th Ave S @ N end Basin oil east	0.5'		14
TP19	17-E2-1.0	11/3/2004	17th Ave S @ N end Basin oil east	1'		11
TP19	17-E2-2.0	11/3/2004	17th Ave S @ N end Basin oil east	2'		12
TP20	17-W1-0.5	11/2/2004	17th Ave S @ 8609 west	0.5'		6.3
TP20	17-W1-1.0	11/2/2004	17th Ave S @ 8609 west	1'		4.5
TP20	17-W1-2.0	11/2/2004	17th Ave S @ 8609 west	2'		1.6
TP21	17-W2-0.5	11/2/2004	17th Ave S @ 8601 west	0.5'		8.6
TP21	17-W2-1.0	11/2/2004	17th Ave S @ 8601 west	1'		0.88
TP21	17-W2-2.0	11/2/2004	17th Ave S @ 8601 west	2'		1.2
TP22	17-W3-0.5	11/3/2004	17th Ave S @ 8620 west	0.5'		0.12
TP22	17-W3-1.0	11/3/2004	17th Ave S @ 8620 west	1'		0.09
TP23	D-C1-0.5	11/3/2004	Dallas Ave S across from Basin Oil entrance center	0.5'		4.9
TP23	D-C1-1.0	11/3/2004	Dallas Ave S across from Basin Oil entrance center	1'		1.7
TP24	D-E1-0.5	11/4/2004	Dallas Ave S @ T117 south entrance	0.5'		7
TP24	D-E1-1.0	11/4/2004	Dallas Ave S @ T117 south entrance	1'		1.9
TP25	D-E2-0.5	11/2/2004	E side Dallas Ave S @ T117 (mid)	0.5'		6.8
TP25	D-E2-1.0	11/2/2004	E side Dallas Ave S @ T117 (mid)	1'		6.5
TP26	D-E3-0.5	11/2/2004	E side Dallas Ave S @ center entrance	0.5'		66
TP26	D-E3-1.0	11/2/2004	E side Dallas Ave S @ center entrance	1'		13
TP27	D-N2-0.5	11/4/2004	N side Dallas Ave S @ marina N entrance	0.5'		0.66
TP27	D-N2-1.0	11/4/2004	N side Dallas Ave S @ marina N entrance	1'		0.1
TP28	D-S1-0.5	11/2/2004	S side Dallas Ave S W of 17th Ave S	0.5'		9.5
TP28	D-S1-1.0	11/2/2004	S side Dallas Ave S W of 17th Ave S	1'		8.7
TP29	D-S2-0.5	11/3/2004	S side Dallas Ave S W of 16th Ave S	0.5'		18
TP29	D-S2-1.0	11/3/2004	S side Dallas Ave S W of 16th Ave S	1'		3.6
TP30	D-S3-0.5	11/3/2004	S side Dallas Ave S @ marina N entrance	0.5'		0.3
TP30	D-S3-1.0	11/3/2004	S side Dallas Ave S @ marina N entrance	1'		0.13
TP31	TP31-0.5	12/7/2004	8523 Dallas Ave S (base of 6" excavation)	0.5		0.82
TP32	TP32-0.5	12/7/2004	8525 Dallas Ave S (base of 6" excavation)	0.5		0.019
TP33	TP33-0.5	12/8/2004	8529 Dallas Ave S (base of 6" excavation)	0.5		0.02
TP34	TP34-0.5	12/8/2004	Dupe of TP33	0.5		0.02

Table 16: Dallas Ave S and Vicinity Sample Results.

Map Label	Sample ID	Sample Date	Location	Sample Depth (ft)	TOC (%)	PCBs (ppm)
TP35	TP35-1.0	12/8/2004	1440 S Cloverdale (base of 12" excavation)	1		0.46
TP36	TP36-0.5	12/9/2004	S Park Marina east (base of 6" excavation)	0.5		0.02
TP37	TP37-0.5	12/9/2004	Dallas Ave across from boat storage yard (base of 6" excava	0.5		5.8
TP39	TP39-0.5	12/9/2004	S Park Marina west (base of 6" excavation)	0.5		0.44
TP40	TP40-0.5	12/10/2004	8601 17th Ave S (Dallas side #1)-base of 6" excavation	0.5		480
TP40	TP40-1.0	12/10/2004	8601 17th Ave S (Dallas side #1)	1		0.68
TP40	TP40-2.0	12/10/2004	8601 17th Ave S (Dallas side #1)	2		0.34
TP41	TP41-0.5	12/10/2004	Dallas Ave S at boat storage yard--base of 6" excavation	0.5		140
TP41	TP41-1.0	12/10/2004	Dallas Ave S at boat storage yard	1		12
TP41	TP41-2.0	12/10/2004	Dallas Ave S at boat storage yard	2		5.9
TP42	TP42-0.5	12/10/2004	8601 17th Ave S (Dallas side #2-in front of garage)--base of	0.5		100
TP42	TP42-1.0	12/10/2004	8601 17th Ave S (Dallas side #2-in front of garage)	1		0.57
TP42	TP42-2.0	12/10/2004	8601 17th Ave S (Dallas side #2-in front of garage)	2		0.28
TP43	TP43-1.0	12/12/2004	8601 17th Ave S (17th side #1)--base of 12" excavation	1		0.019
TP43	TP43-2.0	12/12/2004	8601 17th Ave S (17th side #1)	2		0.02
TP44	TP44-1.0	12/12/2004	8601 17th Ave S (17th side #2)--base of 12" excavation	1		0.02
TP44	TP44-2.5	12/12/2004	8601 17th Ave S (17th side #2)	2.5		0.02
TP45	ROWS0-1	10/26/2004	Outside fence at 8609 17th Ave S	0	11.2	4.9
TP45	ROWS6-1	10/26/2004	Outside fence at 8609 17th Ave S	0.5	3.47	3.6
TP46	ROWS0-2	10/26/2004	Outside fence at 8601 17th Ave S	0	8.48	21
TP46	ROWS6-2	10/26/2004	Outside fence at 8601 17th Ave S	0.5	3.91	93
TP47	ROWS0-3	10/26/2004	Outside fence at 1440 S Cloverdale (Dallas ave side)	0	6.94	6.2
TP47	ROWS6-3	10/26/2004	6-in depth at 1440	0.5	1.42	2.8
TP48	ROWS0-4	10/26/2004	Surface soil next to sidewalk at 8529 Dallas Ave S	0	4.48	2.2
TP48	ROWS6-4	10/26/2004	8529 Dallas Ave S	0.5	2.3	0.99
TP49	ROWS0-5	10/27/2004	Surface soil next to sidewalk at 8523 Dallas Ave S	0	5.36	1.2
TP49	ROWS6-5	10/27/2004	6-in depth at 8523	0.5	2.14	0.85
TP49	ROWS0-6	10/27/2004	Dupe of ROWS0-5	0	5.82	1.1
TP50	ROWS0-7	10/27/2004	Front yard at 8519 Dallas Ave S	0	5.5	0.32
TP50	ROWS6-7	10/27/2004	6-in depth at 8519	0.5	1.2	0.066
TP51	TP51-0.5-041305	4/13/2005	4' in from W edge 16th Ave S, 60' from power pole on Dallas	0.5		0.68
TP52	TP52-0.5-041305	4/13/2005	4' in from W edge 16th Ave S, 16' from power pole on Dallas	0.5		0.089
TP53	HA1-0.5	3/10/2005	Soil pile on S Donovan St	0.5		0.24
TP53	HA1-1.0	3/10/2005	Soil pile on S Donovan St	1'		0.14
TP54	HA2-0.5	3/10/2005	Soil pile on S Donovan St	0.5		0.1
TP54	HA2-1.0	3/10/2005	Soil pile on S Donovan St	1'		0.15
TP55	HA3-0.5	3/10/2005	Soil pile on S Donovan St	0.5		0.092
TP55	HA3-1.0	3/10/2005	Soil pile on S Donovan St	1'		0.13
Yard Samples						
YS1	8519-1	11/17/2004	8519 Dallas Ave S (west side front yard)	2"		0.097
YS1	8519-2	11/17/2004	8519 Dallas Ave S (west side front yard)	4"		0.087
YS2	8519-3	11/17/2004	8519 Dallas Ave S (east side front yard)	2"		0.091
YS2	8519-4	11/17/2004	8519 Dallas Ave S (east side front yard)	4"		0.086
YS3	8525-1	11/17/2004	8525 Dallas Ave S (east side of house)	2"		0.2
YS3	8525-2	11/17/2004	8525 Dallas Ave S (east side of house)	4"		0.22
YS4	8525-3	11/17/2004	8525 Dallas Ave S (backyard by alley)	2"		0.15
YS4	8525-4	11/17/2004	8525 Dallas Ave S (backyard by alley)	4"		0.14
YS5	8529-1	11/17/2004	8529 Dallas Ave S (west of entry walk)	2"		0.34
YS5	8529-2	11/17/2004	8529 Dallas Ave S (west of entry walk)	4"		0.34
YS6	8529-3	11/17/2004	8529 Dallas Ave S (east of driveway)	2"		0.13
YS6	8529-4	11/17/2004	8529 Dallas Ave S (east of driveway)	4"		0.18
YS7	8529-5	11/17/2004	8529 Dallas Ave S (backyard)	2"		0.15
YS8	1440-7	11/17/2004	1440 S Cloverdale St (west end garden)	2"		<0.067
YS8	1440-8	11/17/2004	1440 S Cloverdale St (west end garden)	4"		<0.067
YS9	1440-5	11/17/2004	1440 S Cloverdale St (adj to pond)	2"		0.43
YS9	1440-6	11/17/2004	1440 S Cloverdale St (adj to pond)	4"		0.2
YS10	1417-1	11/17/2004	1417 S Cloverdale St (front yard)	2"		0.088
YS11	1417-2	11/17/2004	1417 S Cloverdale St (garden in backyard)	2"		0.15

Table 16: Dallas Ave S and Vicinity Sample Results.

Map Label	Sample ID	Sample Date Location	Sample Depth (ft)	TOC (%)	PCBs (ppm)
YS12	1412-1	11/17/2004 1412 S Donovan St (garden in front yard)	2"		0.073
YS13	1412-2	11/17/2004 1412 S Donovan St (garden in backyard)	2"		0.083
YS14	8609-5	11/17/2004 8609 17th Ave S (garden in backyard)	2"		<0.058
YS15	8523-3	11/17/2004 8523 Dallas Ave S (front yard)	2"		0.22
YS15	8523-4	11/17/2004 8523 Dallas Ave S (front yard)	4"		0.11
YS16	8523-1	11/17/2004 8523 Dallas Ave S (front yard)	2"		0.12
YS16	8523-2	11/17/2004 8523 Dallas Ave S (front yard)	4"		0.097
YS17	8601-1	10/27/2004 8601 17th Ave S (front yard)	1"		37
YS17	8601-2	10/27/2004 8601 17th Ave S (front yard)	4"		46
YS18	8609-1	10/27/2004 8609 17th Ave S (next to sump)	1"		3.4
YS18	8609-2	10/27/2004 8609 17th Ave S (next to sump)	4"		1.4
YS19	8609-3	10/27/2004 8609 17th Ave S (just north of sidewalk entrance)	1"		0.85
YS19	8609-4	10/27/2004 8609 17th Ave S (just north of sidewalk entrance)	4"		0.53
YS20	1440-3	10/27/2004 1440 S Cloverdale St (west end garden)	4"		0.99
YS21	1440-4	10/27/2004 1440 S Cloverdale St (east end garden)	4"		0.17
YS22	1440-1	10/27/2004 1440 S Cloverdale (next to sidewalk on Dallas Ave S)	1"		ND
YS22	1440-2	10/27/2004 1440 S Cloverdale (next to sidewalk on Dallas Ave S)	4"		ND
YS23	P1-0.5	3/10/2005 8609 17th Ave S	6"		0.32
YS23	P1-1.0	3/10/2005 8609 17th Ave S	1'		1.9
YS23	P1-2.0	3/10/2005 8609 17th Ave S	2'		0.74
YS23	P1-3.0	3/10/2005 8609 17th Ave S	3'		0.38
YS24	P2-0.5	3/10/2005 8609 17th Ave S	6"		0.3
YS24	P2-1.0	3/10/2005 8609 17th Ave S	1'		0.052
YS25	P3-0.5	3/10/2005 8609 17th Ave S	6"		0.29
YS25	P3-1.0	3/10/2005 8609 17th Ave S	1'		0.021
YS26	P4-0.5	3/10/2005 8609 17th Ave S	6"		3.6
YS26	P4-1.0	3/10/2005 8609 17th Ave S	1'		0.021
YS27	P5-0.5	3/10/2005 8609 17th Ave S	6"		0.089
YS27	P5-1.0	3/10/2005 8609 17th Ave S	1'		0.021
YS28	P6-0.5	3/10/2005 8609 17th Ave S	6"		0.34
YS28	P6-1.0	3/10/2005 8609 17th Ave S	1'		0.018
YS29	P7-0.5	3/10/2005 8601 17th Ave S	6"		2.9
YS29	P7-1.0	3/10/2005 8601 17th Ave S	1'		0.32
YS30	P8-0.5	3/10/2005 8601 17th Ave S	6"		0.026
YS30	P8-1.0	3/10/2005 8601 17th Ave S	1'		0.031
YS31	P9-0.5	3/10/2005 8601 17th Ave S	6"		0.13
YS31	P9-1.0	3/10/2005 8601 17th Ave S	1'		0.02
YS32	P10-0.5	3/10/2005 8601 17th Ave S	6"		33
YS32	P10-1.0	3/10/2005 8601 17th Ave S	1'		13
YS32	P10-2.0	3/10/2005 8601 17th Ave S	2'		0.094
YS32	P10-3.0	3/10/2005 8601 17th Ave S	3'		17
YS32	P10-4.0	3/10/2005 8601 17th Ave S	4'		0.44
YS33	P11-0.5	3/10/2005 8601 17th Ave S	6"		0.11
YS34	P12-0.5	3/10/2005 8609 17th Ave S	6"		0.12
YS35	YS35-0.25	4/28/2005 8603 16th Ave S--boat storage yd entrance	3"		0.14
YS35	YS35-1.0	4/28/2005 8603 16th Ave S--boat storage yd entrance	1'		1.6
YS36	YS36-0.25	4/28/2005 8603 16th Ave S--boat storage yd, NE quad	3"		0.067
YS37	YS37-0.25	4/28/2005 8603 16th Ave S--boat storage yd, SE quad	3"		0.31
YS37	YS37-1.0	4/28/2005 8603 16th Ave S--boat storage yd, SE quad	1'		0.25
YS38	YS38-1.0	4/28/2005 Dupe of YS37-1.0	1'		0.24
YS39	YS39-0.25	4/28/2005 8603 16th Ave S--boat storage yd, SW quad	3"		0.31
YS40	YS40-0.25	4/28/2005 8603 16th Ave S--boat storage yd, NW quad	3"		1.9
YS40	YS40-1.0	4/28/2005 8603 16th Ave S--boat storage yd, NW quad	1'		3.2
YS41	YS41-0.25	4/28/2005 8601 17th Ave S--side yd by garage	3"		5.8
YS41	YS41-1.0	4/28/2005 8601 17th Ave S--side yd by garage	1'		0.17
YS42	YS42-0.25	4/28/2005 8601 17th Ave S--side yd	3"		4.1
YS43	YS43-0.25	4/28/2005 8601 17th Ave S--front yd by walkway	3"		3.6
YS43	YS43-1.0	5/11/2005 8601 17th Ave S--front yd by walkway	1'		0.25
YS44	YS44-0.25	4/28/2005 8609 17th Ave S--driveway	3"		13
YS44	YS44-1.0	5/11/2005 8609 17th Ave S--driveway	1'		0.32
YS45	YS45-0.25	4/28/2005 8609 17th Ave S--front yd by walkway	3"		1.8

Table 16: Dallas Ave S and Vicinity Sample Results.

Map Label	Sample ID	Sample Date	Location	Sample Depth (ft)	TOC (%)	PCBs (ppm)
YS46	YS46-0.25	4/28/2005	8609 17th Ave S--side yard by tree	3"		0.76
YS46	YS46-1.0	4/28/2005	8609 17th Ave S--side yard by tree	1'		0.44
YS47	YS47-1.0	4/28/2005	Dupe of YS46-1.0	1'		0.48
YS48	YS48-0.25	5/11/2005	8601 17th Ave S--backyard	3"		1.1
YS48	YS48-1.0	5/11/2005	8601 17th Ave S--backyard	1'		0.07
YS49	YS49-0.25	5/11/2005	8601 17th Ave S--backyard	3"		0.41
YS50	YS50-0.25	5/11/2005	8609 17th Ave S--driveway	3"		11
YS51	YS51-0.25	5/11/2005	8609 17th Ave--side yard	3"		0.34
YS52	YS52-0.25	5/20/2005	8603 16th Ave S--boat storage yd, 15'-4" from NE corner	3"		0.44
YS52	YS52-1.0	5/20/2005	8603 16th Ave S--boat storage yd, 15'-4" from NE corner	1'		0.88
YS53	YS53-0.25	5/20/2005	8603 16th Ave S--boat storage yd, same as YS53, 15' off fence	3"		0.12
YS54	YS54-0.25	5/20/2005	8603 16th Ave S--boat storage yd, 50' S of NW corner	3"		0.31
YS54	YS54-1.0	5/20/2005	8603 16th Ave S--boat storage yd, 50' S of NW corner	1'		0.16
YS55	YS55-0.25	5/20/2005	8603 16th Ave S--boat storage yd, 85' S of NW corner	3"		0.082
YS55	YS55-1.0	5/20/2005	8603 16th Ave S--boat storage yd, 85' S of NW corner	1'		0.11
YS56	YS56-0.25	5/20/2005	8603 16th Ave S--boat storage yd, 75' S of NW corner, 15' from fence	3"		0.04
YS57	YS57-0.25	5/20/2005	8601 17th Ave S--backyard, W of sidewalk	3"		0.42

U = Chemical not detected at the reported concentration

J = Estimated value. Concentration is less than the laboratory reporting limit.

Exceeds state cleanup level for unrestricted land use (1 ppm PCBs)

Table 17. Dallas Ave soil cleanup: Temporary stormwater treatment plant sample results.

		PCB Aroclors (ug/L)								
Sample Location	**Date**	**1016**	**1221**	**1232**	**1242**	**1248**	**1254**	**1260**	**1262**	**1268**
Basin Oil runoff[a]	1/17/2005	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.383**	0.1 U	0.1 U
Basin Oil runoff[a]	1/22/2005	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Basin Oil runoff[a]	2/4/2005	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Plant influent[b]	1/10/2005	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**2.34**	0.1 U	0.1 U
Plant influent[b]	1/17/2005	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.142**	0.1 U	0.1 U
Plant influent[b]	1/22/2005	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.152**	0.1 U	0.1 U
Plant influent[b]	1/24/2005	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.167**	0.1 U	0.1 U
Plant influent[b]	2/4/2005	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Plant influent[b]	2/6/2005	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U

U = Compound not detected at concentration shown.

a. Runoff from the south end of the property at the discharge to the new catch basin installed in 12/04.
b. All runoff entering the temporary stormwater treatment plant (collected from inlet to the treatment system).

FIGURES

Lower Duwamish Waterway

Figure 1

Lower Duwamish Study Area

Legend

Streets
- Arterials
- State Highway
- Interstate Freeway

Streams
- Culvert
- Open Channel

- Lower Duwamish surface drainage basin
- Combined sewer service area w/in Lower Duwamish
- Diagonal storm drain basin
- Diagonal combined sewer service area

N W E S

0.5 0 0.5 Miles

Produced by the City of Seattle

Elliott Bay

Harbor Island

E MARGINAL WY S

1ST AV S

4TH AV S

9TH AV S

S JACKSON ST

E CHERRY ST

FRONTER WY S

15TH AV S

M L KING JR WY S

BEACON AV S

50TH AV S

RAINIER AV S

AIRPORT WY S

Lake Washington

35TH AV SW

DELRIDGE WY SW

W MARGINAL WY SW

16TH AV SW

9TH AV SW

Turning Basin

S 112TH ST

SW 116TH ST

SW 128TH ST

PACIFIC HY S

Puget Sound

Lower Duwamish Waterway

Figure 2

Outfalls in the Lower Duwamish Waterway

Legend

Streets
- Arterials
- State Highway
- Interstate Freeway

Utilities
- Storm drain
- Sanitary sewer
- Combined sewer
- King County interceptor

- King County CSO
- City CSO/SD
- City/County CSO/SD
- County storm drain
- City storm drain
- Private storm drain
- Unknown piped outfall
- WSDOT storm drain
- Port storm drain
- Seep
- Channel/ditch

0.2 0 0.2 Miles

Produced by the City of Seattle

Lower Duwamish Waterway

Figure 3
Businesses Inspected
March 2003 - June 2005

Legend

Streams
- Culvert
- Open channel

Combined sewer service area

Slip 4 drainage basin

Slip 5

Slip 6

Diagonal/Duwamish source area

Lower Duwamish surface drainage basin

Screening visit

Full inspection

Follow-up inspection (Mar 2003 - June 2004)

Follow-up inspection (July 2004 - December 2004)

Follow-up inspection (Jan 2005 - June 2005)

Note: Locations where dots and solid colors overlap are in the partially separated drainage/sewer system.

0.2 0 0.2 0.4 0.6 0.8 1 Miles

Produced by the City of Seattle

Elliott Bay

Harbor Island

Lake Washington

Puget Sound

Turning Basin

E MADISON ST
E CHERRY ST
S JACKSON ST
E MARGINAL WY S
1ST AV S
4TH AV S
6TH AV S
15TH AV S
M L KING JR WY S
BEACON AV S
50TH AV S
RAINIER AV S
AIRPORT WY S
W MARGINAL WY SW
35TH AV SW
DELRIDGE WY SW
16TH AV SW
9TH AV SW
S 112TH ST
SW 116TH ST
SW 128TH ST
PACIFIC HY S

Lower Duwamish Waterway
Figure 4
Source sample locations in Lower Duwamish Waterway

Legend

- Catch basins in ROW
- Catch basins on private property
- Sediment traps
- King County key manhole (wastewater)
- In-line sediment

Basin Boundaries

- Lower Duwamish Waterway storm drain basin
- Combined sewer service area
- Diagonal Ave S drainage basin
- Slip 4 drainage basin
- Slip 5 drainage basin
- Slip 6 drainage basin

N W E S

1000 0 1000 2000 Feet

Produced by the City of Seattle

Elliott Bay
Harbor Island
Lake Washington
Puget Sound
E CHERRY ST
S JACKSON ST
E MARGINAL WY S
4ST AV S
6TH AV S
4TH AV S
TOWER AV S
1ST AV S
15TH AV S
M L KING JR WY S
BEACON AV S
RAINIER AV S
AIRPORT WY S
35TH AV SW
W MARGINAL WY SW
DELRIDGE WY SW
16TH AV SW
9TH AV SW
S 112TH ST
SW 116TH ST
SW 128TH ST
PACIFIC HY S

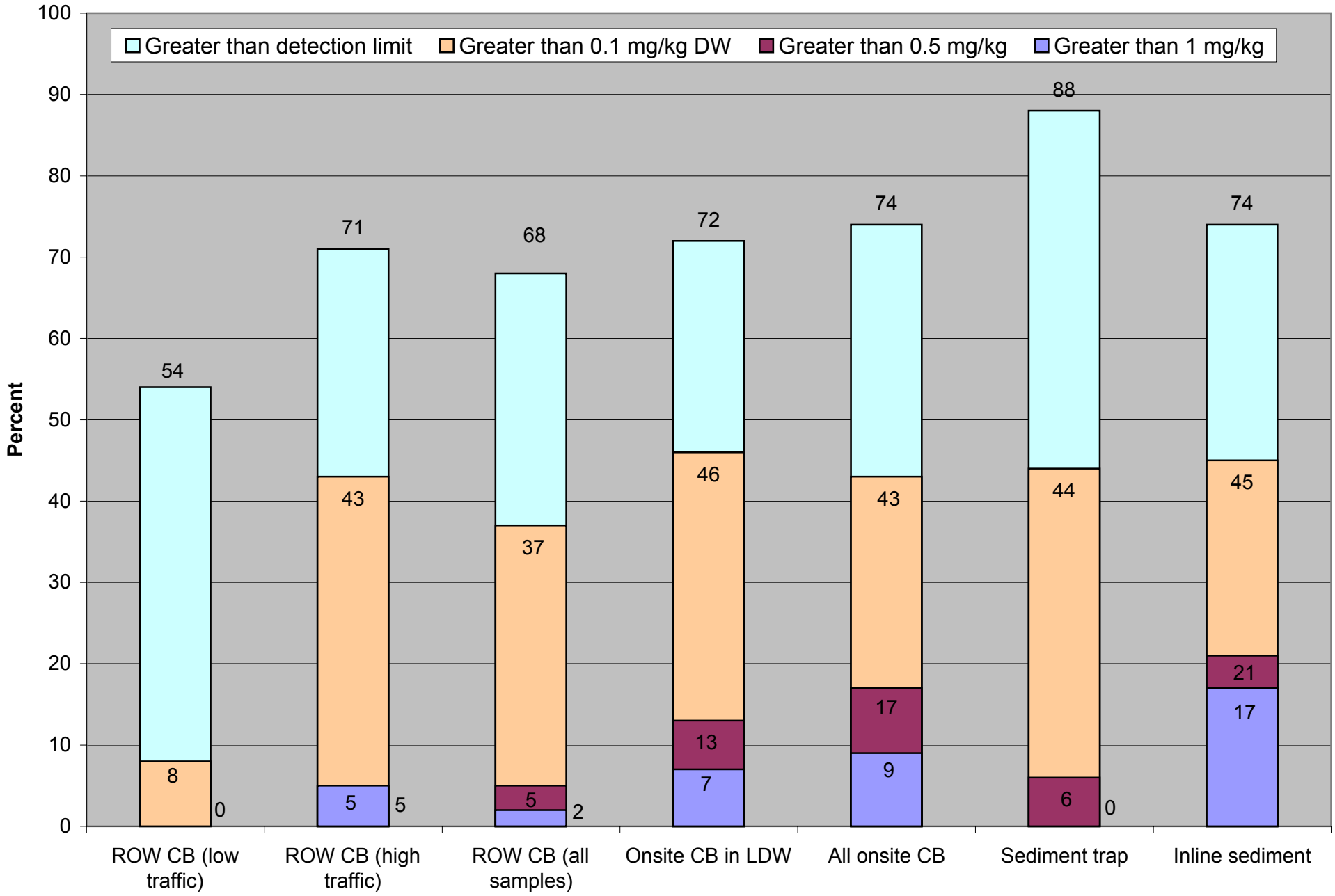


Figure 5. Source sediment PCB comparisons.

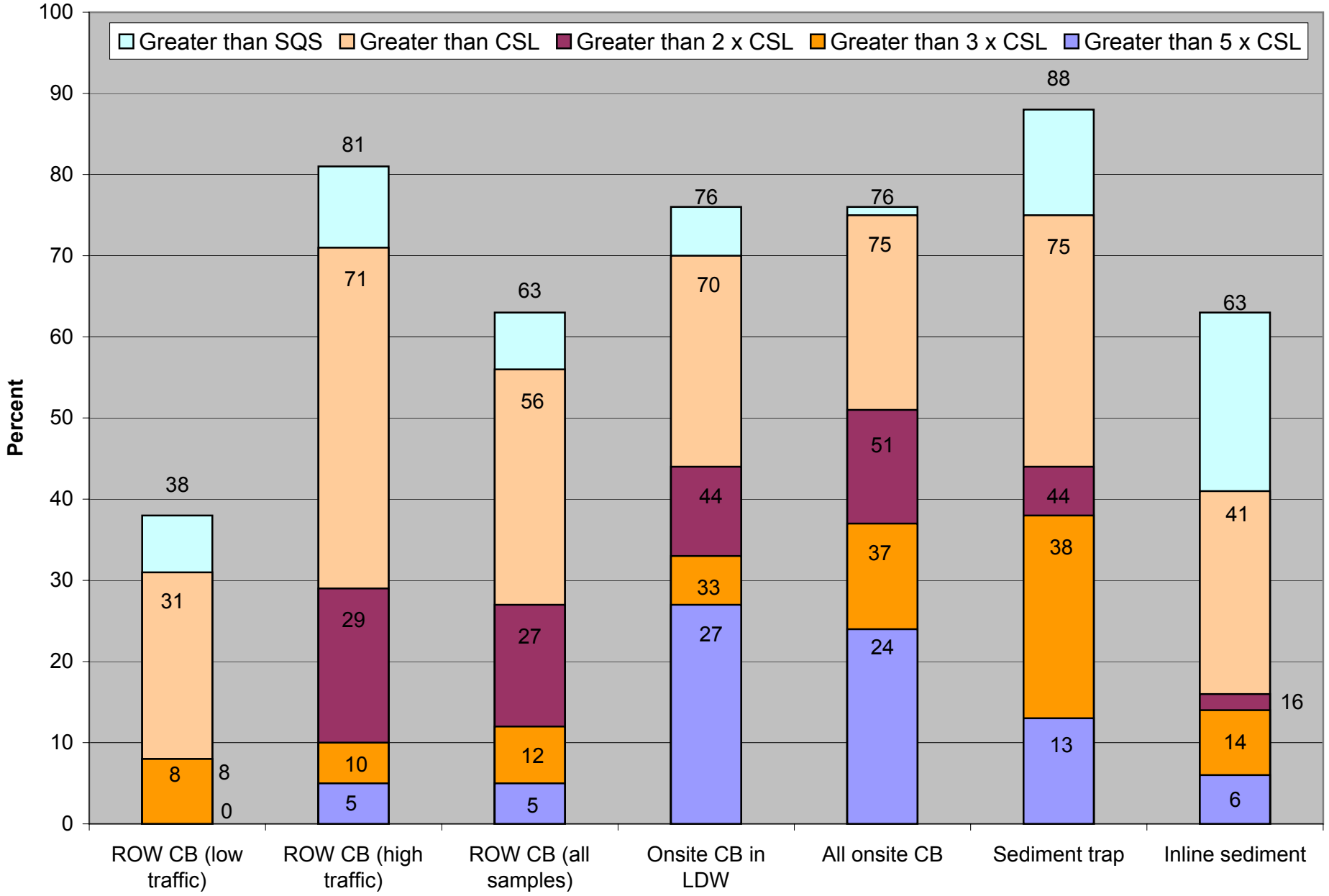
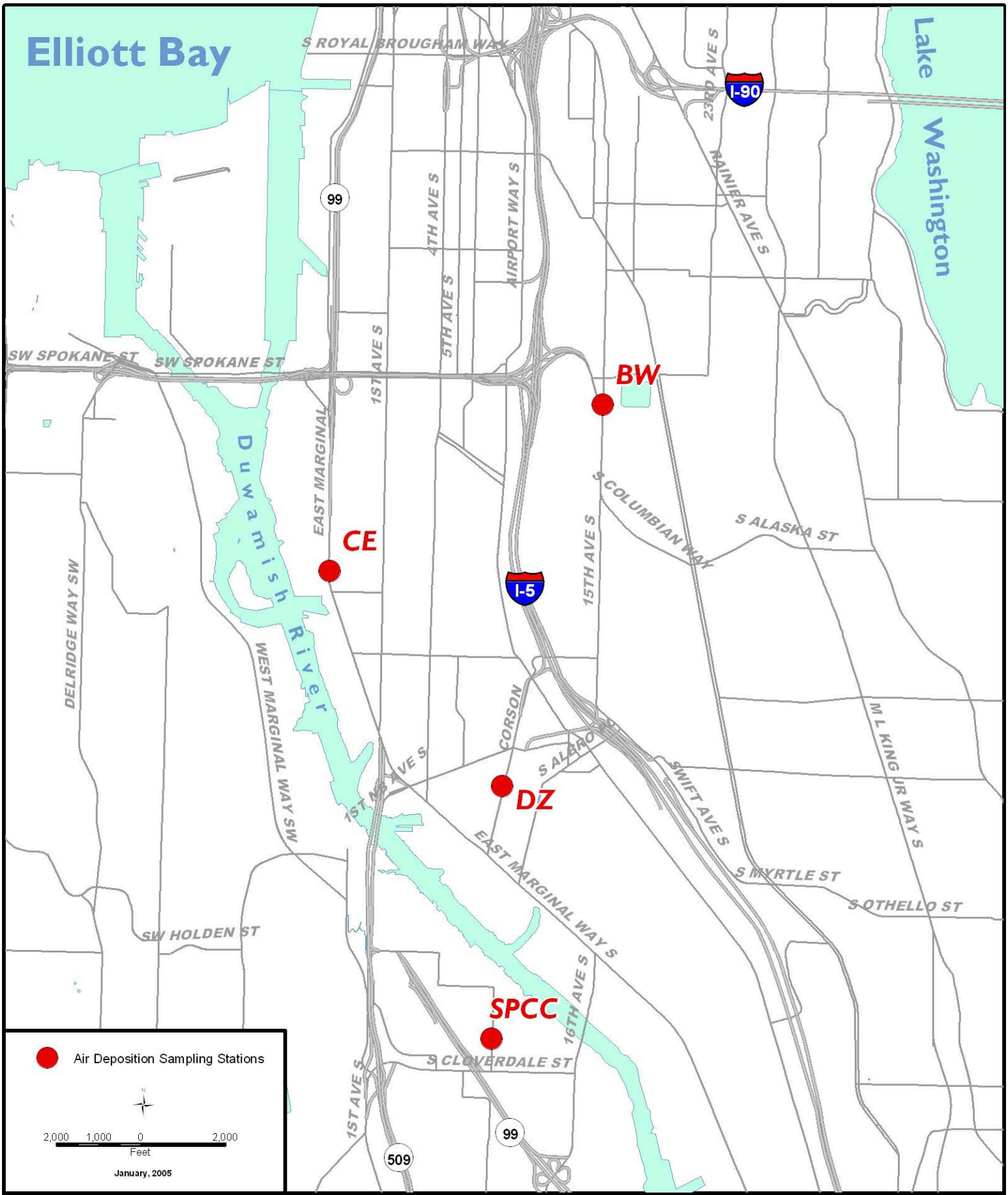


Figure 6. Source sediment BEHP comparisons.

Figure 7. Wet/dry atmospheric deposition sampler



King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

File Name: q:\wtd\projects\diagduam\sampsites.mxd
Shaun O'Neil - March 9, 2005

Figure 8

Air Deposition Sampling Stations

Lower Duwamish Waterway

Figure 9

Diagonal Ave S CSO/SD Drainage Basin Boundary

Legend

Streets
- Arterials
- State Highway
- Interstate Freeway

Streams
- Culvert
- Open Channel

- City combined sewer overflow location
- County combined sewer overflow location

- Diagonal combined sewer service area
- Diagonal storm drain basin
- Storm drain
- County sewer

Note: Locations where dots and solid colors overlap are in the partially separated drainage/sewer system.

N W E S

0.2 0 0.2 0.4 0.6 0.8 1 Miles

Produced by the City of Seattle

Elliott Bay

East Waterway

Lake Washington

TAYLOR AV N
DEXTER AV N
BROADWAY E
E JOHN ST
E DENNY WY
15TH AV
19TH AV
23RD AV
M L KING JR WY
E PIKE ST
E UNION ST
BOREN AV
5TH AV
MADISON ST
9TH AV
12TH AV
E CHERRY ST
E JEFFERSON ST.
CHERRY ST
8TH AV
BOREN AV S
14TH AV S
YESLER WY
E YESLER WY
S JACKSON ST
ALASKAN WY S
7TH AV S
S DEARBORN ST
RAINIER AV S
20TH AV S
23RD AV S
LAKESIDE AV S
S ROYAL BROUGHAM WY
S ATLANTIC ST
6TH AV S
12TH AV S
14TH AV S
S JUDKINS ST
S MASSACHUSETTS ST
S HOLGATE ST
4TH AV S
AIRPORT WY S
17TH AV S
S COLLEGE ST
31ST AV S
S LANDER ST
ALASKAN WY VI NB
1ST AV S
S FOREST ST
S MC CLELLAN ST
S HANFORD ST
S MOUNT BAKER BV
HUNTER BV S
S SPOKANE ST
12TH AVE S
S INDUSTRIAL WY
BEACON AV S
S GENESEE ST
S COLUMBIAN WY
S ALASKA ST
50TH AV S
LAKE WASHINGTON BV S
S HUDSON ST
15TH AV S
S DAWSON ST
M L KING JR WY S
S LUCILE ST
S ORCAS ST
W MARGINAL WY SW
S MICHIGAN ST
S ALBRO PL
CORSON AV S
ELLIS AV S
SEWARD PARK AV S
S GRAHAM ST
S MYRTLE ST
S OTHELLO ST
S WEBSTER ST
HIGHLAND PARK
2ND AV SW

Lower Duwamish Waterway

Figure 10

Land Use in Diagonal Ave S CSO/SD Service Area

Legend

Streets
- Arterials
- State Highway
- Interstate Freeway

Land Use Types
- Commercial
- Industrial
- Multi-Family
- Open Space
- Schools
- Single Family
- Vacant

Diagonal Storm Drainage Basin Boundary

Diagonal Combined Sewer Service Area

N W E S

0.2 0 0.2 0.4 0.6 0.8 1 Miles

Produced by the City of Seattle

Elliott Bay

East Waterway

Lake Washington

DEXTER AV N
E JOHN ST
E DENNY WY
15TH AV
19TH AV
23RD AV
M L KING JR WY
E PIKE ST
E UNION ST
BOREN AV
BROADWAY
MADISON ST
5TH AV
9TH AV
12TH AV
E CHERRY ST
E JEFFERSON ST
14TH AV S
CHERRY ST
YESLER WY
E YESLER WY
S JACKSON ST
ALASKAN WY S
7TH AV S
S DEARBORN ST
BEACON AV S
20TH AV S
23RD AV S
LAKESIDE AV S
36TH AV
S ROYAL BROUGHAM WY
S ATLANTIC ST
6TH AV S
12TH AV S
14TH AV S
S JUDKINS ST
90
S MASSACHUSETTS ST
S HOLGATE ST
4TH AV S
AIRPORT WY S
17TH AV S
S COLLEGE ST
31ST AV S
ALASKAN WY VI NB
S LANDER ST
1ST AV S
S FOREST ST
S MC CLELLAN ST
S HANFORD ST
S MOUNT BAKER BV
HUNTER BV S
S SPOKANE ST
S INDUSTRIAL WY
S GENESEE ST
S COLUMBIAN WY
S ALASKA ST
50TH AV S
LAKE WASHINGTON BV S
S HUDSON ST
15TH AV S
S LUCILE ST
S DAWSON ST
M L KING JR WY S
S ORCAS ST
W MARGINAL WY SW
S MICHIGAN ST
S ALBRO PL
CORSON AV S
ELLIS AV S
S GRAHAM ST
SEWARD PARK AV S
S MYRTLE ST
S OTHELLO ST
2ND AV SW
S WEBSTER ST

Lower Duwamish Waterway

Figure 11

Business Inspections in the Diagonal Ave S CSO/SD Service Area

Legend

Streets
- Arterials
- State Highway
- Interstate Freeway

Streams
- Culvert
- Open Channel

Diagonal combined sewer service area

Diagonal storm drain basin

March 2003 - May 2004
- Follow-up inspection
- Full inspection
- Screening inspection

June - December 2004
- Follow-up inspection
- Full inspection
- Screening inspection

January - June 2005
- Follow-up inspection
- Full inspection
- Screening inspection

Note: Locations where dots and solid colors overlap are in the partially separated drainage/sewer system.

N W E S

0.2 0 0.2 0.4 0.6 0.8 1 Miles

Produced by the City of Seattle

Elliott Bay

East Waterway

Lake Washington

BROADWAY E
E JOHN ST
E DENNY WY
15TH AV
19TH AV
23RD AV
E PIKE ST
11TH AV
E UNION ST
M L KING JR WY
BOREN AV
BROADWAY
5TH AV
MADISON ST
9TH AV
12TH AV
E CHERRY ST
E JEFFERSON ST
5
CHERRY ST
8TH AV
14TH AV S
BOREN AV S
YESLER WY
E YESLER WY
S JACKSON ST
23RD AV S
ALASKAN WY S
7TH AV S
S DEARBORN ST
20TH AV S
S ROYAL BROUGHAM WY
12TH AV S
S JUDKINS ST
S ATLANTIC ST
6TH AV S
14TH AV S
90
S MASSACHUSETTS ST
S HOLGATE ST
AIRPORT WY S
17TH AV S
S COLLEGE ST
4TH AV S
ALASKAN WY VI NB
S LANDER ST
31ST AV S
1ST AV S
S FOREST ST
S MC CLELLAN ST
S HANFORD ST
HUNTER BV S
S SPOKANE ST
BEACON AV S
DUWAMISH WY
S GENESEE ST
S COLUMBIAN WY
50TH AV S
S ALASKA ST
S HUDSON ST
15TH AV S
LAKE WASHINGTON BV S
W MARGINAL WY SW
S LUCILE ST
M L KING JR WY S
S DAWSON ST
S ORCAS ST
S MICHIGAN ST
S GRAHAM ST
CORSON AV S
ELLIS AV S
HIGHLAND PARK WY SW
W SEATTLE BR
16TH AV S
MILITARY R

Lower Duwamish Waterway

Figure 12

Diagonal CSO/SD sediment trap locations

Legend

Streets

- Arterials
- Streets
- State Highway
- Interstate Freeway

- Sediment trap
- SPU storm drain mainline

- Storm drain trib to ST 2
- Storm drain trib to ST 3
- Storm drain trib to ST 5
- Storm drain trib to ST 6
- Storm drain trib to ST 7

Diagonal Ave S CSO/SD storm drain basin

400 0 400 800 Feet

Produced by the City of Seattle

ST1
ST2
ST3
ST4
ST5
ST6
ST7

East Waterway

BROADWAY
BOREN AVE S
14TH AVE
E 23RD AVE
M L KING JR WAY
E YESLER WAY
S JACKSON ST
S DEARBORN ST
7TH AVE S
RAINIER AVE S
20TH AVE S
S JUDKINS ST
12TH AVE S
S MASSACHUSETTS ST
S HOLGATE ST
1ST AVE S
6TH AVE S
17TH AVE S
S COLLEGE ST
31ST AVE S
S LANDER ST
S FOREST ST
S MCCLELLAN ST
EAST MARGINAL WAY S
S HANFORD ST
4TH AVE S
S SPOKANE ST
M L KING JR WAY S
S INDUSTRIAL WAY
15 SB
15 NB
BEACON AVE S
S COLUMBIAN WAY
S ALASKA ST
S HUDSON ST
15TH AVE S
S LUCILE ST

Lower Duwamish Waterway

Figure 13

Catch Basin Samples Collected in Diagonal Ave S CSO/SD Service Area

Legend

Streets
- Arterials
- State Highway
- Interstate Freeway

Diagonal combined sewer service area

Diagonal storm drain Basin

- Onsite catch basin June-04 reporting period
- Onsite catch basin Jan-05 reporting period
- Onsite catch basin June-05 reporting period
- Right-of-way catch basin June-04 reporting period
- Right-of-way catch basin Jan 05 reporting period
- Right-of-way catch basin June-05 reporting period

Note: Locations where dots and solid colors overlap are in the partially separated drainage/sewer system.

N W E S

0.2 0 0.2 0.4 0.6 0.8 1 Miles

Produced by the City of Seattle

Elliott Bay

East Waterway

Lake Washington

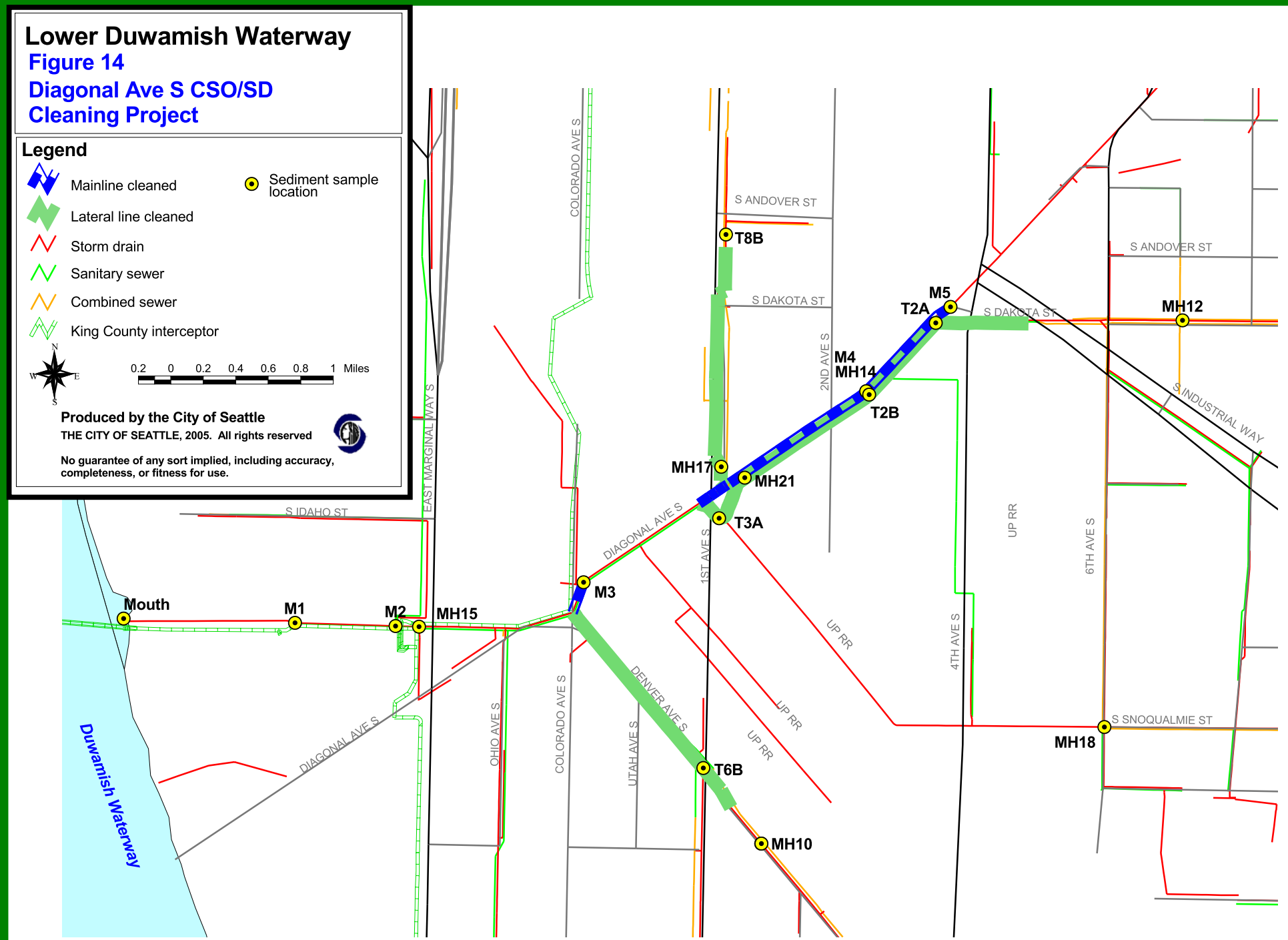
RCB27 RCB26 CB27a CB27b CB28 RCB28 CB30 CB29 RCB6 RCB25 RCB23 RCB24 CB5 CB10 CB4 CB13 ROW24 RCB10 RCB7 RCB8 CB7 RCB22 RCB9 RCB30 CB14 CB38 CB15 CB21 RCB11 RCB41 RCB37 CB1 RCB39 CB12 CB9 CB32 RCB29 RCB12 CB31 RCB19 RCB17 RCB40 RCB5 RCB2 CB25 CB32 CB3 RCB33 RCB35 RCB13 CB2 RCB1 RCB36 RCB34 RCB16 RCB20 RCB21 CB20 CB23 RCB3 CB24 CB16 CB22 CB19 RCB4 CB18

E DENNY WY · E JOHN ST · E MADISON ST · BROADWAY E · 19TH AV · 15TH AV · M L KING JR WY · E PIKE ST · E UNION ST · BOREN AV · 11TH AV · 23RD AV · E CHERRY ST · E JEFFERSON ST · 9TH AV · 12TH AV · CHERRY ST · 14TH AV S · YESLER WY · S JACKSON ST · 20TH AV S · 23RD AV S · S DEARBORN ST · 7TH AV S · ALASKAN WY S · S ROYAL BROUGHAM WY · S ATLANTIC ST · 12TH AV S · RAINIER AV S · S JUDKINS ST · 90 · S MASSACHUSETTS ST · S HOLGATE ST · 1ST AV S · 4TH AV S · 6TH AV S · AIRPORT WY S · 17TH AV S · S COLLEGE ST · 31ST AV S · S LANDER ST · S FOREST ST · S MC CLELLAN ST · S HANFORD ST · S SPOKANE ST · HUNTER BV S · S INDUSTRIAL WY · BEACON AV S · S GENESEE ST · 50TH AV S · LAKE WASHINGTON BV S · S ALASKA ST · S COLUMBIAN WY · S HUDSON ST · 15TH AV S · S DAWSON ST · S LUCILE ST · W MARGINAL WY SW · M L KING JR WY S · S ORCAS ST · S MICHIGAN ST · S GRAHAM ST · CORSON AV S · ELLIS AV S · 2ND AV SW · HIGHLAND PARK · EMST

Lower Duwamish Waterway

Figure 14

Diagonal Ave S CSO/SD Cleaning Project



Lower Duwamish Waterway

Figure 15

Areas draining to Slip 4

Legend

- Storm drain
- Sanitary sewer
- Combined sewer
- King County interceptor

Drainage basin boundaries

- Direct discharge
- Georgetown flume
- I-5 SD
- Slip 4 SD (King County Airport drain)
- Slip 4 CSO/SD

- King County CSO
- City CSO/SD
- City/County CSO/SD
- County storm drain
- City storm drain
- Private storm drain
- Unknown piped outfall
- WSDOT storm drain
- Port storm drain
- Seep
- Channel/ditch

400 0 400 800 Feet

Lower Duwamish Waterway

Figure 16

Businesses inspected in Slip 4
June 2004 - June 2005

Legend

- Storm drain
- Sanitary sewer
- Combined sewer
- King County interceptor

Drainage basin boundaries

- Direct discharge
- Georgetown flume
- I-5 SD
- Slip 4 SD (King County Airport drain)
- Slip 4 CSO/SD

June - December 2004

- Screening visit
- Onsite inspection
- Follow-up inspection

January - June 2005

- Screening visit
- Onsite inspection
- Follow-up inspection

400 0 400 800 Feet

Produced by the City of Seattle

S BENNETT ST
S LUCILE ST
16TH AVE S
17TH AVE S
18TH AVE S
S ORCAS ST
19TH AVE S
20TH AVE S
22ND AVE S
S JUNEAU ST
STANLEY AVE S
S HARDY ST
6TH AVE S
S RIVER ST
CORSON AVE S
S WARSAW ST
CARLETON AVE S
FLORA AVE S
ELLIS AVE S
13TH AVE S
15TH AVE S
S ELIZABETH ST
PERIMETER RD S
23RD AVE S
24TH AVE S
BEACON AVE S
S WARSA
SWIFT AVE S
EAST MARGINAL WAY S
S WILLOW ST
S MYRTLE ST
S ORCHARD ST
S GARDEN ST
S OTHELLO ST
8TH AVE S
Slip 4
S WEBSTER ST
14TH AVE S
16TH AVE S
AIRPORT WAY S
Duwamish Waterway

Lower Duwamish Waterway

Figure 17

Slip 4 Source Sediment Samples

Legend

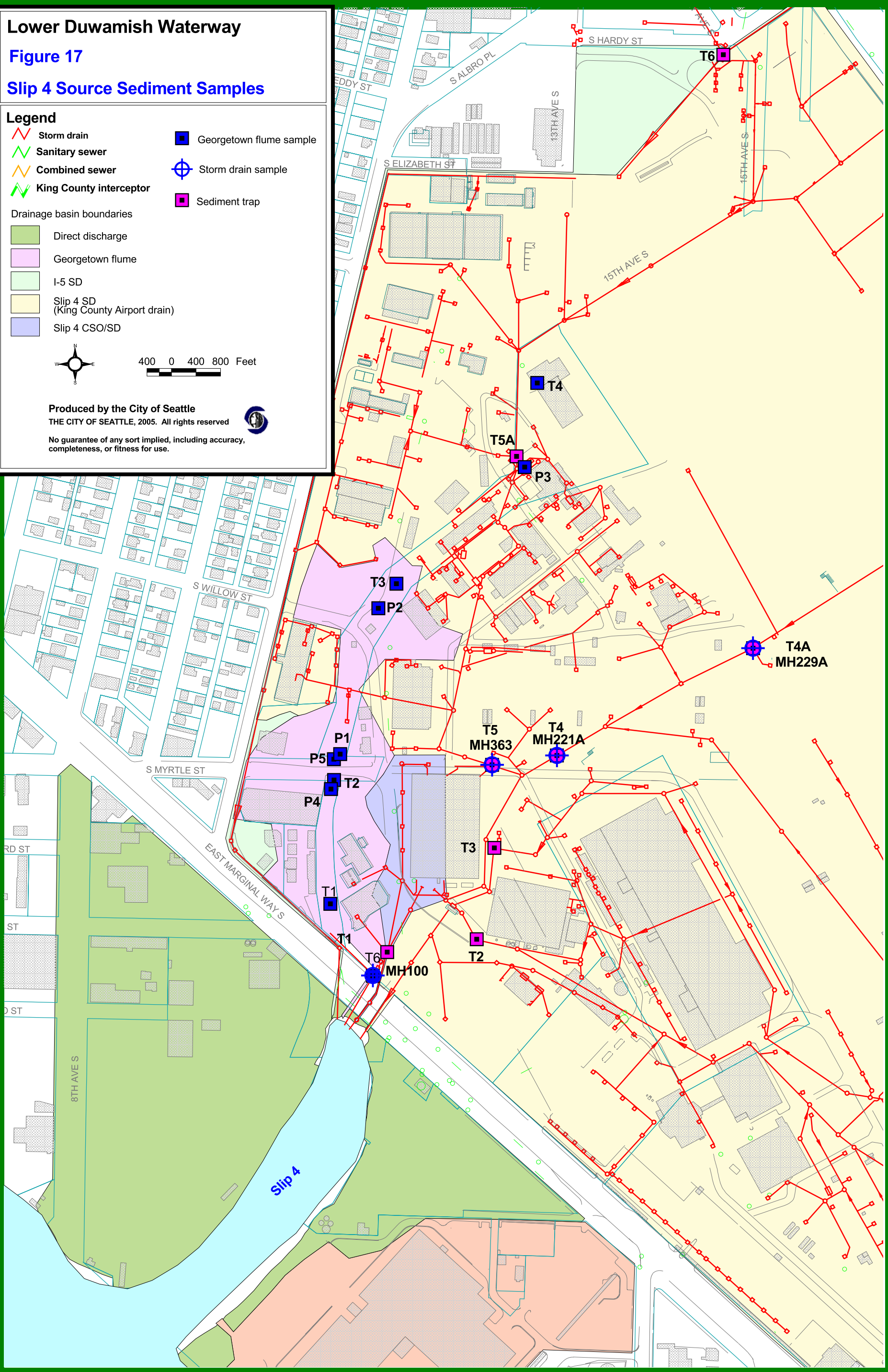
- Storm drain
- Sanitary sewer
- Combined sewer
- King County interceptor
- Georgetown flume sample
- Storm drain sample
- Sediment trap

Drainage basin boundaries

- Direct discharge
- Georgetown flume
- I-5 SD
- Slip 4 SD (King County Airport drain)
- Slip 4 CSO/SD

N W E S

400 0 400 800 Feet

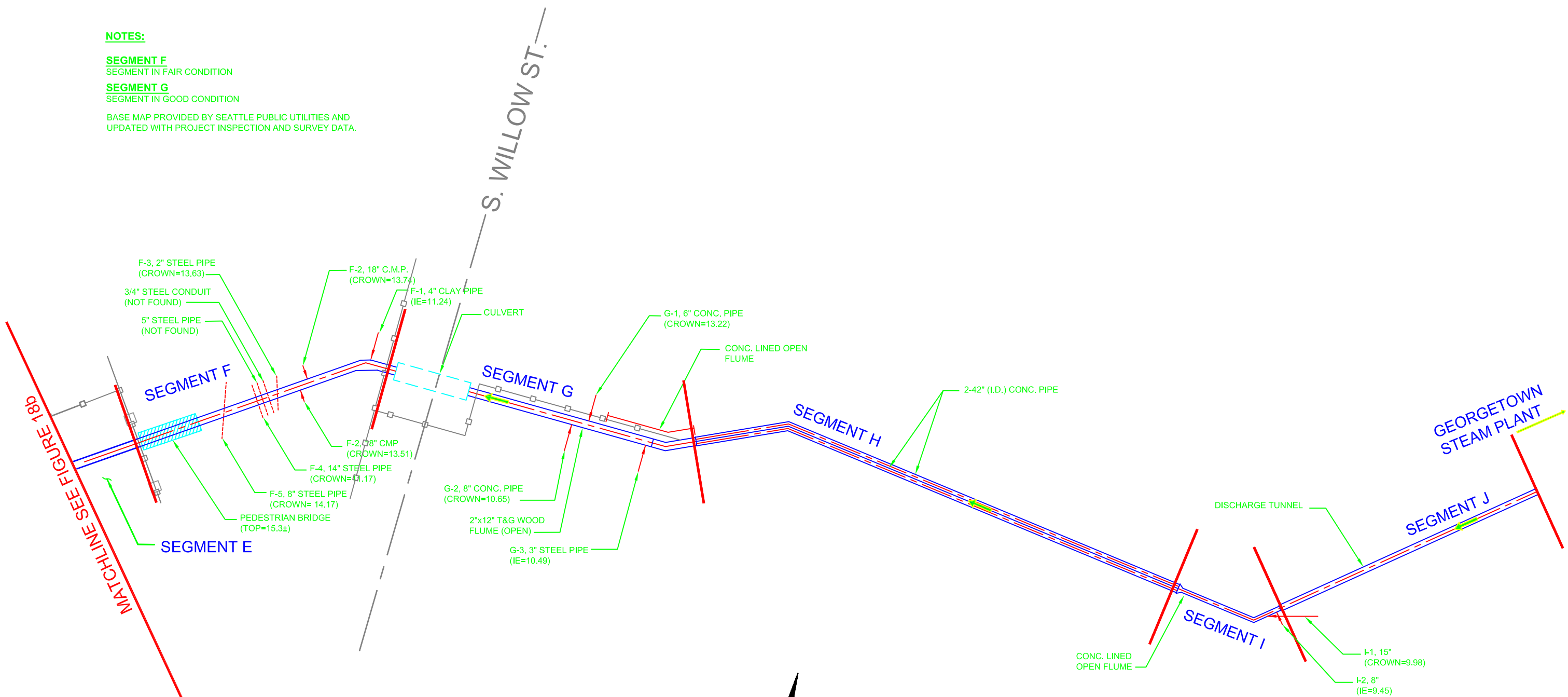


NOTES:

SEGMENT F
SEGMENT IN FAIR CONDITION

SEGMENT G
SEGMENT IN GOOD CONDITION

BASE MAP PROVIDED BY SEATTLE PUBLIC UTILITIES AND
UPDATED WITH PROJECT INSPECTION AND SURVEY DATA.



LEGEND

EXISTING FENCE

DIRECTION OF FLOW

SCALE IN FEET
40 20 0 40 80

DATUM
NAVD 88, CITY OF SEATTLE

DISCLAIMER
DRAWN PER CITY OF SEATTLE DRAWING
UPDATED PER CTS ENGINEERS SURVEY

PRELIMINARY NOT FOR CONSTRUCTION

ONE INCH AT FULL SIZE. IF NOT ONE INCH SCALE ACCORDINGLY

No.	REVISION	BY	APP'D	DATE

HERRERA ENVIRONMENTAL CONSULTANTS
2200 Sixth Avenue
Suite 1100
Seattle, Washington
98121-1820
206-441-9080
206-441-9108 FAX
http://www.herrerainc.com

DESIGNED:
DRAWN: TDP
RECOMMENDED:
APPROVED:
CHECKED:
SCALE:
CONTRACT NO: 01-01948-200

GEORGETOWN STEAM PLANT

UPPER GEORGETOWN FLUME

DATE: AUGUST 2005
FILE NO: 423484/200
DRAWING NO: FIG 18a
SHEET NO: 1 OF 2

NOTES:

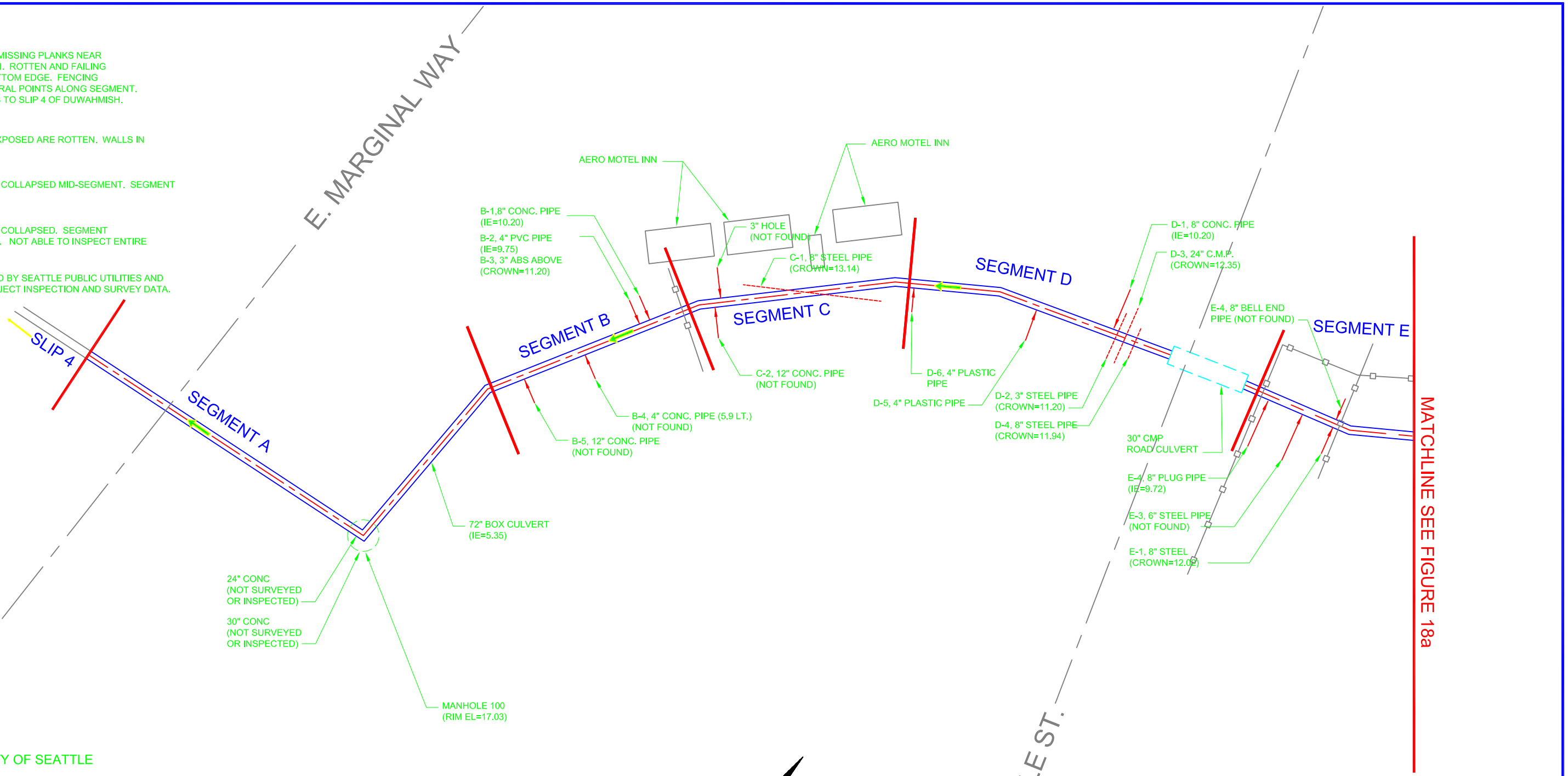
SEGMENT B
BOTTOM OF FLUME MISSING PLANKS NEAR UPSTREAM PORTION. ROTTEN AND FAILING BOARDS ALONG BOTTOM EDGE. FENCING BREACHED AT SEVERAL POINTS ALONG SEGMENT. FLUME DISCHARGES TO SLIP 4 OF DUWAHMISH.

SEGMENT C
BOTTOM BOARDS EXPOSED ARE ROTTEN. WALLS IN FAIR CONDITION.

SEGMENT D
WALLS FAILING AND COLLAPSED MID-SEGMENT. SEGMENT IN POOR CONDITION.

SEGMENT E
WALLS FAILING AND COLLAPSED. SEGMENT IN POOR CONDITION. NOT ABLE TO INSPECT ENTIRE SECTION.

BASE MAP PROVIDED BY SEATTLE PUBLIC UTILITIES AND UPDATED WITH PROJECT INSPECTION AND SURVEY DATA.



DATUM
NAVD 88, CITY OF SEATTLE

LEGEND
EXISTING FENCE
DIRECTION OF FLOW

SCALE IN FEET
40 20 0 40 80

DISCLAIMER
DRAWN PER CITY OF SEATTLE DRAWING
UPDATED PER CTS ENGINEERS SURVEY

PRELIMINARY NOT FOR CONSTRUCTION

ONE INCH AT FULL SIZE IF NOT ONE INCH SCALE ACCORDINGLY

No.	REVISION	BY	APP'D	DATE

HERRERA ENVIRONMENTAL CONSULTANTS
2200 Sixth Avenue
Suite 1100
Seattle, Washington
98121-1820
206-441-9080
206-441-9108 FAX
http://www.herrerainc.com

DESIGNED:
DRAWN: SLH/TDP
RECOMMENDED:
APPROVED:
CHECKED:
SCALE:
CONTRACT NO: 01-01948-200

GEORGETOWN STEAM PLANT

LOWER GEORGETOWN FLUME

DATE: AUGUST 2005
FILE NO: 423484/200
DRAWING NO: FIG 18b
SHEET NO: 2 OF 2

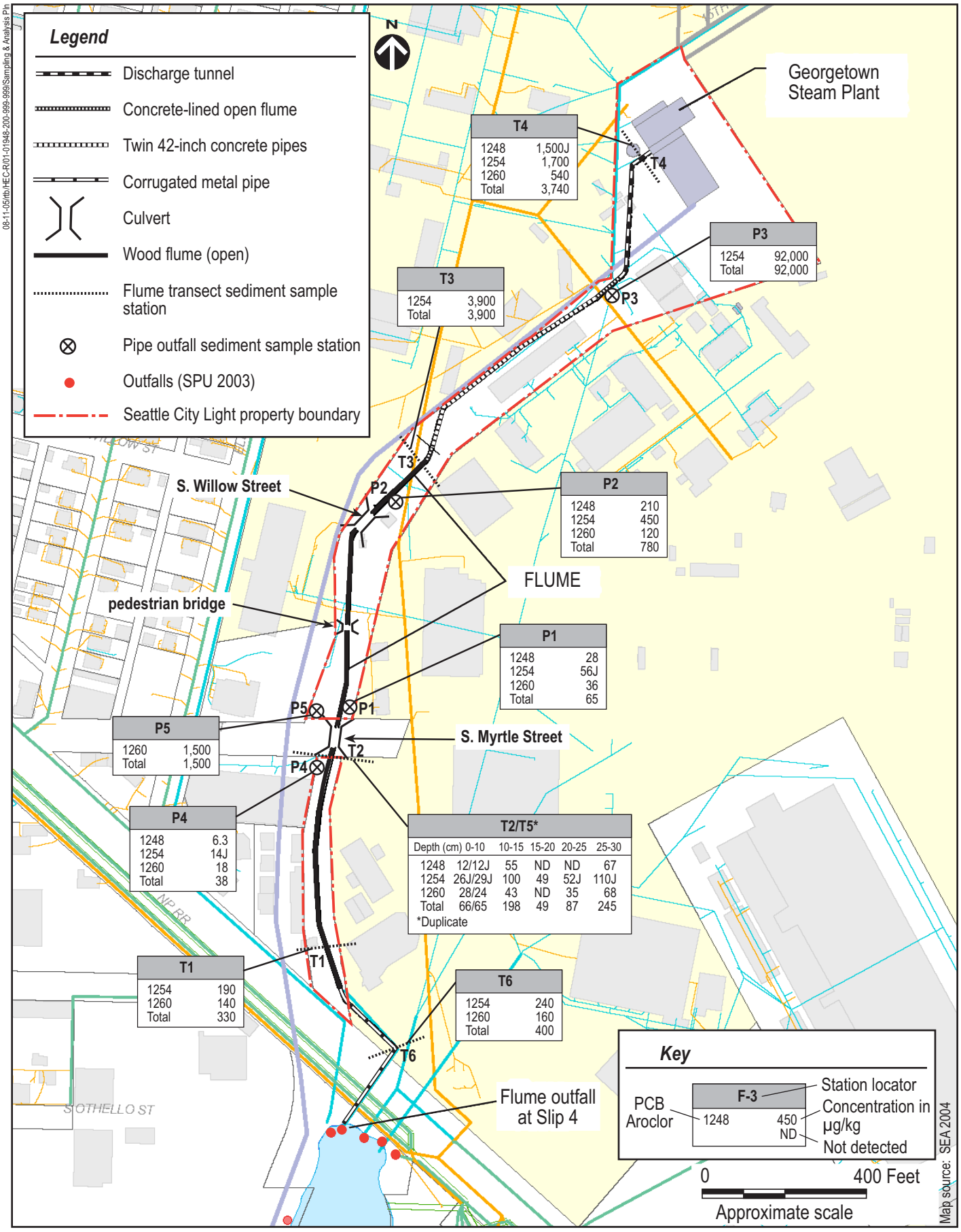


Figure 19. Georgetown flume sediment sample location and PCB results.

Lower Duwamish Waterway

Figure 20

Businesses inspected in Slip 5 and Slip 6

Legend

June - December 2004

- Screening visit
- Onsite inspection
- Follow-up inspection

January - June 2005

- Screening visit
- Onsite inspection
- Follow-up inspection

- **Storm drain**
- **Sanitary sewer**
- **Combined sewer**
- **King County interceptor**

Drainage basin boundaries

- King County Airport storm drain (Slip 5)
- King County Airport storm drain (Slip 6)
- Waterfront discharges

400 0 400 800 Feet

Produced by the City of Seattle

Duwamish Waterway

Former Slip 5

Slip 6

AIRPORT WAY S

DIAGONAL AVE S

EAST MARGINAL WAY S

16TH AV S

S WILLOW ST

S FRONTENAC ST

S MYRTLE ST

S OTHELLO ST

S WEBSTER ST

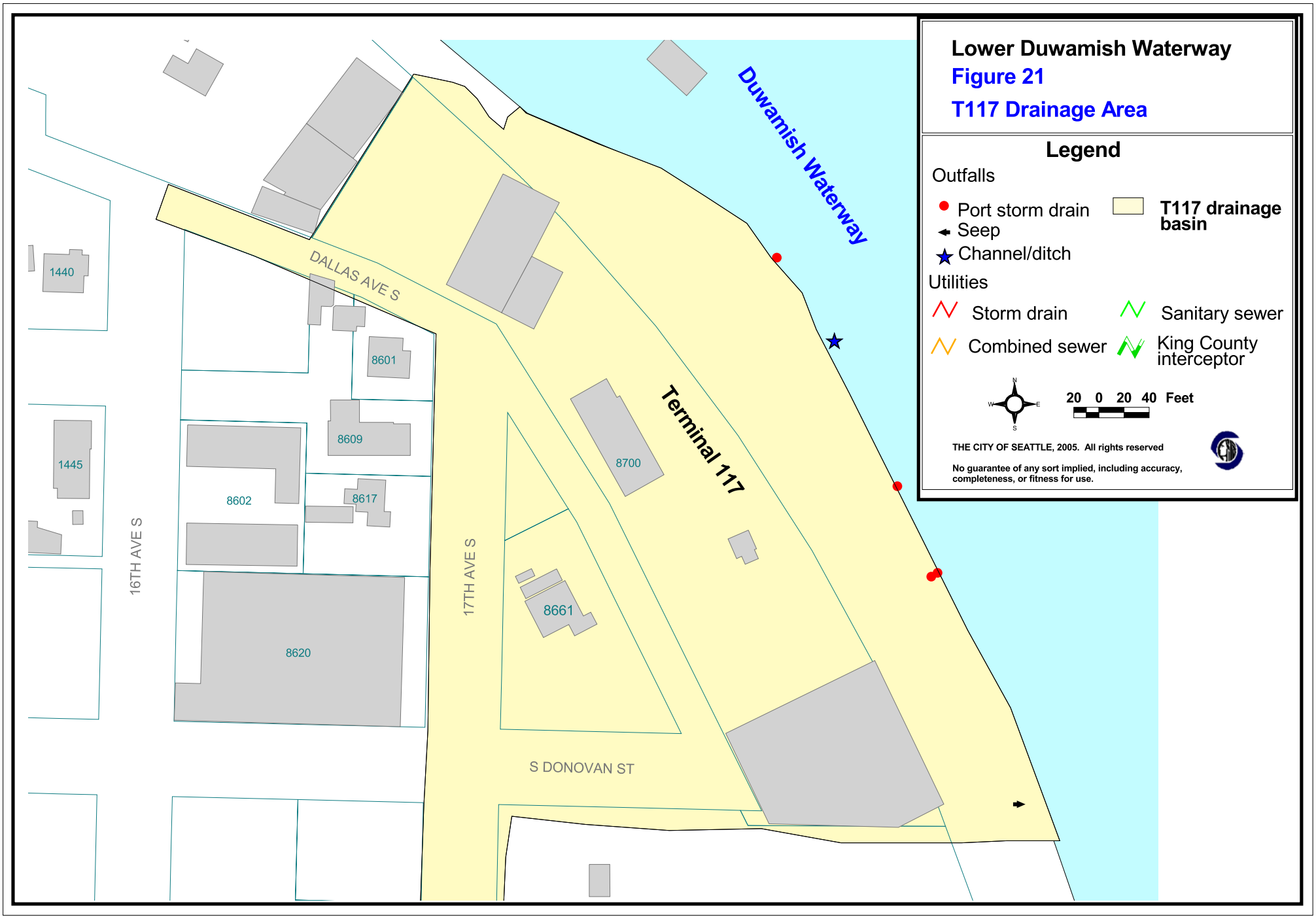
S PORTLAND ST

S 96TH ST

S 98TH ST

S NORFOLK ST

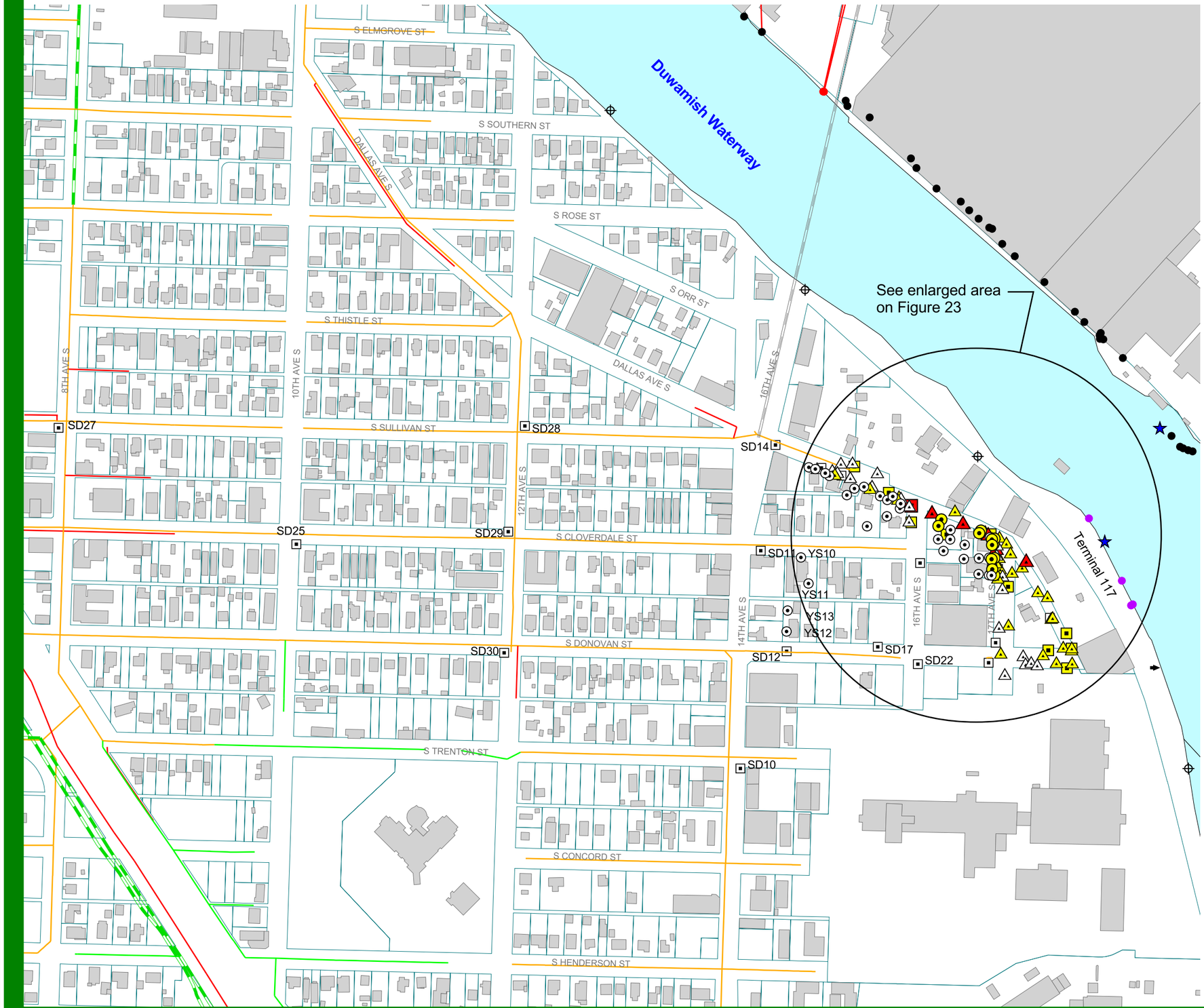
S 103RD ST


Lower Duwamish Waterway
Figure 21
T117 Drainage Area
Legend
Outfalls
Port storm drain
Seep
Channel/ditch
T117 drainage basin
Utilities
Storm drain
Sanitary sewer
Combined sewer
King County interceptor
20 0 20 40 Feet
THE CITY OF SEATTLE, 2005. All rights reserved
No guarantee of any sort implied, including accuracy, completeness, or fitness for use.
Duwamish Waterway
Terminal 117
DALLAS AVE S
16TH AVE S
17TH AVE S
S DONOVAN ST
1440
1445
8601
8609
8602
8617
8620
8700
8661

Lower Duwamish Waterway

Figure 22

Sediment Sample Locations in Vicinity of T117 Early Action Site



Legend

PCBs in Right-of-Way Soil

Below Cleanup Level | Above Cleanup Level | Greater than 50 ppm

PCBs in Roadway Dirt

Below Cleanup Level | Above Cleanup Level

PCBs in Yard Soil

Below Cleanup Level | Above Cleanup Level | Greater than 50 ppm

Property boundary

Building

Utilities

- Storm drain
- Sanitary sewer
- Combined sewer
- King County interceptor

Outfalls

- City storm drain
- Private storm drain
- Unknown piped outfall
- Port storm drain
- Seep
- Channel/ditch

PCBs = Polychlorinated Biphenyl

State Cleanup Level = 1 ppm PCBs

50 0 50100 Feet

Lower Duwamish Waterway

Figure 23

Dallas Ave S and Vicinity
Street and Yard Sample Locations

Legend

PCBs in Right-of-Way Soil

Below Cleanup Level | Above Cleanup Level | Greater than 50 ppm

PCBs in Roadway Dirt

Below Cleanup Level | Above Cleanup Level

PCBs in Yard Soil

Below Cleanup Level | Above Cleanup Level | Greater than 50 ppm

Property boundary | Building

PCBs = Polychlorinated Biphenyl

State Cleanup Level = 1 ppm PCBs

Note: Sample numbers shown in red indicate samples collected from base of excavation following interim cleanup.

20 0 20 40 60 80 100 Feet

Revised 12-5-05

Lower Duwamish Waterway

Figure 24

Dallas Ave S Interim Cleanup

Legend

- Grade, pave, install temporary drainage
- Remove contaminated soil/replace with clean gravel
- Minor grading/paving to correct drainage problem
- Remove contaminated soil/replace with sod
- Property boundary

N W E S

20 0 20 40 60 80 100 Feet

Produced by the City of Seattle

Lower Duwamish Waterway

Figure 25

Sediment sampling locations in Norfolk-MLK Way drainage system

Legend

Streets
- Arterials
- State Highway
- Interstate Freeway

Parcel boundary

Building

Storm drain

Sanitary sewer

County interceptor

Pipe cleaned in 2005

Sediment sampling location

N W E S

50 0 50 100 150 Feet

Produced by the City of Seattle

S NORFOLK ST

Norfolk20

Norfolk21

WSDOT Stormwater Treatment System

AIRPORT WAY S

NP RR

Ditch

5

MH7

M L KING JR WAY S

MH5

40TH AVE S

MH6

MH1

MH3

MH4

S 104TH PL

BN RR

To Lower Duwamish Waterway