DEPARTMENT OF
ECOLOGY
State of Washington

Lower Duwamish Waterway River Mile 2.0-2.3 East (Slip 3 to Seattle Boiler Works) Source Control Area

Summary of Existing Information and Identification of Data Gaps

Final Report

June 2008

Waterbody No. WA-09-1010

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Lower Duwamish Waterway
River Mile 2.0-2.3 East
(Slip 3 to Seattle Boiler Works)
Source Control Area

Summary of Existing Information and Identification of Data Gaps

Final Report

Contract No. C0700036
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June 2008

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Acronyms/Abbreviations

2LAET	Second Lowest Apparent Effects Threshold
Adapt	LSI Adapt, Inc.
AET	Apparent Effects Threshold
AGI	AGI Technologies, Inc.
AOC	area of concern
AST	aboveground storage tank
BEHP	bis(2-ethylhexyl) phthalate
bgs	below ground surface
BMP	best management practice
BTEX	benzene, toluene, ethylbenzene and xylene
City	City of Seattle
COC	contaminant of concern
County	King County
CSCSL	Confirmed and Suspected Contaminated Site List
CSL	Cleanup Screening Level
CSO	combined sewer overflow
CVOC	chlorinated volatile organic compound
DCB	dichlorobenzene
DCA	dichloroethane
DCE	dichloroethene/dichloroethylene
DMR	discharge monitoring report
DNAPL	dense non-aqueous phase liquid
EAI	Environmental Associates, Inc.
ECHO	Enforcement and Compliance History Online
Ecology	Washington State Department of Ecology
E & E	Ecology and Environment, Inc.
EOF	emergency overflow
EPA	U.S. Environmental Protection Agency
ERM	Environmental Resources Management
ESA	Environmental Site Assessment
FS	Feasibility Study
GIS	Geographic Information System
gpm	gallons per minute
GWC	Great Western Chemical Company
GWI	Great Western International
ISIS	Integrated Site Information System
JPHC	James P. Hurley Co.
KCIA	King County International Airport
KCIWP	King County Industrial Waste Program
LAET	Lowest Apparent Effects Threshold
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
LNAPL	light non-aqueous phase liquids

Acronyms/Abbreviations (Cont.)

LUST	leaking underground storage tank
µg/L	micrograms per liter
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mgy	million gallons per year
MOU	Memorandum of Understanding
MP&E	Marine Power & Equipment
MTCA	Model Toxics Control Act
MW	monitoring well
NAPL	non-aqueous phase liquids
NDPES	National Pollutant Discharge Elimination System
NFA	No Further Action
NOAA	National Oceanographic and Atmospheric Administration
NTU	nephelometric turbidity units
OC	organic carbon
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene/tetrachloroethylene/perchloroethylene
PCP	pentachlorophenol/penta
ppb	parts per billion
ppm	parts per million
PSCAA	Puget Sound Clean Air Agency
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RM	river mile
ROW	right-of-way
SCAP	Source Control Action Plan
SCS	Seattle Cold Storage
SD	storm drain
SH	silt horizon
SPU	Seattle Public Utilities
SMS	Sediment Management Standards
SQS	Sediment Quality Standards
SVE	soil vapor extraction
SVOC	semi-volatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
TAL	Target Analyte List
TCA	trichloroethane
TCE	trichloroethene/trichloroethylene
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TPH-D	total petroleum hydrocarbons in the diesel range
TPH-G	total petroleum hydrocarbons in the gasoline range
TPH-O	total petroleum hydrocarbons in the heavy-oil range

Acronyms/Abbreviations (Cont.)

TRI	Toxics Release Inventory
UNIMAR	United Marine Shipbuilding, Inc.
UST	underground storage tank
VC	vinyl chloride
VCP	Voluntary Cleanup Program
VOC	volatile organic compound
WBZ	water bearing zone
WWTP	wastewater treatment plant

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1.0 Introduction

1.1 Background and Purpose

This Summary of Existing Information and Identification of Data Gaps Report (Data Gaps Report) pertains to a section of the Lower Duwamish Waterway (LDW) referred to as River Mile 2.0-2.3 East (Slip 3 to Seattle Boiler Works). This area is one of several source control areas identified as part of the overall cleanup process for the LDW Superfund Site.[1] Figure 1 illustrates the LDW sediment areas that correspond to each source control area. The RM 2.0-2.3 East sediment area extends north-south between river miles 2.0 and 2.3, and east-west from the eastern shoreline to the eastern limit of the LDW navigational channel. The RM 2.0-2.3 East Source Control Area (RM 2.0-2.3 East) is defined by the portion of the overall LDW drainage basin[2] that corresponds to this sediment area (Figure 2). RM 2.0-2.3 East consists of the adjacent and other upland properties within the RM 2.0-2.3 East drainage basin, and it includes embankment areas fronting the properties at the shoreline.

This report summarizes readily available information regarding properties within the RM 2.0-2.3 East drainage basin. The summary is necessary:

- to identify potential upland sources of sediment recontamination;
- to identify any potential contaminant migration pathways into the LDW;
- to identify any data gaps needing attention before effective source control can be accomplished; and
- to determine what, if any, effective source control is already in place.

The LDW consists approximately of the lower 5.5 miles of the Duwamish River as it flows into Elliott Bay in Seattle, Washington. In September 2001, the U.S. Environmental Protection Agency (EPA) added this site to the National Priorities List due to chemical contaminants in sediments. The Washington State Department of Ecology (Ecology) added the site to the Washington State Hazardous Sites List on February 26, 2002.

The key parties involved in the LDW Superfund site are the Lower Duwamish Waterway Group (LDWG; comprised of the city of Seattle (city), King County (County), the Port of Seattle, and The Boeing Company), EPA, and Ecology. LDWG is conducting a Remedial Investigation/Feasibility Study (RI/FS) for the LDW Superfund site.

EPA is leading the effort to determine the most effective clean-up strategies for the LDW through a RI/FS process. Ecology was granted the authority[3] to investigate upland sources of

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[1] This Data Gaps Report incorporates data published through May 2008.

[2] The area referred to herein as the "RM 2.0-2.3 East drainage basin" is actually a sub-drainage basin of the LDW valley. The LDW valley drainage basin has been divided into the sub-drainage basins, defined tentatively by storm water collection systems and outfalls, as shown in Figure 1.

[3] EPA and Ecology signed an interagency Memorandum of Understanding (MOU) in April 2002 and updated the MOU in April 2004. The MOU divides responsibilities for the site. EPA is the lead agency for the sediment

contamination and to develop plans to reduce contaminant migration to waterway sediments (to the maximum extent practicable). The Lower Duwamish Waterway Source Control Strategy (Ecology 2004) describes the process for identifying source control issues and implementing effective controls. The plan is to identify and manage sources of potential recontamination in coordination with sediment cleanups.

The focus of the Source Control Strategy is to identify and control contamination that could affect LDW sediments. This will be achieved using existing administrative and legal authorities to perform inspections and require necessary source control actions (Ecology 2007). It is based primarily on the principles of source control for sediment sites described in EPA's Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites (EPA 2002), and the Washington State Sediment Management Standards (SMS) (WAC 173-340-3707(7) and WAC 173-204-400).

The Source Control Strategy involves developing and implementing a series of detailed, area-specific Source Control Action Plans (SCAPs). Several areas, often defined by drainage basins, have been identified and prioritized for SCAP development as described in the LDW Source Control Status Report (Ecology 2007). Before developing each SCAP, Ecology often prepares a Data Gaps Report for the specific area. Findings from the Data Gaps Report are reviewed by LDW stakeholders and are incorporated into the SCAP. This process helps ensure that the action items in the SCAP will be effective, implementable, and enforceable.

Further information about the LDW can be found at:

- Ecology's LDW website: http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/lower_duwamish_hp.html
- EPA's LDW website: http://yosemite.epa.gov/r10/cleanup.nsf/sites/lduwamish
- The LDWG website: http://www.ldwg.org.

1.2 Organization of Document

Section 2 of this report provides background information on the LDW Superfund Site. Section 3 provides a summary of background information on RM 2.0-2.3 East, including a description of the RM 2.0-2.3 East drainage basin, COCs to LDW sediments, and potential migration pathways of contaminants to LDW sediments. Section 4 describes potential sources of contaminants to RM 2.0-2.3 East sediments, including adjacent and upland facilities of concern, groundwater, stormwater, bank erosion, spills, and atmospheric deposition. Section 4 also summarizes data gaps that will be incorporated into the Source Control Action Plan for RM 2.0-2.3 East. Section 5 provides a list of documents cited in the report.

Information presented in this report was obtained from the following sources:

Remedial Investigation/Feasibility Study, while Ecology is the lead agency for source control issues (EPA and Ecology 2002, 2004).

- Ecology Northwest Regional Office Central Records;
- Washington State Archives;
- King County Waste Discharge Permits and Authorizations;
- Seattle Public Utilities (SPU) Business Inspection Reports;4
- Ecology Facility/Site Database (Ecology 2007a);
- Ecology Industrial Stormwater General Permits (Ecology 2007b);
- Ecology National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge Permit Database (Ecology 2007c);
- Ecology Hazardous Waste Facility Search Database (Ecology 2007d);
- Ecology Integrated Site Information System (ISIS; Ecology 2007e)
  - Confirmed and Suspected Contaminated Sites List (CSCSL)
  - Underground Storage Tank (UST) List
  - Leaking Underground Storage Tank (LUST) List
  - No Further Action (NFA) Sites List;
- Ecology Washington Coastal Atlas Database (Ecology 2008a);
- EPA Toxics Release Inventory (TRI) Explorer Database (EPA 2007a);
- EPA Envirofacts Data Warehouse Database (EPA 2007b);
- EPA Enforcement and Compliance History Online (ECHO) Database (EPA 2007c);
- King County Geographic Information System (GIS) Center Parcel Viewer and Property Tax Records (King County 2007a);
- LDWG Draft Phase 2 Remedial Investigation (RI) Report (November 2007) Database (LDWG 2008);
- Puget Sound Clean Air Agency (PSCAA) Approved Air Operating Permits Database (PSCAA 2007); and
- Washington Secretary of State Corporations Online Database (Washington Secretary of State 2007).

1.3 Scope of Document

The scope of the document research conducted for this Data Gaps Report is limited, geographically, to the upland area within the RM 2.0-2.3 East drainage basin (Figure 2) and discharge points into the LDW along the waterfronts of the properties within this boundary. There are other potential sources of recontamination upstream of RM 2.0-2.3 East that might, via the LDW, impact the sediments of RM 2.0-2.3 East. However, they have been, or will be, addressed in other studies.

[4] SPU inspection reports were requested, but not all were available before this report was completed.

This report includes review of seven facilities within the RM 2.0-2.3 East drainage basin: SCS Refrigerated Services, Seattle Distribution Center, Glacier Marine Services, V. Van Dyke, Riverside Industrial Park, Shultz Distributing, and Cascade Columbia Distribution. The potential for any existing contamination to migrate to the LDW was examined for each of these facilities. However, it is possible that contamination from outside of the RM 2.0-2.3 East drainage basin may be migrating via unknown groundwater pathways into RM 2.0-2.3 East sediments. This report does not identify or assess the possibility of migration from sources outside of the RM 2.0-2.3 East drainage basin.

Similarly, air pollution is a potential source of contamination to RM 2.0-2.3 East sediments with origins outside of the RM 2.0-2.3 East drainage basin. Although some limited discussion of atmospheric deposition is provided in Section 3, the scope of work for this report did not include an assessment of data gaps pertaining to air pollution effects on RM 2.0-2.3 East sediments.

Data on existing sediment contamination in RM 2.0-2.3 East are available. However, this report focuses only on upland sources that could recontaminate RM 2.0-2.3 East sediments if sediment remediation is required. This focus does not preclude the potential for recontamination from capped sediments, if sediment-capping is the remedial option selected. Source control needed or any contaminated sediments left in place will be important to address as part of the remedial option selection process for RM 2.0-2.3 East.

Ecology & Environment, Inc., (E & E) did not conduct QA/QC on reported data as part of the scope of this report. Data published in previous reports approved by EPA and/or Ecology are assumed to have been validated and to be accurate. Information from reports by others that have not been approved by EPA or Ecology is included only for summary purposes.

2.0 Lower Duwamish Waterway Superfund Site

The Duwamish River originates at the confluence of the Black and Green Rivers, near Tukwila, Washington. From the confluence, the Duwamish River flows approximately 12 miles (19 kilometers) before splitting at the southern end of Harbor Island to form the East and West Waterways, which discharge into Elliott Bay. The LDW study area consists of the downstream portion of the Duwamish River, excluding the East and West Waterways (just south of Harbor Island).

The LDW is a receiving water body for different types of industrial and municipal stormwater and periodic overflow discharges from combined sewer systems during high rainfall events. Industrial and municipal stormwater discharges to the LDW are discussed in Sections 2.3 and 4.0. There are currently no permitted discharges of industrial wastewater directly into the LDW.

2.1 Site History

General background and site description of the LDW Superfund site is provided in the *Lower Duwamish Waterway Phase I Remedial Investigation Report* (Windward 2003), which describes the history of dredging, filling, and industrialization of the Duwamish River and it environs, as well as the physiography, physical characteristics, hydrogeology, and hydrology of the area. In the late 1800s and early 1900s, extensive topographic modifications were made to the river, including the filling of tideflats and floodplains to create a straightened river channel. Current side slips are frequently remnants of old river bed meanders. The channel was dredged for navigational purposes and the excavated waterway material was used to fill the old channel areas and the lowlands above flood levels. Because the dredge fill materials were similar to the native deposits, they are typically difficult to distinguish from the native silts and sands. Subsequent filling for land development purposes has resulted in a surficial layer of fill over most of the lower Duwamish Valley. This material is typically more granular because it was generally placed to allow for stable construction conditions and/or building foundations (Windward 2003).

Most of the upland areas adjacent to the LDW have been heavily industrialized for many decades. Historical and current commercial and industrial operations include cargo handling and storage, marine construction, boat manufacturing, marina operations, concrete manufacturing, paper and metals fabrication, food processing, and airplane parts manufacturing. Two mixed commercial and residential communities, Georgetown and South Park, are also located near the LDW (Windward 2003).

2.2 Site Geology and Hydrogeology

Groundwater within the Duwamish Valley alluvium is typically encountered under unconfined conditions within approximately 10 feet (3 meters) of ground surface. Groundwater in this unconfined aquifer is found within fill and native alluvial deposits. The direction of groundwater flow in the unconfined aquifer is generally toward the LDW. However, the direction may vary locally depending on subsurface material, proximity to the LDW and tidal influence. Tidal fluctuations generally affect groundwater flow direction within 300 to 500 feet (100 to 150 meters) of the LDW, depending on location (Windward 2003). A confined groundwater zone is present beneath the unconfined aquifer. Flow in this confined zone is to the north toward Elliott Bay. The bottom of the unconfined aquifer is located on top of a layer of marine sediment at a depth of 45 to 50 feet (13 to 15 meters) (Cook 2001).

2.3 Storm Drain and Sanitary Sewer Systems

Separated storm drain and sanitary sewer systems and combined sewer systems serve properties within the LDW drainage basin. Storm drain systems convey stormwater runoff collected from streets, paved areas, and roof drains from residential, commercial, and industrial properties. Many properties directly adjacent to the LDW are served by private storm drain systems that discharge directly to the LDW. A combination of private and city storm drain systems serve upland areas of the LDW drainage basin.

Some areas in the vicinity of the LDW are served by combined sewer systems, which carry both stormwater and municipal/industrial wastewater in a single pipe. These systems were generally constructed before about 1970 because it was less expensive to install a single pipe rather than separate storm and sanitary systems. Under normal rainfall conditions, wastewater and stormwater are conveyed through this combined sewer pipe to a wastewater treatment facility. During large storm events, however, the total volume of wastewater and stormwater can sometimes exceed the conveyance and treatment capacity of the combined sewer system. When this occurs, the combined sewer system is designed to overflow through relief points, called combined sewer overflows (CSOs). The CSOs prevent the combined sewer system from backing up and creating flooding.

Untreated municipal/industrial wastewater and stormwater can be discharged during CSOs to the LDW during these storm events. The city owns and operates the local sanitary sewer collectors and trunk lines, while King County owns and operates the larger interceptor lines that transport flow from the local systems to the West Point Wastewater Treatment Plant (WWTP). The city's combined sewer network has its own NPDES permit for CSOs; CSOs from the County's interceptor lines are administered under the NPDES permit established for the West Point WWTP.

An Emergency Overflow (EOF) is a discharge that can occur from either the combined or sanitary sewer systems that is not necessarily related to storm conditions and/or system capacity limitations. EOF discharges typically occur as a result of mechanical issues such as pump station failures or when transport lines are blocked; pump stations are operated by both the city and County. Pressure relief points are provided in the drainage network to discharge flow to an existing storm drain or CSO pipe under emergency conditions to prevent sewer backups. EOF events are not covered under the city's or County's existing CSO wastewater permits.

CSO/EOF outfalls that discharge to the LDW are listed in Table 1. Of the County CSO outfalls along the LDW, the Michigan CSO, South Brandon Street CSO, and Hanford No. 1 (discharging via the city's Diagonal Avenue South CSO/SD) outfalls had the highest average combined sewer overflow volumes between 1999 and 2005. Annual stormwater discharge volumes are usually substantially higher than annual CSO discharge volumes because storm drains discharge whenever it rains, while CSOs only occur when storm events exceed the system capacity. Annual stormwater discharges to the LDW have been estimated at approximately 4,000 million gallons per year (mgy) compared to less than 65 mgy from the County CSOs and less than 10 mgy from the city CSOs (Windward 2007a)[5].

To minimize the frequency and volume of CSO events, the County uses different CSO control strategies to maximize system capacity. An automated control system manages flows through the King County interceptor system so that the maximum amount of flow is contained in pipelines and storage facilities until it can be conveyed to a regional wastewater treatment plant for secondary treatment. In some areas of the system, where flows cannot be conveyed to the plant, the flows are sent to CSO treatment facilities for primary treatment and disinfection prior to discharge. County CSOs discharge untreated wastewater only when flows exceed the capacity of these systems (King County 2007b)[6].

As a result, some areas of the CSO drainage basins may discharge to different outfalls at different times, depending on the route that the combined stormwater/wastewater has taken through the County conveyance system. Furthermore, some industrial facilities in the LDW basin may discharge stormwater to a separated system and industrial wastewater to a combined system, or a conveyance that begins as a separated system may discharge to a combined system further downstream along the flow path.

When preparing a Data Gaps Report for a source control area, all properties that potentially discharge to that source control area (whether through a CSO/EOF or a separated storm drain outfall) are identified to the extent that the boundaries of the drainage basin are known. However, for areas where drainage basins overlap, a property review is performed only if the property has not already been included in a previously published Data Gaps Report. Exceptions include situations in which contaminants may be transported to the current source control area via a transport pathway that was not applicable for the earlier evaluation.

[5] Stormwater discharges are regulated under a separate NPDES permit.
[6] City CSOs are generally smaller and flows are not treated prior to discharge.

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3.0 RM 2.0-2.3 East Source Control Area

Seven facilities of concern within the RM 2.0-2.3 East drainage basin have been identified for inclusion within this report: SCS Refrigerated Services, Seattle Distribution Center, Glacier Marine Services, V. Van Dyke, Riverside Industrial Park, Shultz Distributing, and Cascade Columbia Distribution. These facilities have confirmed or suspected contamination of various upland media, or conduct activities that threaten LDW sediments. These seven facilities are discussed in detail in Section 4.

3.1 RM 2.0-2.3 East Drainage Basin

The RM 2.0-2.3 East drainage basin encompasses stormwater drainage under normal conditions for approximately 37 acres of commercial and industrial properties between the LDW and East Marginal Way South (Figure 3). Figures 3 and 4 also illustrate the portion of the RM 2.0-2.3 East drainage basin east of East Marginal Way South. That portion, referred to as the South Brighton Street CSO drainage basin, or combined sewer service area, encompasses 34.4 acres. The Brighton CSO/SD serves as both a storm drain and a combined sewer outfall. Stormwater and wastewater from this basin normally discharge to the King County sanitary system. However, in the event of a combined sewer overflow, this basin can discharge to the LDW through the South Brighton Street combined sewer overflow/storm drain (CSO/SD). Under normal conditions, some stormwater from areas west of East Marginal Way South discharges through the South Brighton Street CSO/SD. The South Brighton Street CSO/SD is discussed in further detail in Section 4. Storm drain and combined sewer systems are discussed in Section 2.3.

In addition to the main seven facilities of concern identified for RM 2.0-2.3 East discussed in Section 4, four former facilities of concern were identified within the South Brighton Street CSO basin portion of the RM 2.0-2.3 East drainage basin: Arrow Transportation, Inland Transportation Company, Ben's Truck Parts, and the Hat n' Boots Gas Station. These four facilities have been removed and the property is now occupied by a new South Seattle Community College Campus (Figure 4). It is unclear whether any residual contamination from these four facilities exists or whether contamination could be a threat to LDW sediments. Potential pathways for such contamination could be either directly by groundwater to the LDW or by groundwater to a combined sewer to the LDW during a CSO event. The South Brighton Street CSO/SD system and the four former facilities of concern identified within its basin are described in further detail in Section 4.

Figure 4 illustrates known storm drain system lines and outfalls within RM 2.0-2.3 East. Private properties may or may not have supplied information to the city pertaining to their storm drain systems. Facilities within the RM 2.0-2.3 East drainage basin, but outside of the South Brighton Street CSO basin, may discharge stormwater into the city storm drain system, which ultimately discharges into the LDW. Facilities adjacent to the LDW may discharge directly into the LDW.

3.2 National Pollution Discharge Elimination System Permits

In 2005, the city of Seattle conducted a comprehensive survey of outfalls (or outfall-like structures) terminating in the LDW. The survey identified 227 outfalls or structures. Of these, 42 are municipally-owned, 101 were identified as privately-owned, and 84 are of unknown ownership. Discharges from many of these outfalls are permitted under NPDES. Six types of NPDES permits cover discharges to the LDW: the Phase I Municipal Stormwater General Permit (applies to city of Seattle, Port of Seattle, and King County discharges), Phase II Municipal Stormwater General Permit (applies to city of Tukwila discharges), Individual Permit, Industrial Stormwater General Permit, Sand and Gravel General Permit, and Boatyard General Permit. Three of the six types of NPDES permits apply to discharges from RM 2.0-2.3 East and are described below.

The **Phase I Municipal Stormwater General Permit** covers stormwater discharges from outfalls owned by the city of Seattle, the Port of Seattle, and King County. The South River Street SD, at the north end of the SR509 bridge (Figures 3 and 4), is covered by this type of permit.

The Phase I Municipal Stormwater General Permit requires more monitoring than does the industrial stormwater general permit, including monitoring of the solids portion (sediments). Monitoring requirements are detailed in Special Conditions, S8, in the Phase I permit. The permit was issued on January 17, 2007. The analyte list is tiered, depending on how much sediment is collected in a sample. The stormwater monitoring portion of the permit does not require monitoring of all outfalls, but only of three basins or sub-basins considered representative of residential, commercial, and industrial use. Any monitoring required under this permit is of limited value to the LDW source control effort. The Phase 1 Municipal Stormwater Permit is heavily dependent on the best management practices of the permittee, such as street sweeping and catch basin cleaning.

Another key component of the permit is the requirement placed on permit holders to detect, remove, and prevent illicit connections and illicit discharges, including spills into the municipal separate storm drains (Special Condition 5.8). This condition has led the city of Seattle and King County to initiate programs and ordinances governing stormwater and surface water within their jurisdictions.

An **Individual Permit** is written for a specific discharge at a specific location. The individual permit is highly tailored to regulate the pollutants specific to the process that generates the discharge. An individual permit may be a NPDES permit for discharges to surface waters or a county permit for discharge to the combined sewer system. NPDES individual permits may be issued to an industry or to a municipality. Of the four individual permits issued within the LDW, two are for the city of Seattle and King County combined sewer system. Coming from a different combined sewer system, the South Brighton Street CSO/SD outfall (shown in Figures 3 and 4) is covered by a different individual permit issued to the city of Seattle.

The **Industrial Stormwater General Permit** covers 112 industries within the drainage basin of the LDW. Facilities of concern within RM 2.0-2.3 East covered under this permit include SCS

Refrigerated Services, Glacier Marine Services, V. Van Dyke, and Shultz Distributing. Coverage under the Industrial Stormwater General Permit requires whole water monitoring of stormwater discharge for pH, turbidity, oil & grease, copper, and zinc. If stormwater is discharged to a 303(d)-listed surface water body, monitoring for total suspended solids is also required. Additional monitoring is required for timber products, air transportation, chemical, food, and metal industries. Development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) is also required under the Industrial Stormwater General Permit.

3.3 Contaminants of Concern

Although the scope of this report does not include a detailed review of existing sediment conditions in the RM 2.0-2.3 East portion of the LDW, results from LDW sediment studies provide guidance in assessing source control requirements for the upland areas. Several contaminants in LDW sediments within the vicinity of RM 2.0-2.3 East have been documented to be at levels of concern based on results of sampling conducted between 1998 and 2006. The SMS (Chapter 173-204 WAC) establish Marine Sediment Quality Standards (SQS) and Cleanup Screening Levels (CSL) for some contaminants that may be found in sediments. When contaminant concentrations in sediments are less than the SQS, it is assumed there will be no adverse effects on biological resources and no significant health risk to humans. CSLs represent "minor adverse effects" levels used as an upper regulatory threshold for deciding about source control and cleanup.

For this report, "Contaminant of Concern" (COC) is defined as a contaminant that may recontaminate the LDW sediments of RM 2.0-2.3 East if sediment remediation is performed. To be identified as a COC for RM 2.0-2.3 East sediments, a contaminant must have met either of the following criteria:

A. The detected concentration in one or more RM 2.0-2.3 East sediment samples as reported in the November 2007 *Lower Duwamish Waterway Phase 2 Remedial Investigation Draft Report* (Windward 2007a) exceeded the SQS or CSL value. Section 3.2.1 summarizes the separate sediment investigations performed in the vicinity of RM 2.0-2.3 East, and the COCs identified as a result of those investigations.

B. The contaminant was detected above an applicable screening level in one or more samples of upland media (including stormwater, groundwater, soil, seeps, and storm drain solids), even if not detected in RM 2.0-2.3 East sediment samples. Section 3.2.2 summarizes the COCs identified at the facilities of concern through a review of available information and a comparison of sampling data to applicable screening levels.

3.3.1 Contaminants of Concern Identified through Sediment Sampling

Figure 5 depicts surface and subsurface sediment sampling locations within the RM 2.0-2.3 East sediment area, as identified in the November 2007 *Lower Duwamish Waterway Phase 2 Remedial Investigation Draft Report* (Windward 2007a). Appendix A summarizes contaminants detected in surface and subsurface sediment samples collected through the sediment investigations described below; samples with contaminant concentrations exceeding SQS and CSL values are presented in Tables 2 and 3.

Contaminants of Concern Identified through Sediment Sampling				
Contaminant of Concern (COC)	**Surface Sediment**		**Subsurface Sediment**	
	> SQS	**> CSL**	**> SQS**	**> CSL**
Metals				
Arsenic	●		●	●
Copper			●	●
Lead			●	●
Mercury			●	
Zinc			●	●
PAHs				
Acenaphthene			●	
Benzo(a)anthracene			●	
Benzo(a)pyrene			●	
Benzo(g,h,i)perylene			●	
Benzofluoranthenes (total)			●	
Chrysene			●	
Dibenzo(a,h,)anthracene			●	
Dibenzofuran			●	
Fluoranthene	●		●	
Fluorene			●	
Indeno(1,2,3-cd)pyrene			●	
Phenanthrene			●	
Total HPAH			●	
PCBs				
PCBs (total)	●		●	
TPHs				
1,2,4-Trichlorobenzene			●	●
1,2-Dichlorobenzene			●	●
Other SVOCs				
Benzyl alcohol	●	●		

Sediment Investigations

Surface and subsurface sediment samples have been collected from the RM 2.0-2.3 East sediment area as part of the following investigations:

<u>Duwamish Waterway Characterization Study (NOAA 1998)</u>

September through November 1997, as part of the Duwamish Waterway Characterization Study, surface sediment samples were collected from eight locations (EST 187, EST 188, EST 189, EST 190, EST 191, EST 192, EST 193, and EST 194) within the RM 2.0-2.3 East sediment area.

For all eight samples, polychlorinated biphenyls (PCBs) were detected at concentrations below SQS and CSL values.

EPA Site Inspection, Lower Duwamish River (Weston 1999)

In August 1998, as part of the EPA Site Inspection, surface sediment samples were collected from 12 locations (DR105, DR106, DR107, DR108, DR109, DR110, DR111, DR112, DR114, DR115, DR148, and DR149) and subsurface sediment samples were collected from two locations (DR106 and DR112) within the RM 2.0-2.3 East sediment area. All samples were analyzed for Target Analyte List (TAL) metals (aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc), polycyclic aromatic hydrocarbons (PAHs), phthalates, and PCBs. In addition, surface sediment samples collected from DR109, DR110, DR111, DR112, and DR115 and subsurface sediment samples collected from DR112 were analyzed for organotins (including butyltins); the surface sediment sample collected from DR111 was analyzed for volatile organic compounds (VOCs) and pesticides; and surface sediment samples collected from DR111 and DR115 were analyzed for dioxins/furans.

LDW Phase 2 Remedial Investigation, Benthic Invertebrate, Clam Tissue, and Co-located Sediment Sampling (Windward 2005a)

August through September 2004, as part of the Phase 2 Remedial Investigation, benthic invertebrate tissue and co-located sediment samples were collected. Within the RM 2.0-2.3 East sediment area, one sample was collected from B6b and analyzed for TAL metals, PAHs, phthalates, other semi-volatile organic compounds (SVOCs), organochlorine pesticides, PCBs, and butyltins.

LDW Phase 2 Remedial Investigation, Round 1, 2, and 3 Sediment Sampling (Windward 2005b, 2005c, 2007b)

Three rounds of sediment sampling were performed in 2005-2006 as part of the Phase 2 Remedial Investigation; eight surface sediment samples were collected within the RM 2.0-2.3 East sediment area. In Round 1 (January 2005), one sample was collected at LDW-SS76; in Round 2 (March 2005), samples were collected at LDW-SS73, LDW-SS74, LDW-SS77, LDW-SS78, and LDW-SS81; in Round 3 (October 2006), samples were collected at LDW-SS329 and LDW-SS330. All samples were analyzed for SMS compounds; in addition, LDW-SS76, LDW-SS73, LDW-SS74, and LDW-SS81 were analyzed for organochlorine pesticides; LDW-SS74 was analyzed for PCB congeners; and LDW-SS74 and LDW-SS78 were analyzed for butyltins.

LDW Remedial Investigation, Subsurface Sediment Sampling (Windward 2007c)

February 2006, as part of the Phase 2 Remedial Investigation, subsurface sediment samples were collected from three locations (LDW-SC36, LDW-SC37, and LDW-SC202) within the RM 2.0-2.3 East sediment area. All samples were analyzed for SMS compounds; in addition, LDW-SC36 and LDW-SC202 were analyzed for butyltins.

Contaminants of Concern Identified

The November 2007 Lower Duwamish Waterway Phase 2 Remedial Investigation Draft Report Online Database (LDWG 2007), which summarizes all LDW sediment investigation sample results, was queried by sample location for surface and subsurface sediment samples in which contaminants were detected. Contaminant concentrations in sediment samples within the RM 2.0-2.3 East sediment area were compared to SQS and CSL values in Appendix A; contaminant concentrations exceeding SQS and CSL values are presented in Tables 2 and 3.

To allow for comparison of applicable SMS compounds to SQS and CSL values, organic compounds were organic carbon (OC) normalized. Detected concentrations (dry weight basis) were normalized to the total organic carbon (TOC) concentration in the samples. However, comparison to TOC-normalized concentrations is only effective at predicting adverse effects in sediments with TOC content within the range of 0.5 to 4.0 percent. For samples with TOC concentrations outside of the applicable range, concentrations of organic compounds were compared with Puget Sound Apparent Effects Threshold (AET) values. The AET values are the functional equivalent of the SQS and CSL values, only they are expressed on a dry-weight basis. The lowest AET (LAET) was used as the equivalent of the SQS, and the second lowest AET (2LAET) was used in place of the CSL.

Contaminants that exceeded the SQS or CSL values were identified as COCs and are listed in the table below. COCs were identified in surface sediment at several locations, including LDW-SS73, LDW-SS77, LDW-SS329, DR111, DR148, DR112, and B6b. COCs were identified in subsurface sediment at only one location, LDW-SS37. In general, COCs were present in sediment samples at concentrations only slightly above SQS or CSL values, with the greatest exceedances observed in subsurface sediment (2-4 foot depth) at LDW-SC37 for arsenic, copper, lead, and zinc. PCBs, total petroleum hydrocarbons (TPHs), and several PAHs were also found in exceedance of SQS and CSL values at LDW-SC37.

3.3.2 Contaminants of Concern Identified in Upland Media

Available information, including sampling results from environmental investigations, was reviewed for the seven facilities of concern identified within the RM 2.0-2.3 East source control area: SCS Refrigerated Services, Seattle Distribution Center, Glacier Marine Services, V. Van Dyke, Riverside Industrial Park, Shultz Distributing, and Cascade Columbia Distribution. Environmental investigations and sampling results are described in further detail for each facility of concern in Section 4.

In general, a COC was identified in upland media at a facility of concern when the contaminant was detected above an applicable screening level in one or more samples of upland media (including stormwater, groundwater, soil, seeps, and storm drain solids). Screening level criteria used included MTCA Method A cleanup levels for soil and groundwater; Ecology stormwater compliance benchmark levels for facilities covered under the Industrial Stormwater General Permit for stormwater discharge; SMS criteria for both sediments sampled within the LDW in association with a facility of concern and storm drain solids; and a recently developed screening tool to help determine when a detected contaminant is not a concern to LDW sediments (SAIC 2006a).

Contaminants of Concern Identified in Upland Media			
Facility of Concern	**Contaminant of Concern (COC)**	**Media Identified In**	**Potential Pathway to LDW Sediments**
Adjacent Facilities of Concern			
SCS Refrigerated Services	Copper and zinc	Stormwater discharge	Stormwater
Glacier Marine Services	Arsenic, chromium, cadmium, copper, mercury, lead, zinc and oil & grease	Storm drain solids, surface runoff and sediment	Stormwater
Upland Facilities of Concern			
V. Van Dyke	Zinc and oil & grease	Stormwater discharge	Stormwater
	Petroleum hydrocarbons (TPH-G and benzene)	Soil and groundwater	Stormwater and groundwater
Riverside Industrial Park	Petroleum hydrocarbons (TPH-G, benzene, ethylbenzene and xylenes)	Groundwater	Stormwater and groundwater
Shultz Distributing	Chlorinated solvents (primarily PCE and TCE)	Groundwater	Stormwater and groundwater
Cascade Columbia Distribution	Chlorinated solvents (PCE, TCE, VC, and cis-1,2-DCE); petroleum hydrocarbons (TPH, benzene, and toluene); PCP; chlorinated dioxins and furans; and methylene chloride	Soil	Groundwater discharging to RM 2.3-2.8 East and stormwater
	Chlorinated solvents (PCE, TCE, VC, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, 1,1,1-TCA, and 1,2-DCA); petroleum hydrocarbons (TPH, benzene, toluene, and ethylbenzene); PCP; chlorinated dioxins and furans; methylene chloride; and 1,4-DCB	Groundwater	Stormwater; and groundwater discharging to RM 2.3-2.8 East

Contaminants that were no longer detected above applicable screening levels in upland media following completion of remedial actions at potential upland sources were not included. In some instances it was not feasible to determine whether a contaminant was a COC because either applicable screening levels have not been established for the particular contaminant or media, or applicable screening levels could not be applied due to inadequate data. Whenever these situations occurred a data gap was identified to indicate where further study may be required.

Application of Sediment Management Standards to the Identification of Contaminants of Concern in Upland Media

Section 3.2.1 discusses COCs identified through sediment sampling, for which SMS can be directly applied. However, there are no existing standard methods to determine which contaminants detected in upland media (including stormwater, groundwater, soil, seeps, and storm drain solids) are potential COCs for LDW sediments.

There are no established cleanup levels or management standards for storm drain solids. Technically the SMS criteria do not apply to storm drain solids. However, SMS criteria and LAET values provide a conservative basis to evaluate contaminant concentrations in storm drain solids samples. Any contaminants found in storm drain solids above SMS or LAET/2LAET screening levels are considered to be COCs with regard to LDW sediments because if the solids migrated to the LDW they would become sediments. Although it is conservative to ignore mixing and dilution effects, SMS and LAET/2LAET criteria are considered a reasonable measure of contamination for storm drain solids. When feasible, contaminant concentrations detected in samples of storm drain solids were also compared to SQS/CSL and/or LAET/2LAET values to provide a rough indication of contaminant exceedances.

Recently, Ecology developed a screening tool to help determine when a detected contaminant is not a concern to LDW sediments (SAIC 2006a). Using conservative assumptions, the screening tool translates marine sediment concentration limits defined by SMS into upland soil and groundwater concentrations or screening levels. These screening levels were calculated by applying partitioning coefficients and other factors to the SMS criteria. These screening tool levels are referred to as either "soil-to-sediment screening levels" or "groundwater-to-sediment screening levels." Concentrations less than the screening tool levels provide an indication that SMS compounds in upland groundwater and soil are not likely to pose a risk to LDW sediments. The screening levels calculated for this tool incorporate a number of conservative assumptions, including the absence of contaminant dilution and ample time for contaminant concentrations in soil, sediment, and groundwater to achieve equilibrium. In addition, the screening levels do not address issues of contaminant mass flux from upland to sediments, nor do they address the area or volume of sediment that might be affected by upland contaminants. Because of these assumptions and uncertainties, these screening levels are most appropriately used for ruling out, but not establishing, a concern. If contaminant concentrations in upland soil or groundwater are below these screening levels, it is unlikely they will exceed marine sediment SQS. The use of this tool to screen out contaminants in the presence of non-aqueous phase liquids is inappropriate. However, upland concentrations that exceed these screening levels may or may not pose a threat to marine sediments. Additional site-specific information must be considered in order to make such an assessment.

Where feasible, these screening tool levels were compared to the most recent upland groundwater and soil results for a given property or study area. Generally, if a contaminant is not detected above the applicable screening tool level, given appropriate reporting limits, then the contaminant is not considered to be a COC for the given location. However, in some instances site-specific criteria may be more stringent than the screening tool levels. In this case if a detected contaminant concentration is below a screening tool level, but above a site-specific criterion, then it cannot be ruled out as a COC. In other cases the method detection limit (MDL) or reporting limit may be greater than a screening tool level. In these cases it cannot be determined if the concentration is below the screening tool level, so the contaminant cannot be ruled out as a COC unless other factors prevail.

Contaminants of Concern Identified

Contaminants identified in upland media that exceeded an applicable screening level were identified as COCs and are listed in the table below. The upland media the COC was found in, as well as the potential pathways identified for the COCs to reach LDW sediments, are also summarized in the table. Detailed information pertaining to the COCs identified is included in Section 4 for each facility of concern.

Each COC identified in upland media was considered for screening against levels defined by Ecology's screening tool, discussed above, to determine whether the potential COC could be ruled out. However, the screening tool did not apply either because the COCs identified for RM 2.0-2.3 East were not SMS compounds, or because the compound was found in media other than soil or groundwater (e.g., storm drain solids, storm water).

3.4 Potential Pathways of Contamination to Sediment

To assess whether contamination in upland media is a potential source of LDW sediment recontamination, potential pathways between the potential source and the LDW must be evaluated. Pathways can lead to either point or non-point discharges. Point discharges include direct stormwater discharges via outfalls, spills, combined sewer overflow outfalls and direct wastewater discharges. Non-point discharges include groundwater migration, erosion or leaking from bank soils, and atmospheric deposition. In some cases a pathway is not known to have, historically or currently, any contamination. However, this report considers all pathways that may provide a conduit for upland contaminants to reach LDW sediments. The potential contaminant migration pathways evaluated for RM 2.0-2.3 East are described below and are discussed in more detail in Section 4.

Stormwater

Stormwater discharges directly to the LDW via outfalls or as surface runoff from properties adjacent to the LDW. Stormwater from urban areas may contain a wide variety of substances including bacteria, metals, oil, detergents, pesticides, fertilizers, and other chemicals that are washed off the land during rain events. These pollutants are transported in dissolved and particulate phases to the LDW by a combination of public and private storm drain systems. Storm drains can also convey materials from businesses with NPDES-permitted discharges, vehicle washing, runoff from landscaped areas, erosion of contaminated soil, infiltration of contaminated groundwater through breaks in conveyance lines, and materials illegally disposed of into the system.

Storm drain and combined sewer systems in the LDW area are discussed in Section 2.3, and more specifically within the RM 2.0-2.3 East stormwater drainage basin in Section 3.1. Outfalls that discharge directly to the LDW within RM 2.0-2.3 East are shown in Figures 3 and 4, and include one public CSO/SD, one public storm drain, and two private storm drains. These outfalls, discussed in detail in Section 4, are:

- South Brighton Street CSO/SD, owned by city of Seattle
- South River Street SD, owned by city of Seattle
- Outfall No. 2025, owned by SCS Refrigerated Services
- Outfall No. 2024, owned by Glacier Marine Services (Fox Avenue Building LLC)

Groundwater

Contaminated groundwater may enter the LDW directly via groundwater discharge to surface water, tidal fluctuation, seeps, or infiltration into storm drains/pipes, ditches, or creeks that discharge to the LDW. Contaminants from spills and releases to soils on properties in the RM 2.0-2.3 East drainage basin area may migrate to groundwater and subsequently be transported to RM 2.0-2.3 East sediments.

In general, shallow groundwater in the Duwamish Valley is typically encountered within about 10 feet (3 meters) of the ground surface and exists under unconfined conditions. The general direction of shallow groundwater flow in the Duwamish Valley is toward the LDW, although the direction may vary locally depending on the nature of the subsurface material, proximity to the LDW, and tidal action. High tides can cause temporary groundwater flow reversals, generally within 300 to 500 feet (100 to 150 meters) of the LDW (SAIC 2006b).

Spills

Spills of waste materials containing contaminants of concern may occur directly to the LDW through in-water activities or onto the ground within the RM 2.0-2.3 East drainage basin. Activities occurring in the RM 2.0-2.3 East upland areas at this time may result in spills if adequate containment procedures are not followed.

Bank Erosion

Waterway bank soil, contaminated fill, waste piles, landfills, and surface impoundments may release contaminants directly into RM 2.0-2.3 East waters through soil erosion, soil erosion to stormwater, leaching to groundwater, or leaching from banks to the LDW.

Atmospheric Deposition

Atmospheric deposition occurs when air pollution deposits enter the LDW directly or through stormwater. Such deposits can become a possible source of contamination to RM 2.0-2.3 East sediments. Air pollution is generated from point source or widely dispersed air emissions. Examples of point source emissions include paint overspray, sand-blasting, industrial smokestacks, and fugitive dust and particulates from loading/unloading of raw materials (for example, sand, gravel, and concrete). Examples of widely dispersed emissions include vehicle emissions and aircraft exhaust.

None of the facilities of concern identified for RM 2.0-2.3 East have current operations that have known point source emissions of air pollution that may contribute contaminants to RM 2.0-2.3

East sediments. Air traffic at King County International Airport (KCIA) may result in significant emissions, but this pertains to the entire airfield operations and lies outside the scope of this report.

The Washington State Department of Health hired a consultant to model air emissions from multiple sources in south Seattle. The objective of the multiple-source air modeling project in the Duwamish valley was to identify (1) air pollutants, (2) key air pollution sources affecting residential areas of south Seattle, and (3) the geographic areas of south Seattle affected by air pollutants. This effort is an initial step to identify priorities for future work in the area. The modeling report will summarize key findings of the modeling effort and recommend future actions. Ecology understands the report will be published in 2008. A study on atmospheric deposition planned by the Puget Sound Partnership has not been funded yet and no schedule has been developed. Ecology will continue to monitor these efforts (Ecology 2008b).

Out of concern for phthalate recontamination at sediment cleanup sites in the larger Puget Sound region, the Sediment Phthalates Work Group was formed in 2006. One of the group's accomplishments was reviewing existing information to explore the potential for phthalate recontamination via atmospheric pathways. The group concluded that phthalates reach sediments through a complex pathway involving off-gassing to air followed by attachment to particulates, deposition to the ground, and transport to sediments through stormwater (Sediment Phthalates Work Group 2007).

King County conducted air monitoring in the LDW area to assess whether atmospheric deposition is a potential source of phthalates, particularly bis(2-ethylhexyl)phthalate (BEHP), in stormwater runoff (KCDNRP 2008). The most significant finding is that BEHP concentrations were up to three times greater in the Duwamish valley stations than in the Beacon Hill station. Results were similar to results from other studies conducted within the same airshed and within other regions.

Based on a comparison with results from other atmospheric deposition networks that employed high-volume air sampling techniques to collect gaseous and particulate phase air samples, the total deposition results from this study are likely to be biased low for the lighter phthalates, low- to mid-range PAH compounds, and low- to mid-range PCB congeners. Since side-by-side comparison sampling of the passive atmospheric deposition samplers with high-volume air samplers was not conducted, it is not possible to assess the degree of bias (KCDNRP 2008).

The sampling stations were located at Beacon Hill, Duwamish Valley, Georgetown, KCIA, and South Park Community Center. The following range of air deposition flux values was observed (KCDNRP 2008):

Analyte	Range of Air Deposition Flux (µg/m2/day)	Location of Highest Values
Butyl benzyl phthalate	0.163 to 7.007	South Park
Bis(2-ethylhexyl)phthalate	0.261 to 12.240	Duwamish Valley
Benzo(a)pyrene	0.008 to 2.225	KCIA
Pyrene	0.035 to 4.652	KCIA
Aroclor 1254	<0.011 to 0.044	Georgetown
Aroclor 1260	<0.011 to 0.034	Georgetown

Detailed results are provided in King County's *Monitoring Report – October 2005 to April 2007* (KCDNRP 208).

4.0 Potential Sources of Sediment Recontamination

This section summarizes available information on potential contaminant sources and pathways. This summary was evaluated to identify any potential for contaminant migration and recontamination of LDW sediments. In some instances, data or lack of data indicates a source or pathway may be present. A data gap is identified when available data are insufficient to confirm or rule out the presence of contamination or any significant potential for contaminant migration to LDW sediments.

Within RM 2.0-2.3 East, potential sources of sediment recontamination include direct discharges via outfalls and direct and/or indirect discharges from facilities of concern that are within the RM 2.0-2.3 East source control area, both adjacent to and upland from the LDW. These outfalls and facilities of concern are illustrated in Figures 3 and 4 and are discussed in the following sub-sections. Information on the four outfalls known to discharge directly to the LDW from RM 2.0-2.3 East is summarized in Section 4.1.

Within the scope of this report, facilities within RM 2.0-2.3 East were identified as facilities of concern if Ecology's files showed the facilities as contaminated sites or permitted facilities, the facilities were shown to be within RM 2.0-2.3 East in Ecology's Facility/Site Database, or the facilities were listed as primary upland properties in the vicinity of RM 2.0-2.3 East in the November 2007 *Lower Duwamish Waterway Phase 2 Remedial Investigation Draft Report* (Windward 2007a). Table 4 summarizes all the facilities of concern that were identified, the source of identification, whether the facility was included as a facility of concern in this report, and errors that may have been identified in Ecology's Facility/Site Database during the review.

Facilities of concern are categorized in Sections 4.2 and 4.3 as adjacent or upland facilities of concern, and are discussed in order from north to south and west to east, as shown in Figures 2 through 4. The facilities of concern were evaluated for the following means of potential recontamination of LDW sediments:

- Existing upland contamination of soil, groundwater, stormwater, or storm drain solids;
- Migration pathways that may exist between the potential sources and the LDW; and
- Activities that could lead to an accidental release of a contaminant of concern.

Current and historical land uses, environmental investigations and cleanup activities, and facility inspections were summarized for each facility of concern where information was available. More detail is provided for facilities where more information was available for review. Property ownership information was obtained from King County tax records and from existing reports. Current land use information was obtained from existing reports and Ecology online databases. The Ecology online databases were searched for information on current NPDES permit numbers, USTs, LUST release incidents, and hazardous waste facilities, and for inclusion of the property on the CSCSL. Reports and miscellaneous information in Ecology's files were also reviewed for relevant information. Section 1.2 lists all the sources reviewed for this report.

4.1 Stormwater Outfalls

4.1.1 South Brighton Street CSO/SD

The South Brighton Street CSO/SD outfall and CSO drainage basin are shown in Figures 3 and 4. Combined sewer systems in the LDW area are discussed in Section 2.3, and the RM 2.0-2.3 East drainage basin is discussed in Section 3.1. As shown in Table 1, the South Brighton Street CSO/SD discharges at approximately RM 2.1 East.

The storm drain lines shown in Figure 4 indicate that the following facilities of concern may connect to the city storm drain system and discharge to the LDW under normal conditions via the South Brighton Street CSO/SD: Seattle Distribution Center, Glacier Marine Services, and Shultz Distributing. Furthermore, the function of the connection between the South Brighton Street CSO/SD and the South Myrtle Street SD to the south is not clear from the available storm drain mapping data (Figure 4). This conduit may be a pathway for stormwater, and potentially contaminants, to flow from RM 2.0-2.3 East into the adjacent Source Control Area or vice versa. Table 4 summarizes these facilities of concern and the seven main facilities of concern discussed in Sections 4.2 and 4.3.

SPU records show that the South Brighton Street CSO/SD has not overflowed since monitoring began in March 2000 (see Table 1). According to SPU, land use within the 34.4-acre South Brighton Street CSO drainage basin as of 2001 was 10% residential, 65% industrial and 25% parks (SPU 2001).

In 2000, the city of Seattle conducted a study to predict the chemical quality of Seattle's CSO discharges based on data from CSOs in other municipalities in the Northwest, and to determine whether there is any evidence that chemicals in sediment adjacent to outfalls can be attributed to CSOs. At the South Brighton Street CSO/SD, polychlorinated biphenyl (PCB) concentrations exceeded the CSL in one of five sediment samples collected within 250 feet (76 meters) of the outfall. However, PCB concentrations were below the CSL at the four stations located closest to the outfall (Windward 2003).

4.1.1.1 Facilities of Concern

South Seattle Community College

The South Seattle Community College facility is within the South Brighton Street CSO drainage basin at the intersection of East Marginal Way South and Corson Avenue South (see Figure 3).

Facility Summary: South Seattle Community College	
Address	6737 Corson Avenue South
Property Owner	Buttleman, Kurt R./South Seattle Community College
Former/Alternative Property Names	Arrow Transportation Inland Transportation Company Ben's Truck Parts Hat n' Boots Gas Station
Former/Alternative Addresses	See Ben's Truck Parts and Hat n' Boots Gas Station sections below
Former/Alternative Lessee/Operator Names	N/A
Tax Parcel No.	0001800137
Parcel Size	7.03 acres
NPDES Permit No.	N/A
EPA RCRA ID No.	See Arrow Transportation section below
EPA TRI Facility ID No.	N/A
Ecology Facility/Site ID No.	See each former facility section below
Ecology UST Site ID No.	See Arrow Transportation, Ben's Truck Parts and Hat n' Boots Gas Station sections below
Ecology LUST Release ID No.	N/A
Listed on Ecology CSCSL	No

According to King County tax records, Washington State Department of Transportation purchased the property from Washington State Department of Natural Resources on April 29, 2004. The current taxpayer is listed as Buttleman, Kurt R./South Seattle Community College. There are two buildings on the property: a 54,035-square-foot building built in 2007 (called "Building E" with predominant use listed as "Vocational School"), and a 13,450-square-foot building built in 2007 (predominant use listed as "College") (King County 2007a).

The four former facilities of concern identified within the South Brighton Street CSO drainage basin are Arrow Transportation, Inland Transportation, Ben's Truck Parts, and Hat n' Boots Gas Station. All four facilities were formerly on tax parcel no. 0001800137. The new South Seattle Community College Campus now occupies the entire property. Table 4 summarizes these facilities of concern along with the seven main facilities of concern discussed in Sections 4.2 and 4.3.

Available information from the online databases listed in Section 1.3 is summarized in the following sub-sections for the four former facilities of concern. In addition to online database information, one file was available for review in Ecology's files pertaining to Inland Transportation Company (see below). In general, very little information was available pertaining to site use or potential residual contamination at the four former facilities.

Arrow Transportation

Arrow Transportation is listed on Ecology's Facility/Site Database at 6737 Corson Avenue South, with Facility/Site ID No. 69693852 (Ecology 2007a). The facility is also listed on Ecology's Hazardous Waste Facility Search Database with Resource Conservation and Recovery Act (RCRA) Site ID No. WAD007942733 (inactive since 12/31/1991) (Ecology 2007d).

Arrow Transportation is on Ecology's UST List with UST Site ID No. 1940. Four USTs were removed from the site; one contained used oil/waste oil, and contents of the other three are not known. UST removal dates are not listed (Ecology 2007e).

Inland Transportation Company

Inland Transportation Company is in the Ecology Facility/Site Database with an address of 6737 Corson South and Facility/Site ID No. 2134 (Ecology 2007a).

On March 12, 1985, Ecology performed a "Potential Hazardous Waste Site Preliminary Assessment." According to Ecology, Inland Transportation was a contract hauler of petroleum and chemical products and wastes, and the facility was used for truck storage, maintenance, and washing. Offices were also present at the facility. The facility handled many different chemicals and petroleum wastes, none stored on-site except the wastes remaining in trucks after deliveries. Other wastes at the site, mainly oils and pre-treatment sludges, resulted from truck maintenance and repair. According to Ecology, all wastes appeared to be properly handled and disposed. Runoff was collected and treated by an oil/water separator prior to discharge to the sanitary sewer, and trucks were kept in "dedicated service," carrying only one type of chemical to lessen the frequency of tank cleaning (Ecology 1985).

According to Ecology, past practices at the Inland Transportation Company facility in the 1970s had resulted in contaminant discharges to the LDW. Apparently an inspection performed by King County (known as "Metro" at that time) observed truck cleaning at the site, during which 5-10 gallons of waste oil, some perchloroethylene, and other materials were discharged to the LDW. According to the 1985 inspection performed by Ecology, wastes were managed appropriately in 1985, and Ecology concluded it unlikely that any residual contamination remained on-site (Ecology 1985).

Ben's Truck Parts

Ben's Truck Parts is in Ecology's Facility/Site Database with an address of 6655 Corson Avenue South and Facility/Site ID No. 74169521 (Ecology 2007a).

The facility is on Ecology's UST List with UST Site ID No. 396593. One UST that had stored leaded gasoline was removed from the site. The UST removal date is not listed (Ecology 2007e).

Hat n' Boots Gas Station

Hat n' Boots Gas Station is in Ecology's Facility/Site Database as "WA DNR Corson Ave Site Hat Boots" at 6800 East Marginal Way South, with Facility/Site ID No. 61845527 (Ecology

2007a). The actual location was determined to be southeast of the address listed, at approximately the intersection of East Marginal Way South and Corson Avenue South.

The Hat n' Boots Gas Station is on Ecology's UST List with UST Site ID No. 8914. Three USTs containing diesel oil, unleaded gasoline, and leaded gasoline were removed from the site on unlisted dates (Ecology 2007e).

4.1.1.2 Data Gaps

The following data gaps have been identified for the South Brighton Street CSO/SD. These must be addressed before effective source control can be accomplished for the RM 2.0-2.3 East source control area.

- Source tracing and sampling is needed in the South Brighton Street CSO/SD drainage basin to identify additional potential sources of LDW sediment recontamination.
- Dye testing should be performed to determine if any properties west of East Marginal Way are discharging stormwater to the South Brighton Street CSO/SD.
- The possible connection between South Brighton Street CSO/SD and South Myrtle Street SD needs to be examined to understand any potential interfaces between the adjacent Source Control Areas.
- According to Ecology's files, a memo was written by the National Atmospheric and Oceanographic Administration (NOAA) dated July 19, 1993, and named "Fox Avenue South CSO/SD." Available information indicates that "Fox Avenue South CSO/SD" most likely refers to the South Brighton Street CSO/SD. The memo discussed high levels of arsenic, zinc, copper, and lead in Slip 3 and within the storm drain system. The Marine Power & Equipment (MP&E) facility's sandblasting operations were discussed as the possible contamination source. The memo also stated that high levels of high and low molecular weight polyaromatic hydrocarbons, dibenzofuran, phthalates, phenols, vinyl chloride, and similar chemicals were found in the drainage system. Mention of this memo was not discovered until very late in the report-writing process. The memo was not available at the time but should be reviewed.
- The four former facilities of concern (Arrow Transportation, Inland Transportation Company, Ben's Truck Repair, and Hat n' Boots Gas Station) are no longer present on the property now occupied by South Seattle Community College. Very little information was available for review pertaining to historical site use at these four facilities. The historical records should be further investigated for potential sources of sediment recontamination.

4.1.2 South River Street SD

The South River Street SD is shown in Figures 3 and 4. Storm drain systems in the LDW area are discussed in Section 2.3, and the RM 2.0-2.3 East stormwater drainage basin is discussed in Section 3.1.

The drainage lines depicted in Figure 4 indicate that V. Van Dyke and Riverside Industrial Park may connect to the city storm drain system and discharge to the LDW via the South River Street SD. SCS Refrigerated Services, Muckleshoot Seafood Products, and Rainier Petroleum may discharge to the LDW through the South River Street SD, although connections to the storm drain system are not shown. Also, Figure 4 shows a drain line on the west side of V. Van Dyke that appears to connect to the 1st Avenue South Bridge SD. The function of this line is not clear from the available storm drain mapping data. This conduit may be a pathway for stormwater, and potentially contaminants, to flow from RM 2.0-2.3 East into the adjacent Source Control Area.

4.1.2.1 Data Gaps

The following data gaps have been identified for the South River Street SD. These data gaps must be addressed before effective source control can be accomplished for the RM 2.0-2.3 East source control area.

- Dye testing should be performed to confirm the connection of the facilities of concern listed above to the South River Street SD.
- The overlap of drainage lines in RM 2.0-2.3 East that may discharge to the 1st Avenue South Bridge storm drain line should be examined to understand any interfaces between the adjacent Source Control Areas.
- The city storm drain system should be further investigated to determine whether additional facilities of concern might discharge stormwater to the LDW through the South River Street SD.

4.1.3 Private Stormwater Outfalls

Known private stormwater outfalls that discharge to the LDW from RM 2.0-2.3 East include one private stormwater outfall belonging to SCS Refrigerated Services and one belonging to Glacier Marine Services. These two outfalls can be seen in Figures 3 and 4, and are discussed in Sections 4.2.1 and 4.2.3.

4.2 Adjacent Facilities of Concern

4.2.1 SCS Refrigerated Services

Facility Summary: SCS Refrigerated Services	
Address	303 South River Street
Property Owner	SCS Holdings LLC
Former/Alternative Property Names	Seattle Cold Storage (SCS) SCS Industries SCS Holdings FEI Refrigerated Services
Former/Alternative Addresses	173 South River Street 203 South River Street 315 South River Street 205 South River Street
Former/Alternative Lessee/Operator Names	Northland Services Puget Sound Ice Manufacturing
Tax Parcel No.	5367204100
Parcel Size	3.58 acres
NPDES Permit No.	SO3005565
EPA RCRA ID No.	N/A
EPA TRI Facility ID No.	N/A
Ecology Facility/Site ID No.	34383748
Ecology UST Site ID No.	N/A
Ecology LUST Release ID No.	N/A
Listed on Ecology CSCSL	No

SCS Refrigerated Services is adjacent to the LDW on the east side between RM 2.0 and 2.1. The property is bordered on the south by the Slip 3 Inlet. The Seattle Distribution Center facility is adjacent to the property to the east and the Rainier Petroleum facility is adjacent to the property to the west. The SCS Refrigerated Services property is bordered on the north by South River Street. The Riverside Industrial Park property is across South River Street from SCS Refrigerated Services.

According to King County tax records, SCS Holdings LLC purchased the property from Schnitzer Investment Corporation on January 15, 1998. The one building on the property is a 71,718-square-foot cold storage warehouse built in 1969 (King County 2007a).

According to Ecology's Facility/Site Database, the SCS Refrigerated Services facility, listed as SCS Industries, operates under Industrial Stormwater General Permit No. SO3005565 (Ecology 2007a); however, no SWPPP was found on file with Ecology. According to the November 2007 *Lower Duwamish Waterway Phase 2 Remedial Investigation Draft Report* (Windward 2007a), the facility discharges to the LDW through a private storm drain designated Outfall No. 2024, depicted in Figure 4. The outfall is 12 inches in diameter and has a flow rate of 10 gallons per minute (gpm). Three outfalls are covered under the facility's NPDES permit; they may all discharge to the LDW through Outfall No. 2024, or some may discharge to the city storm drain system (Windward 2007a).

4.2.1.1 Current Operations

According to the SCS Refrigerated Services webpage, the SCS Refrigerated Services facility provides cold storage in a refrigerated warehouse space and distribution in the Puget Sound area. The facility is currently for sale and relocation to the company's Terminal 25 facility is anticipated by summer 2008 (SCS 2008). The facility can be seen in Figure 6, an aerial photo of the Slip 3 Inlet area taken in July 2006.

4.2.1.2 Historical Use

According to King County tax records, residences were constructed on the SCS Refrigerated Services property beginning in 1908. In 1919, a boat shop and shed were constructed on a portion of the property with an address of 314 South River Street, and in 1937 the sign on the boat shop read Paragon Boat Company; this portion of the property was purchased by S.S. Mullen, Inc., in 1956 and portions of the buildings were still standing in 1964.

In 1939, a shed was constructed to cover a drag saw, used to saw large logs, on the portion of the property that had an address of 177 South River Street. A log chute on piling extending into the LDW was also present on this portion of the property, but was removed by 1950. A concrete block factory was constructed on the 177 South River Street portion of the property in the 1940s and was torn down in 1967. A new shed was added to this portion of the property in the 1950s.

In 1958, a shop was moved by E.C. Perkins to the portion of the property with an address of 215 South River Street.

In 1967, Farwest Capitol Company moved an office building onto the portion of the property that had an address of 173 South River Street; the office building was moved off the property in 1969. The existing warehouse building was constructed in 1968 and 1969, and according to the SCS Refrigerated Services webpage, the SCS Refrigerated Services facility began operations in 1969 under the name of Seattle Cold Storage (SCS 2008).

According to King County tax records, Farwest Capitol Company sold the property to Schnitzer Investment Corporation on October 10, 1969. Under Schnitzer Investment Corporation, lessees and operators at the facility included Puget Sound Ice Manufacturing 1992-1993, Northland Services 1996-2001, and SCS Holdings beginning in January 1998. SCS Refrigerated Services changed its name to FEI Refrigerated Services in December 1997.

4.2.1.3 Facility Inspections

Stormwater Compliance Inspection, SCS Refrigerated Services (May 2007)

On May 30, 2007, Ecology conducted a Stormwater Compliance Inspection, prompted by zinc, copper, and turbidity monitoring data that exceeded benchmark and/or action levels, according to the Industrial Stormwater General Permit requirements. In 2005, discharge monitoring reports (DMRs) from the facility showed that zinc, copper, and turbidity exceeded the benchmark values and action levels. The benchmark values and action levels in micrograms per liter (µg/L) are, respectively, 117 and 372 for zinc, and 15 and 30 for copper; the benchmark value and action level for turbidity in NTUs are 25 and 50. Zinc was measured at 495 µg/L n the first quarter of 2005 and at 785 µg/L in the third quarter. Copper was not reported in the first quarter, and measured at 77.1 µg/L in the third quarter. Turbidity was less than the benchmark value in the first quarter, but exceeded both the benchmark value and action level in the third quarter at 110 NTUs. “No qualifying storm event” was entered for the second quarter monitoring data (Ecology 2007f).

During the inspection, Ecology made the following recommendations (Ecology 2007f):

1. Clean up all areas that have an accumulation of sediment and other material.
2. Submit a "Level 2 Source Control Report" to Ecology for zinc.
3. Complete the actions required for a "Level 1 Response" for copper and turbidity.
4. Inspect, clean, and remove sediment from all catch basins.
5. Conduct quarterly visual monitoring, summarize observations and include a report or checklist in the facility's SWPPP.

4.2.1.4 Potential Pathways of Contamination

Stormwater

The SCS Refrigerated Services facility discharges untreated stormwater to the LDW through a private storm drain, designated as Outfall No. 2024 and shown in Figure 4. Three outfalls are covered under the facility's NPDES permit; they may all discharge to the LDW through Outfall No. 2024, or some may discharge to the city storm drain system. Figure 4 shows that stormwater from the eastern portion of the SCS Refrigerated Services facility discharges through Outfall No. 2024, and that stormwater along the northern edge of the facility discharges elsewhere. Perhaps stormwater drainage from the northern edge of the facility connects to the city storm drain system and discharges to the LDW through the South River Street SD, but the connection is not shown and its existence should be confirmed.

The SCS Refrigerated Services facility stormwater discharge is authorized under the Industrial Stormwater General Permit. Compliance with the SWPPP maintained by the facility will minimize the potential for contaminants to migrate to the LDW via stormwater. However, the facility's stormwater discharge has exceeded permit benchmark values for zinc, copper, and turbidity in the past, and a Stormwater Compliance Inspection conducted in May 2007 identified catch basins with accumulations of sediment requiring cleaning. Information was not available for review to determine whether benchmark values are no longer exceeded or whether catch basins are now kept clean.

Additionally, in 2006, LDW sediment sampling identified benzyl alcohol in surface sediment above SQS and CSL values at LDW-SS73, depicted in Figure 5. Benzyl alcohol was identified as a COC for RM 2.0-2.3 East, and is discussed in Section 3.2.1. Because LDW-SS73 is close to Outfall No. 2024, the source of benzyl alcohol at this location could be stormwater discharge from SCS Refrigerated Services.

Spills

Although no spills are known to have occurred at the facility, spills may be a potential pathway of contamination through both the facility's storm drain system as described above and through surface runoff, since the facility is directly adjacent to the LDW. Whether any spills have been documented at the facility is unknown.

Groundwater

Groundwater from the SCS Refrigerated Services facility likely flows toward the LDW. However, the file review revealed no reports of known soil or groundwater contamination at the SCS Refrigerated Services facility.

Bank Erosion

The SCS Refrigerated Services facility is on the east bank of the LDW; however, the information reviewed gave no indication as to whether or not there is a potential for bank erosion or leaching of near-bank soils to recontaminate LDW sediments. This potential needs to be assessed.

Atmospheric Deposition

The information reviewed gave no indication that any activities at the SCS Refrigerated Services facility may result in atmospheric deposition.

4.2.1.5 Data Gaps

The following data gaps have been identified for the SCS Refrigerated Services property. These data gaps must be addressed before effective source control can be accomplished for the RM 2.0-2.3 East source control area.

- Detailed information regarding current operations at the SCS Refrigerated Services facility is needed to determine the threat facility operations may pose to LDW sediments.
- Ecology should obtain a copy of the facility's SWPPP. Information is needed that describes the facility's storm drain system to determine whether stormwater discharge from the SCS Refrigerated Services facility could lead to sediment recontamination.
- The discharge point of storm drain lines along the northern edge of the facility is not known and should be determined.
- A Stormwater Compliance Inspection was performed at the facility on May 30, 2007. Ecology specified actions to be taken in response to zinc, copper, and turbidity exceedances of benchmark values in the facility's 2005 DMRs. Ecology also required that accumulated sediment be cleaned from catch basins and other areas. Ecology should verify whether SCS Refrigerated Services complied with Ecology's requests.
- More information on historical site use, such as dates of operation under the Paragon Boat Company or the concrete block factory, is needed to determine whether operations may have led to contamination of concern to LDW sediment recontamination.
- The possibility that bank erosion may be a pathway of contamination to LDW sediments should be investigated.

4.2.2 Seattle Distribution Center

Facility Summary: Seattle Distribution Center	
Address	6701 East Marginal Way South
Property Owner	CLPF-Seattle Distribution Center LP
Former/Alternative Property Names	N/A
Former/Alternative Addresses	6749 East Marginal Way South 6797 East Marginal Way South
Former/Alternative Lessee/Operator Names	See Section 4.2.2.1 below
Tax Parcel No.	5367204080
Parcel Size	6.96 acres
NPDES Permit No.	N/A
EPA RCRA ID No.	N/A
EPA TRI Facility ID No.	N/A
Ecology Facility/Site ID No.	N/A
Ecology UST Site ID No.	N/A
Ecology LUST Release ID No.	N/A
Listed on Ecology CSCSL	No

The Seattle Distribution Center is adjacent to the LDW on the east side at approximately RM 2.2. The property is bordered on the west by the SCS Refrigerated Services facility, the Slip 3 Inlet and the Glacier Marine Services facility. The property is bordered on the northeast by East Marginal Way South and on the south by South Brighton Street. Seattle Distribution Center is across South Brighton Street from the Shultz Distributing facility.

According to King County tax records, CLPF-Seattle Distribution Center LP purchased the property from Schnitzer Investment Corporation on August 25, 2004. The two buildings on the property are a 124,472-square-foot and a 50,065-square-foot distribution warehouse, both built in 1967 (King County 2007a).

4.2.2.1 Current Operations

The Seattle Distribution Center facility provides warehouses for distribution of products and houses a number of different tenants. The facility can be seen in Figure 6, an aerial photo of the Slip 3 Inlet area taken in July 2006. According to Ecology, in April 2002, the sign posted outside the Seattle Distribution Center listed tenants as Fujitec America, FSI (a Division of MBI Systems), Longview Fibre, Kasen Motorsports, Food Buying Service, Rosella's Fruit & Produce, Summit Brokerage, Hoa Ying Trading Corp., SCS Refrigerated Services, and Campbell Chain/Cooper Tools.

4.2.2.2 Historical Use

According to King County tax records, a two-story warehouse owned by Seattle Retail Lumber Company was constructed on the Seattle Distribution Center property in 1915. Seattle Retail Lumber Company also used a small house and garage constructed in 1937 and an existing frame warehouse remodeled in 1944. A three-story mill was also built in the 1940s. In 1969, all the above-mentioned buildings were torn down.

According to King County tax records, the Seattle Distribution Center property was owned by King County 1943 through 1945; lessees and operators at the property included B.W. Lockwood and Seattle Lumber Retail Company. Entities listed in association with the Seattle Distribution Center property include Alice L. Lockwood and Nellum Investment Corporation in 1966, and Schnitzer Investment Company apparently purchased the property from Farwest Capitol Company on October 10, 1969. Under Schnitzer Investment Company, Puget Sound Ice Manufacturing is listed in 1992-1993 records and D&J Property LLC is listed in 2004 in association with the property. CLPF-Seattle Distribution Center purchased the property from Schnitzer Investment Company in 2004.

4.2.2.3 Potential Pathways of Contamination

Stormwater

Figure 4 shows that the Seattle Distribution Center facility storm drain system discharges stormwater from the facility in multiple locations. In the northern portion of the property, the Seattle Distribution Center storm drain system connects to the SCS Refrigerated Services storm drain system and discharges to the LDW through the SCS Refrigerated Services' permitted private storm drain, Outfall No. 2024, discussed in Section 4.2.1. Although Figure 4 is not clear, to the south of Outfall No. 2024, it appears that the Seattle Distribution Center storm drain system may discharge to the Slip 3 Inlet through the facility's own private storm drain. Finally, at the southern end of the property, it appears that the Seattle Distribution Center storm drain system connects to the city's storm drain system and discharges to the LDW through the South Brighton Street CSO/SD. Figure 4 apparently shows that stormwater from the Seattle Distribution Center facility migrates to the LDW via multiple storm drain lines; however, information on existing contamination or operations at the facility that may create stormwater pollution was not found in the files for review.

Spills

Little is known about current operations at the Seattle Distribution Center facility. Since distribution of products requires trafficking by truck and railcar, spills may be a pathway of contamination. Furthermore, spills could migrate to the LDW both through the facility's storm drain system and through surface runoff, since the facility is directly adjacent to the LDW. However, no documentation pertaining to spills was found in the files for review.

Groundwater

Groundwater in the vicinity of the Seattle Distribution Center facility likely flows toward the LDW. However, no information was found in the files for review regarding known soil or groundwater contamination at the Seattle Distribution Center facility.

Bank Erosion

The northern end of the Seattle Distribution facility is on the east bank of the LDW; however, the information reviewed gave no indication as to whether or not there is a potential for bank erosion or leaching of near-bank soils to recontaminate LDW sediments. This potential needs to be assessed.

Atmospheric Deposition

The information reviewed gave no indication that any activities at the Seattle Distribution facility may result in atmospheric deposition.

4.2.2.4 Data Gaps

The following data gaps have been identified for the Seattle Distribution Center property. These data gaps must be addressed before effective source control can be accomplished for the RM 2.0-2.3 East source control area.

- Detailed information on current operations at the Seattle Distribution Center is needed to determine whether operations at the facility may pose a threat to LDW sediments.
- A description of the facility's storm drain system is needed to determine whether stormwater discharge from the Seattle Distribution facility could be of concern to sediment recontamination; most importantly, storm drain lines discharging to the LDW from the facility must be verified.
- Information on historical site use, particularly when the facility was in operation under Seattle Lumber Retail Company, is needed to determine whether historical operations at the property may have resulted in contamination of concern to LDW sediment recontamination.
- No environmental investigation, cleanup activities, or facility inspections are known to have been conducted at the Seattle Distribution Center facility. A facility inspection should be conducted to ensure that operations at the facility are not of concern to LDW sediments.
- Figure 4 apparently shows that the Seattle Distribution Center facility may discharge some of its stormwater through a private storm drain. The presence of this storm drain should be confirmed.
- Requiring the Seattle Distribution Center facility to have a NPDES permit should be investigated.
- The potential for bank erosion as a pathway of contamination to LDW sediments should be investigated.

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4.2.3 Glacier Marine Services

Facility Summary: Glacier Marine Services	
Address	6701 Fox Avenue South
Property Owner	Seatac Marine Properties LLC
Former/Alternative Property Names	Northland Services United Marine International United Marine Shipbuilding (UNIMAR) Evergreen Marine Leasing Marine Power & Equipment (MP&E) Reliable Transfer & Storage Peter Pan Seafoods
Former/Alternative Lessee/Operator Names	Johnson Manufacturing
Tax Parcel No.	0001800104 (north) 0001800128 (south)
Parcel Size	5.85 acres (north) 5.24 acres (south)
Former/Alternative Addresses	6751 Fox Avenue South (Parcel 0001800104) 6809 Fox Avenue South (Parcel 0001800128) 6803 Fox Avenue South (Parcel 0001800128)
NPDES Permit No.	SO3000962
EPA RCRA ID No.	WAD980977128 (inactive since 12/31/2004)
EPA TRI Facility ID No.	98108NTDMR6701F
Ecology Facility/Site ID No.	22653378
Ecology UST Site ID No.	11256
Ecology LUST Release ID No.	N/A
Listed on Ecology CSCSL	No

Glacier Marine Services is adjacent to the LDW on the east side, at approximately RM 2.2. The property is bordered on the north by the Slip 3 Inlet and on the west by the main channel of the LDW. Bunge Foods is immediately adjacent to the Glacier Marine Services property to the south. Fox Avenue South bounds the property on the east. East of Fox Avenue South is the Seattle Distribution Center and the Shultz Distributing facility. South Brighton Street intersects Fox Avenue South on the east side of the property; the South Brighton Street CSO/SD runs beneath the Glacier Marine Services property along the dividing line between the north and south parcels of the property, and discharges to the LDW below the dock of the Glacier Marine Services property.

According to King County tax records, the Glacier Marine Services property encompasses two tax parcels, 0001800104 and 0001800128. An address is not listed for parcel 0001800104; parcel 0001800128 is listed under the facility address of 6701 Fox Avenue South. Seatac Marine Properties LLC purchased both parcels from Fox Avenue LLC on December 29, 2004. Two structures are listed as located on tax parcel 0001800128, including a 44,100-square-foot industrial manufacturing building built in 1976 and a 2,112-square-foot office building built in 1994. No structures are listed for tax parcel 001800104 (King County 2007a).

The Glacier Marine Services facility, owned and operated by Seatac Marine Properties LLC operates under Industrial Stormwater General Permit No. SO3000962. Ownership of the permit was transferred from Northland Services to Seatac Marine Properties LLC effective January 1, 2005. The most recent available SWPPP for review was for Northland Services in 2001.

According to Ecology's files, both United Marine Shipbuilding and Northland Services operated under RCRA ID No. WAD980977128.

According to EPA's TRI database, in the 1988 Release Report and Waste Transfer Report, United Marine International disposed of 1,086,851 pounds of "copper compounds" off-site for solidification/stabilization (EPA 2007a).

According to Ecology's UST List, under Northland Services, two USTs have been removed from the Glacier Marine Services property. One UST stored between 111 and 1,100 gallons of unleaded gasoline; the capacity and contents of the second UST were not specified. In addition, a third UST was listed as exempt. UST removal dates are not listed (Ecology 2007e).

4.2.3.1 Current Operations

The facility currently in operation at the Seatac Marine Properties LLC-owned property is Glacier Marine Services. The most current facility layout is illustrated in Figure 8. The facility can also be seen in Figures 6 and 7, aerial photos of the Slip 3 Inlet area taken in July 2006.

The most recent information reviewed that describes current operations at the facility is from the 2001 SWPPP and Ecology's February 2002 Hazardous Waste Compliance Inspection Report. The SWPPP and inspection report were written when the facility was in operation as Northland Services. Ownership of Industrial Stormwater General Permit No. SO3000962 was transferred from Northland Services to Seatac Marine Services LLC in 2005. An updated SWPPP for Glacier Marine Services was not found in the files for review; however, information reviewed indicated that operations under Glacier Marine Services may be similar to Northland Services' past operations, which are summarized below in Section 4.2.3.2.

4.2.3.2 Historical Use

According to King County tax records, a shop building was constructed on tax parcel 0001800104 in 1926, and an office building was constructed in 1944. A machine shop was constructed on parcel 0001800104 in 1943 and remodeled in 1970. Ownership of the property at the time is not known; however, the office building and machine shop were leased by Johnson Manufacturing Company starting in 1944 and ending sometime in the late 1960s or early 1970s.

According to King County tax records, a concrete and aluminum building was constructed on tax parcel 0001800128 in 1910. The building had an address of 6809 Fox Avenue South, and served as a paint factory; an addition was added in 1955. An industrial manufacturing building was built on the parcel in 1976, and in 1994, an office building was built.

MP&E purchased parcel 0001800104 from Peter Pan Seafoods on October 6, 1977. Available information does not indicate when ownership under Peter Pan Seafoods began. At the time of purchase by MP&E, old shipways, a dock, an old manufacturing building and cranes were present on-site. Parcel 0001800128 was purchased from Reliable Transfer & Storage by MP&E on February 16, 1978. At the time of purchase, an old brick building was on-site (DMC 1979).

MP&E repaired and constructed ships on the property. According to Ecology, between 1981 and 1985, while MP&E was in operation at the property, at least 10 complaints were received in response to the facility shoveling, washing, or dumping sandblasting grit (possibly containing copper) into the river. The design of the drydock allowed blasting grit to enter the water regardless of tarping.

According to Ecology, in 1985, EPA Criminal Investigators conducted an investigation into practices at the MP&E facility. Surveillance was conducted over several months, which identified deliberate disposal of sandblasting grit into the LDW. On April 10, 1987, MP&E, its president and two vice presidents were sentenced in federal court. Information about this criminal investigation was not discovered until very late in the report-writing process, and the criminal investigation report was not available in the files for review; therefore, review of this report will be included as a data gap.

According to reports from Hazardous Waste Compliance Inspections conducted at the facility by Ecology in 1989, ownership of the property changed from MP&E to United Marine Shipbuilding (UNIMAR; also known as Evergreen Marine Leasing) on August 23, 1988. UNIMAR was in the process of ceasing operations during the inspections conducted March through May, 1989, and in May 1989, ownership of the property transferred from UNIMAR to First Interstate Bank due to defaulted loan payments (Cargill 1989).

According to King County tax records, Northland Services purchased both tax parcels from Evergreen Marine Leasing (otherwise known as UNIMAR, apparently under control of First Interstate Bank) on June 16, 1992 (King County 2007a).

Northland Services - Facility Operations

The Northland Services facility operated a marine shipping business, which moved cargo to and from destinations in southeastern Alaska, Anchorage, and western Alaska. The facility operations commonly included transporting fishing industry supplies, construction materials and equipment, and general re-supply items such as groceries, hardware, and vehicles. The facility also shipped frozen fish products from Alaska to Northland Services. The facility operations seldom included the transportation of hazardous waste. Northland Services also provided stevedore support for Samson Tug and Barge Company (Ecology 2002).

According to the 2001 SWPPP, most of the 9-acre site was concrete-covered. A 43,000-square-foot building housed most of the vehicle maintenance activities conducted on-site. As part of its operations, Northland Services conducted on-site fueling for its forklifts, which moved containers to and from the barges. Northland Services' fuel station was in the north central portion of the site and was supplied by two, single-compartment, 550-gallon aboveground storage tanks (ASTs) containing diesel fuel. Kerosene was also stored at the fuel island in a 55-gallon aboveground drum (Anchor 2001).

Northland Services - Storm Drain System

Figure 8 illustrates the Northland Services facility layout in 2001 with approximate catch basin locations depicted. Figure 9 illustrates the site layout in 1989, when the facility was owned and operated by MP&E; the MP&E storm drain and the city storm drain (South Brighton Street CSO/SD) lines are depicted. In 2001, most of the 9-acre site was concrete-covered and a portion of the facility was built over the LDW. Site topography was fairly level. According to the 2001

SWPPP, stormwater drainage from the western portion of the site flowed into numerous discharge points on-site and discharged directly into the LDW (apparently through the South Brighton Street CSO/SD line shown in Figures 9 and 4). These discharge points consisted of openings in the concrete surface that were covered with grates. Stormwater drainage from the eastern portion of the site was collected in catch basins that channeled the stormwater directly into the LDW (apparently through the South Brighton Street CSO/SD line shown in Figures 9 and 4, and through the MP&E storm drain line labeled "003" in Figure 9). Figure 4 shows that Outfall No. 2025 may correlate to the "003" storm drain line; however, this has not been confirmed. Northland Services' standard indoor plumbing and water discharge from its oil/water separator were connected to the local sanitary sewer system (Anchor 2001).

Northland Services - Potential Sources of Stormwater Pollutants

According to the 2001 SWPPP, potential sources of pollution at the Northland Services facility included (Anchor 2001):

- **Vehicle Fluids Handling and Cleaning:** Vehicle fluids were regularly changed at Northland Services. All vehicle maintenance work, including fluids changing, was conducted over one of two pits in the maintenance building. Each pit contained a sump into which fluids drained. Fluids were then pumped into the coalescing oil/water separator at the wash rack, where the oil and other contaminants were removed before the water was pumped into the sanitary sewer system. The oil/water separator was serviced routinely and records were kept on file for at least three years.
- **Refrigerator Container Repair and Maintenance:** Northland Services conducted on-site refrigeration maintenance service to repair and maintain its refrigerated containers. All container repair and maintenance was done inside the maintenance building and all materials used, such as Freon, were contained and recycled.
- **Generator Repair:** Generators were repaired immediately south of the maintenance building inside a container that had been converted into a workshop. Repair involved use of oils and solvents and may have included cleaning the generators. Oils and solvents were captured within the closed container.
- **Touch-up Painting of Barges and Containers:** Touch-up painting of small portions of barges was done in the dock area using rollers during dry weather only. Touch-up painting of containers using rollers was done in the maintenance building. No spray painting was done at the facility. Solvents were used to clean the paint materials, and this was generally done in the maintenance building.
- **Welding Handrails on Barges:** As part of Northland Services' general maintenance program, barge handrails were welded as needed.
- **Fueling:** Diesel was stored on-site in ASTs to fuel the forklifts and other support vehicles. The ASTs were located at the north-central portion of the site. An aboveground kerosene tank, consisting of a 55-gallon drum and 5-gallon pail containers, were also in this area. A propane tank was outside near the southeastern corner of the maintenance building. Spill response kits were kept near the fueling station at all times, and inventories were verified monthly. Because propane is a gas, any accidental release would have emitted pollutants to the air and not to storm or groundwater.

According to King County tax records, on April 7, 2004, Northland Services sold the two tax parcels to Fox Avenue LLC, and on December 29, 2004, Fox Avenue LLC sold both tax parcels to Seatac Marine Properties LLC (King County 2007a).

4.2.3.3 Environmental Investigations and Cleanup Activities

Fox Street/Slip 3 Sampling and Analysis, Marine Power & Equipment (1984)

On April 5, 1984, Metro sampled storm drain solids (referred to as sediment in the report) within the "Fox Street Drainage System." The sampling occurred at the "Fox Street storm drain," which from Figure 10 appears to contribute to the South Brighton Street CSO/SD line upland of the MP&E facility, and at the South Brighton Street CSO/SD outfall, from which MP&E and several other facilities within the South Brighton Street CSO Basin discharge stormwater. On April 18, 1984, Metro collected sediment and water samples from the LDW and sampled dock runoff from MP&E. Metro performed this sampling as part of the Duwamish Monitoring Program, to investigate heavy metal contamination in the vicinity of Slip 3. Figure 10 illustrates the sample locations: "Fox Street" (storm drain upland of MP&E facility), "below drain" (South Brighton Street CSO/SD and discharge from MP&E facility to the LDW), "east drydock" and "west drydock" (in Slip 3 adjacent to the MP&E facility to the north), "downstream" (at the synchrolift, downstream of the MP&E facility), "upriver" (upstream of the MP&E facility) and "dock runoff." Sample results are included in Appendix B; samples were analyzed for lead, arsenic, zinc, copper, cadmium, nickel, chromium, mercury, and oil & grease (Hubbard 1984).

The *Fox Street/Slip 3 Sampling and Analysis Report* (Hubbard 1984) includes hand-drawn locations on Figure 10 and hand-written sample results (Appendix B); the sample results are difficult to read and are unclear about which media was sampled at each location (river sediment or water), and contaminant concentration units are not provided. Sample results were compared to Four-Mile Rock Dredge Spoil Disposal Criteria throughout the report, apparently because sandblasting was known to occur at the MP&E facility, and sediment contaminated with sandblast waste normally exceeded Four-Mile Rock Dredge Spoil Disposal Criteria. Due to unclear data presentation in the report, sampling results are discussed qualitatively and in reference to the Four-Mile Rock Dredge Spoil Disposal Criteria as in the *Fox Street/Slip 3 Sampling and Analysis Report*; further analysis of the data or comparison of sample results to SMS values could not be performed with available information.

The *Fox Street/Slip 3 Sampling and Analysis Report* stated that concentrations of arsenic, cadmium, copper, lead, and zinc found in the storm drain system were among the highest found so far in the Duwamish Monitoring Program. The following conclusions were drawn (Hubbard 1984):

- Very high concentrations of heavy metals were found in storm drain solids collected from the facility storm drain system. Relatively elevated concentrations were also found immediately below its discharge to the LDW, compared to upstream and downstream LDW sediment samples. Very high concentrations of oil & grease were also found in the Fox Street storm drain.

- High concentrations of heavy metals were found in the sediment under both ends of the drydock and at the synchrolift.
- The relative concentrations of lead, arsenic, zinc, and copper in the sediment and water below the synchrolift corresponded very closely with runoff samples collected from the synchrolift.
- The relative concentrations in the Fox Street storm drain did not correspond to sediment samples at the "outfall" (presumably the South Brighton Street CSO/SD outfall), indicating additional inputs between the Fox Street storm drain and the outfall.
- All the samples taken in the facility storm drain system and in the river exceeded the Four-Mile Rock Dredge Spoil Disposal Criteria, but the upriver sample only slightly exceeded the criteria for arsenic.
- Small amounts of drydock material escaping into Slip 3 can cause the sediment to exceed the EPA criteria; almost any amount of drydock solids can cause arsenic and lead violations.

Metro recommended the following (Hubbard 1984):

- Further sampling of water and sediment of the "Fox Street drainage system" is necessary to determine sources of heavy metals and oil & grease.
- Sediment sampling results at the drydock and synchrolift should be evaluated, as it appears that MP&E runoff and drydock material are adversely impacting LDW sediments.

Storm Drain and Sediment Sampling, Marine Power & Equipment (1986)

In March 1986, Metro sampled storm drain solids (referred to as sediment in the report) from storm drains in the vicinity of the MP&E facility, and sediment from the LDW. Available information does not specify whether this sampling was performed specifically to supplement sampling performed in April 1984, discussed above. However, Metro supplied sampling results to EPA for use in its proceedings against MP&E (MP&E was under Federal indictment at the time of this sampling). Figure 11 illustrates sample locations #1 through #19. Sample location #1 appears to correlate with the "Fox Street" location on Figure 10, #2 is at a River Street storm drain, #3 is at a storm drain at the intersection of Fox Street and Willow Street; and #4 through # 8 appear to correlate with "below drain," "upriver," "downstream," "west drydock," and "east drydock," respectively, on Figure 10. Sample locations #9 and #10 appear to have been omitted, as they are not included in the sample results, which are included in Appendix B, and they are not visible on Figure 11. Sample locations #11 through #19 appear to be at catch basins across the MP&E facility. Samples were analyzed for arsenic, cadmium, chromium, copper, mercury, nickel, lead, and zinc; sample results at each location are included in Appendix B (Sample 1986).

An analysis of sample results was not included in available information, but Metro determined that sample results indicated that the MP&E facility was the main source of contamination to storm drains and sediment in the vicinity of Slip 3 (Sample 1986).

As follows, storm drain solids and sediment sample results are compared to SQS values. In order to make the comparison it is assumed that the concentrations provided in the report, and included in Appendix B, are in milligrams per kilogram (mg/kg) dry weight, as appropriate for heavy metals. Units are shown as "mg/kg", but are not specified as dry weight. SMS values are technically not applicable to storm drain solids since they are not considered sediments until washed out into the LDW; however, the comparison is made to put the sample results into context. In mg/kg DW, the SQS values are arsenic (57), cadmium (5.1), chromium (260), copper (390), mercury (0.41), lead (450) and zinc (410); there are no SMS values for nickel.

Storm drain sample locations upland from where the MP&E facility discharges to the storm drain system include sample location #2 (River Street storm drain, which was apparently sampled for "background" since it appears to discharge to the LDW through the South River Street SD, not through the South Brighton Street CSO/SD) and sample location #3, which does discharge to the LDW through the South Brighton Street CSO/SD. Sample location #1 is directly upland of the MP&E facility and downgradient of sample location #3, and discharges to the LDW through the South Brighton Street CSO/SD; MP&E stormwater appears to drain to this storm drain. Sample locations #11 through #19 are on MP&E property.

Results from sample location #2 exceeded SQS values for all of the heavy metals analyzed that are SMS compounds. Results in mg/kg were arsenic (183.3), cadmium (7.5), chromium (266.7), copper (466.7), mercury (0.45), lead (683.3), and zinc (1,300). Results (in mg/kg) from sample location #3 exceeded SQS values for arsenic (111.8), cadmium (6.2), mercury (0.56), lead (617.6), and zinc (852.9). From these sample results, it appears that the storm drain system is contaminated by heavy metals in the Slip 3 area in general; however, heavy metals concentrations detected in catch basins on MP&E property exceeded the SQS values by a considerably larger margin. At sample location #1, and at #11 through #19, concentrations that exceeded SQS values, with ranges in mg/kg, were arsenic (1,045.5 to 3,871), cadmium (6.7 to 18.6), copper (711.5 to 7,627), mercury (0.63 to 0.75), lead (730.8 to 1,891.3), and zinc (2,266.7 to 15,323). Chromium is the only heavy metal included in SMS that was not found in MP&E storm drains at concentrations exceeding SQS values.

Sediment sample locations include #4 (below the South Brighton Street CSO/SD), #5 (upriver of the MP&E facility), #6 (downstream of the MP&E facility), and #7 and #8 (at the west and east ends of the drydock). Arsenic and zinc exceeded SQS values at sample location #4, mercury exceeded the SQS value at sample location #5, arsenic and mercury exceeded SQS values at sample location #7, and arsenic and zinc exceeded SQS values at sample location #8. Samples from location # 6 did not exceed SQS values.

EPA Dive Survey and Sediment Sampling, Marine Power & Equipment (1987)

On February 6, 1987, EPA divers collected sediment samples from the LDW in the vicinity of the MP&E facility. On April 6, 1987, the EPA dive team investigated the amount and extent of sandblasting debris on the river bottom in the vicinity of the MP&E facility. Sediment sample locations are shown in Figure 12: 87060043 (south of synchrolift), 87060044 (lift end of synchrolift) and 87060045 (northwest corner of synchrolift). Sediment samples were analyzed for arsenic, cadmium, chromium, copper, lead, zinc, tin, iron, and mercury. In addition, a bioassay was conducted on sediments collected at each sample location (Matta 1987).

Laboratory analytical results were provided, but an analysis or conclusions were not provided in available information; therefore, sediment sample results are compared to SQS values. In mg/kg DW, the SQS values are arsenic (57), cadmium (5.1), chromium (260), copper (390), lead (450), zinc (410), and mercury (0.41). There are no SMS values for tin or iron. At sample location 87060043, copper at 410 mg/kg and zinc at 1,250 mg/kg exceeded the respective SQS values. At sample location 87060044, cadmium (11.6 mg/kg), copper (1,340 mg/kg), lead (539 mg/kg), and zinc (3,790 mg/kg) all exceeded the respective SQS values. At sample location 87060045, zinc (700 mg/kg) exceeded the SQS value.

The bioassay measured the response of the marine amphipod, *Rhepoxynius abronius*, to sediments collected from each of the three sample locations (87060043, 87060044, and 87060045). The test is not standard compared to current methods, and an interpretation of the raw data was not provided in available information. However, over the ten-day test period, amphipods placed in the LDW sediments had a survival rate ranging from 73 to 83 percent, compared to the 89 to 91.7 percent survival rate of amphipods placed in the control sediments (Matta 1987).

Results from the EPA dive survey of the river bottom in the vicinity of the MP&E facility stated that over the entire area investigated, only a light "dusting" of sandblasting grit was found near the west end of the synchrolift and drydock. The areas underneath the synchrolift and drydock were not investigated. EPA determined that, given the small amount of sandblasting grit found, removal was not necessary (Matta 1987).

UST Removal and Site Assessment, Northland Services (1993)

In October 1993, West Pac Environmental removed three USTs from the Northland Services facility and James P. Hurley Company (JPHC) prepared a *UST Site Assessment Report*. A 1,000-gallon gasoline UST, a 1,000-gallon diesel UST and a 500-gallon heating fuel UST were removed from the north yard of the property because they were no longer needed for operations. Thirteen soil samples were collected from the UST excavations and spoil piles and analyzed for total petroleum hydrocarbons. Locations of the three former USTs, two spoil piles, and soil sample locations are depicted in Figure 13 (JPHC 1993).

Total petroleum hydrocarbons were not detected in 11 of the 13 soil samples. Total petroleum hydrocarbons in the diesel-range (TPH-D) were found to be below the MTCA Method A cleanup level in one soil sample (Sample 3-2 collected from the southwest sidewall of UST 3, shown in Figure 13). One soil sample collected from the excavated spoil pile in the vicinity of the gasoline and diesel USTs (Sample SP1-1 in Figure 13) yielded a TPH concentration in the heavy-oil-range (TPH-O) of 220 parts per million (ppm), which was above the 1993 MTCA Method A cleanup level for TPH-O of 200 ppm (the current MTCA Method A cleanup level for industrial soil for TPH-O is 2,000 ppm) (JPHC 1993).

Since Sample SP1-1 exceeded the MTCA Method A cleanup level for TPH-O, West Pac Environmental isolated approximately 10 cubic yards of impacted soil for off-site disposal. The remaining stockpile soil was used to backfill the excavation. JPHC stated that the source of the TPH-O contamination was unknown; due to the condition of the USTs and the absence of free product or petroleum staining in the soil surrounding the former USTs, JPHC concluded that the source of contamination was unrelated to the USTs. Groundwater was not encountered within the limits of the UST excavation (JPHC 1993).

4.2.3.4 Facility Inspections

Hazardous Waste Compliance Inspections, United Marine Shipbuilding (March through May 1989)

On March 28, 1989, Ecology performed a Hazardous Waste Compliance Inspection at the Glacier Marine Services facility. At that time, the facility was in operation as UNIMAR, and Glacier Marine Services was in the process of ceasing operations; ownership of the property was being transferred from UNIMAR to First Interstate Bank. A layout of the facility in 1989 is illustrated in Figure 9. Ecology noted the following NPDES permit violations (Cargill 1989):

1. Sandblast grit was allowed to accumulate in an unacceptable manner; piles of sandblast grit were found on the north craneway adjacent to the synchrolift and not stored with the spent grit.

2. Liquid products, including potential hazardous substances and dangerous wastes, were not stored to prevent entry to waters of the state; unsealed drums and 5-gallon containers were not stored under cover behind dikes.

3. Stormwater contaminated with oil was found ponded and flowing to a catch basin that did not direct water through an oil/water separator for treatment.

4. Oil was spilled in the following locations:

    a) Onto land adjacent to the fuel pumps with no cleanup efforts apparent;

    b) From an Ingersoll-Rand air compressor between the synchrolift and north craneway;

    c) From a bilge slop tank to the paved area near the catch basin for discharge #007; and

    d) On land on the perimeter of the air compressor located at the southeast end of the large steel fabrication shop (appears to be referred to as "Maintenance Building" in Figure 8).

5. Dust and overspray from abrasive blasting of the barge on the synchrolift on March 28, 1989 was not controlled with structures or drapes.

6. Leaking water piping was noted in one of the synchrolift motor pits and at the fire station on the outfitting pier near the west end of the central craneway.

7. Spent sandblast debris and spent grit were not stored in a manner that prevented their entry or entry of leachate into receiving waters.

8. Solid waste, specifically oils and lubricants, were not handled in a manner that would prevent their entry into state ground and surface waters.

In addition, Ecology noted that the catch basin maintenance log stated that sorbent pads had been placed in all catch basins; however, during the inspection, three catch basins were observed with no pads in place. Ecology brought the above discrepancies to the attention of UNIMAR (Cargill 1989).

On April 26, 1989, Ecology performed a follow-up inspection to ensure that the violations had been addressed, but conditions indicated in Items 1, 2, 3, 6, 7, and 8 above remained the same. Additionally, Ecology noted the following violations (Cargill 1989):

9. The catch basin had not been inspected or cleaned since February; and

10. Hydraulic fluid and oil had been spilled near the northwest corner of the large steel fabrication shop on or about April 25, and had not yet been cleaned.

On May 2, 1989, Ecology conducted a second follow-up inspection; no changes were found in site conditions from the previous inspection. Ecology stenciled 59 full or partially full drums with a tracking number for laboratory analysis (Cargill 1989).

On May 23, 1989, a third follow-up inspection performed by Ecology found that the yard had been swept clean; however, there were still accumulations of sandblast grit in the synchrolift motor wells, as well as between and under conex boxes. While many of the drums and waste oil containers had been consolidated near the center craneway, 15 to 20 drums were still located in areas without dikes and without cover along the south craneway. There were still several 5-gallon containers of waste oils without covers. There was also a spill of heavy oil on the southern side of the new drum storage area near the center craneway. The oil was floating on ponded stormwater and in the tracks for the crane. No effort to contain or remove the oil was underway at the time of the inspection. The placement of the drums and the spill was discussed with the facility personnel, who stated that the spill would be cleaned immediately and the drums would be relocated under cover (Cargill 1989).

On May 24, 1989, a fourth follow-up inspection by Ecology confirmed that most of the spilled oil had been removed and that the drums located in the central yard had been moved into the large steel fabrication shop (Cargill 1989).

During the five inspections, Ecology documented numerous drums and pails of product and waste scattered across the facility. A few of the containers were labeled and appeared to contain useable product; however, the remainder were not labeled to indicate contents, risks, or accumulation date. Some drums were not closed, many were rusting, and some were bulging or punctured. The drums and pails that lacked adequate contents labels were assumed to be dangerous waste until laboratory analysis could confirm otherwise. Ecology provided the facility with steps to take to satisfy dangerous waste requirements and identified the following actions to be taken immediately (Cargill 1989):

1. Materials in containers with severe rusting, apparent structural defects, or leaking must be transferred to a container in good condition or overpacked.

2. Containers must be labeled with the material's major risks.
3. Containers not in use must be kept closed.
4. Containers must be stored in a covered area so they are protected from the elements, and containment (berms or dikes) must be sufficient to contain spills or leaks.
5. Ignitable or reactive wastes must be maintained in container storage equal to the Uniform Fire Code.

Ecology provided the facility with a list of actions required to preclude discharge of pollutants to waters of the state and to identify contaminated areas that may have required remedial action under MTCA. The following actions were ordered to be taken by the facility on April 26, 1989 (Cargill 1989):

1. All catch basins shall be cleaned of grit, dirt, and oily residue.
2. Storm sewer lines, including that portion of the municipal storm sewer which runs through the facility, should be cleaned in accordance with best industry practice, which may entail use of an eductor truck to flush sediments and oily residue from the lines. Dams should be placed in line downstream from the area being cleaned to prevent any discharge of sediments or wash water to surface waters of the state. All wastes generated should be collected, characterized, and properly disposed. If the waste solids do not classify as dangerous or extremely hazardous waste, they should be disposed of in a conforming, lined landfill, subject to the approval of the local health department with jurisdiction. Waste liquids should be disposed of to the sanitary sewer, subject to the approval, terms, and conditions of Metro.
3. Synchrolift hoist pits and other areas below the synchrolift deck where grit and dirt accumulate should be swept or vacuumed clean.
4. The yard, including areas between and under conex boxes and under and around other movable equipment and structures, should be swept or vacuumed clean of all grit, paint chips, and oil & grease.
5. Oils on paved surfaces should be cleaned with sorbent materials.
6. Soils contaminated with spent sandblast grit and debris, as well as petroleum, should be collected, characterized, and properly disposed in the same manner as wastes generated from storm sewer cleaning.
7. Fuel tanks must be pumped out and decommissioned in accordance with the requirements of the Seattle Fire Code.
8. Exposed soils near Slip 3 should be sampled, and, if necessary, remediated. Sampling and analysis must be in accordance with EPA and Ecology guidelines for collection, preservation, analysis, and quality assurance/quality control. A minimum of four soil samples should be taken and analyzed separately. Analysis of the samples should

include, but not be limited to, priority pollutant metals, organic and inorganic tin, TPHs, and polynuclear aromatic compounds.

9. Waste oils and lubricants must be stored and labeled, according to Ecology's specifications. Waste oils and lubricants must be disposed of in a manner that does not allow release or discharge of these materials to the environment.

10. Dangerous and extremely hazardous wastes must be handled and disposed of in accordance with WAC 173-303, Dangerous Waste Regulations.

Hazardous Waste Compliance Inspection, United Marine Shipbuilding (July 1989)

According to Ecology's files, an additional inspection was performed on July 6, 1989, at the Request of First Interstate Bank to determine what had been done to address the issues identified during the inspections described above and what remained to be accomplished. Hart Crowser had been hired to dispose of wastes left on-site and to perform a site assessment; Hart Crowser had planned to install a downgradient well to check for soil and groundwater contamination. Some oil-contaminated soil, small piles of grit, and improperly stored drums containing petroleum products remained at the property. First Interstate Bank and Ecology discussed cleaning the storm drains and catch basins, and methods of collecting sediment and wastewater to prevent discharge to the LDW. Information about this inspection was not discovered until very late in the report-writing process, and the inspection report was not available in the files for review; therefore, review of this report and any subsequent reports will be included as a data gap.

Hazardous Waste Compliance Inspection, Northland Services (February 2002)

On February 21, 2002, Ecology performed a Hazardous Waste Compliance Inspection at the former Northland Services facility. There was no hazardous waste on-site at the time; the facility infrequently handled hazardous waste. According to the Facility Manager, containers with regulated waste were moved to a designated hazardous waste storage area as they arrived. Pickup was arranged before the shipment was offloaded from ships. Generally the waste remained on-site two to three days before being picked up by the next transporter. Few issues were identified by Ecology during the inspection. Ecology recommended that efforts be made regularly to refresh employees on proper procedures (Ecology 2002).

4.2.3.5 Potential Pathways of Contamination

Stormwater

Figure 8 illustrates facility catch basin locations in 2001, when the facility was in operation as Northland Services, and Figure 9 illustrates storm drain lines at the facility in 1989, when the facility was in operation as MP&E. Figure 9 apparently shows that the facility discharged most of its stormwater directly to the LDW through the South Brighton Street CSO/SD, and some stormwater through the storm drain line labeled "003." Figure 4 indicates that "Outfall 2025 and Seep" may correlate to MP&E's storm drain 003.

Environmental investigations at the facility in operation as MP&E identified high concentrations of heavy metals (arsenic, chromium, cadmium, copper, mercury, lead and zinc), oil & grease in the facility's storm drain system. High concentrations of the same heavy metals were also present in dock runoff and sediments beneath the drydock and synchrolift. Inspections conducted following MP&E's operations at the facility identified several environmental concerns, including accumulations of sandblast grit, contaminated stormwater, spilled oil, improperly stored and labeled drums and containers, etc. These findings illustrate the significant role that stormwater pathways have had in the past for contaminants at the site to reach LDW sediments.

Ecology identified several cleanup actions to be taken at the site in 1989, including storm drain system cleaning. Although no major issues were identified during the February 2002 Hazardous Waste Compliance Inspection, documentation pertaining to the completion of the cleanup actions was not available in the files for review; most notably, it is not known whether the facility's storm drain system was cleaned.

GIS data provided by SPU from September 9, 2003, identified a seep at the location in Figure 4 labeled "Outfall 2025 and Seep," which is in the vicinity of the historical drydock and may correlate to the outfall from the storm drain line labeled "003" on Figure 9. In 2006, LDW sediment sampling identified contamination in the vicinity of Glacier Marine Services. COCs identified through sediment sampling within RM 2.0-2.3 East are discussed in Section 3.2.1; sediment sampling locations are shown in Figure 5 and samples with contaminant concentrations exceeding SQS and CSL values are presented in Tables 2 and 3. Most of the COCs identified for RM 2.0-2.3 East were found in subsurface sediment at LDW-SC37, which is adjacent to the Glacier Marine Services facility to the north. This area is in the vicinity of the historical drydock, the outfall from the storm drain line labeled as "003" on Figure 9, and the "Outfall 2025 and Seep" location shown in Figure 4. Heavy metal COCs identified at LDW-SC37 during environmental investigations conducted at MP&E included arsenic, lead, mercury, copper, and zinc. PCBs and several PAHs were also identified at LDW-SC37. Arsenic was also found in exceedance in surface sediment at LDW-SS77, also in the vicinity of the historical drydock, at the outfall from the storm drain line labeled "003" on Figure 9, and from the "Outfall 2025 and Seep" shown in Figure 4.

Based on available information, the Glacier Marine Services storm drain system does not pass through areas of known or suspected subsurface soil or groundwater contamination; however, the storm drain system has been known to contain high concentrations of heavy metals and oil & grease that discharged and may continue to discharge directly to the LDW. Although a current SWPPP was not available for review, Glacier Marine Services discharges stormwater under the Industrial Stormwater General Permit, and stormwater pollutants could still contribute to sediment recontamination within RM 2.0-2.3 East via the stormwater pathway.

Spills

Operations at the Glacier Marine Services facility could result in spills. Contaminated solids such as sandblasting grit and drydock solids could also migrate from the facility's surface directly into the LDW; this has happened historically. Spills or solids generated from facility operations could migrate to the LDW both through the facility's storm drain system and through surface runoff, since the facility is directly adjacent to the LDW.

Groundwater

Groundwater in the vicinity of the Glacier Marine Services facility likely flows to the north-northwest, toward the LDW. However, no information was available in the files for review regarding known soil or groundwater contamination at the Glacier Marine Services facility.

Bank Erosion

The Glacier Marine Services facility is on the east bank of the LDW; however, the information reviewed gave no indication as to whether or not there is a potential for bank erosion or leaching of near-bank soils to recontaminate LDW sediments. This potential needs to be assessed.

Atmospheric Deposition

The information reviewed gave no indication that any activities at the Glacier Marine Services facility may result in atmospheric deposition.

4.2.3.6 Data Gaps

The following data gaps have been identified for the Glacier Marine Services property. These data gaps must be addressed before effective source control can be accomplished for the RM 2.0-2.3 East source control area.

- Additional information detailing historical use at the Glacier Marine Services property is needed to determine whether past operations at the property would be of concern to sediment recontamination.
- Information regarding current operations at the Glacier Marine Services property is needed. The most recent available information regarding operations at the Glacier Marine Services facility is taken from the 2001 SWPPP and Ecology's February 2002 Hazardous Waste Compliance Inspection Report, when the facility was in operation as Northland Services. Ecology should obtain an updated SWPPP from Glacier Marine Services.
- The facility's storm drain system is not clearly described in the 2001 SWPPP. From Figure 9, it appears that the storm drain labeled "003" discharged to the Slip 3 Inlet in 1989, and from Figure 4, it appears that this discharge point may be the storm drain labeled "Outfall No. 2025 and Seep." A clear description of the facility's storm drain system is needed, and whether the facility discharges through "Outfall No. 2025" should be clarified.
- According to the 2001 SWPPP, vehicle maintenance work such as fluids changing is conducted over pits in the maintenance building. Fluids are then pumped through an oil/water separator and discharged to the sanitary sewer system. The facility's connection to the sanitary sewer system is not indicated in the files available for review and should be clarified.
- According to the 2001 SWPPP, touch-up painting of barges is conducted at the facility. Historically, sandblasting was performed at the property and was illegally disposed of in the LDW. Whether sanding, scraping, or sandblasting is currently performed at the

facility to prepare barges and ships for painting is not mentioned in the SWPPP and should be clarified.

- In 1985, EPA conducted a criminal investigation into the practices at the MP&E facility, which put MP&E under federal indictment in 1987. The criminal investigation report, referenced in Ecology's files as "U.S. EPA Office of Criminal Investigation, Report of Investigation 1985-1987," was not available in the files for review and should be reviewed. The outcome of the federal indictment should also be reviewed.
- The *Fox Street/Slip 3 Sampling and Analysis* was conducted in 1984, wherein sampling was conducted in the MP&E facility's storm drain system, and dock runoff and drydock solids were sampled. Heavy metals and oil & grease were found in the storm drain system, and runoff and drydock materials were found to be adversely impacting the LDW. However, due to the unclear presentation of data in the report, an appropriate analysis of the sample results could not be performed. The *Fox Street/Slip 3 Sampling and Analysis* data should be re-reviewed and it should be determined whether an appropriate follow-up investigation was conducted.
- The *Fox Street/Slip 3 Sampling and Analysis Report* stated that the U.S. Coast Guard collected drydock solids from the MP&E drydock in 1983. Heavy metal concentrations from these solids correlated closely with concentrations in sediment found below the west end of the drydock. The 1983 U.S. Coast Guard sampling data were not available in the files for review.
- Hazardous Waste Compliance Inspections conducted at the MP&E facility March through May 1989 identified numerous cleanup actions to be taken at the facility to address accumulations of sandblast grit, contaminated stormwater, spilled oil, and so forth. Although no major issues were identified during the February 2002 Hazardous Waste Compliance Inspection (the facility was in operation as Northland Services at the time), documentation pertaining to the completion of the cleanup actions was not available in the files for review. According to Ecology's files, an additional inspection was performed at the facility in July 1989 to evaluate cleanup that remained to be accomplished at the facility. This inspection report was not available for review in Ecology's files and should be reviewed to determine what cleanup actions were performed by MP&E.
- According to Ecology's files, after First Interstate Bank assumed control of the MP&E facility, Hart Crowser was hired to dispose of wastes left on-site and to perform a site assessment, including installation of a downgradient well to check for soil and groundwater contamination. Information pertaining to the work performed by Hart Crowser was not available in the files for review.
- According to Ecology's files, in a 1993 memo NOAA stated that in addition to high levels of arsenic, zinc, copper, and lead; high levels of high and low molecular weight polyaromatic hydrocarbons, dibenzofuran, phthalates, phenols, vinyl chloride, and so forth were found in the "Fox Street Drainage System." The memo, referenced in Ecology's files as "NOAA Memo Dated July 19, 1993, Subject: Fox Avenue South CSO/SD," was not available for review in Ecology's files and should be reviewed to identify potential additional sources of contamination to LDW sediments through the storm drain system.

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- The potential for bank erosion as a pathway of contamination to LDW sediments should be investigated.

4.3 Upland Facilities of Concern

4.3.1 V. Van Dyke

Facility Summary: V. Van Dyke	
Address	150 South River Street
Property Owner	V. Van Dyke, Inc./Doris Van Dyke
Former/Alternative Property Names	N/A
Former/Alternative Lessee/Operator Names	Mitchell Bros. Terminal Co. Pile Contractors, Inc. (gravel lot)
Former/Alternative Addresses	N/A
Tax Parcel No.	5367202270 5367202400 (gravel lot)
Parcel Size	0.77 acres 0.21 acres (gravel lot)
NPDES Permit No.	SO3000453
EPA RCRA ID No.	WAD988516779
EPA TRI Facility ID No.	N/A
Ecology Facility/Site ID No.	68427684
Ecology UST Site ID No.	12577
Ecology LUST Release ID No.	N/A
Listed on Ecology CSCSL	No

V. Van Dyke is located upland, on the east side of the LDW, at approximately RM 2.0. The property is bordered on the north by South Michigan Street, on the east by a building on the adjacent P.F. Industries property, on the south by South River Street, and on the west by Occidental Avenue; on the south side of South River Street is a gravel lot under the 1st Avenue South Bridge; the lot is also used by V. Van Dyke.

According to King County tax records, Doris Van Dyke has owned the property since at least 1989; however, property ownership information is unclear. According to King County tax records there are only two structures on the property: a 1,100-square-foot office building built in 1955 and a 2,800-square-foot equipment shed built in 1974. There are no structures on the gravel lot across Occidental Avenue under the 1st Avenue South Bridge (King County 2007a). The gravel lot is owned by V. Van Dyke, Inc., and is sub-leased to Pile Contractors (SPU 2007c).

The V. Van Dyke facility operates under Industrial Stormwater General Permit No. SO3002346, which was originally issued on December 18, 1992, and was last scheduled to expire on November 18, 2005. Permit renewal information was not available and the most current available SWPPP for review was from 1993, stamped as received from Ecology in 2001.

According to Ecology's UST List, six USTs have been removed from the property. Two of the USTs stored used/waste oil, one stored unleaded gasoline, and the remaining three stored unspecified substances. UST removal dates are not listed (Ecology 2007e).

4.3.1.1 Current Operations

V. Van Dyke is a trucking facility, mainly providing heavy hauling, truck storage, and maintenance. The most current available facility layout is illustrated in Figure 14, and a portion of the facility can be seen in Figure 6, which is an aerial photo of the Slip 3 Inlet area taken in July 2006. The property has an office building, two shop buildings, and a vehicle wash pad area. The large shop building is used for vehicle maintenance and repair, and the small shop building is used as a welding shop, sub-leased by Pile Contractors. The small shop building had been used to store waste, such as used oil (labeled "haz mat area" in Figure 15, and as storing used oil in Figure 16, referenced below). Scrap metal is stored outside in containment and under cover (Buss 1993 and SPU 2006).

V. Van Dyke stores trailers and other equipment, and conducts some maintenance in a gravel lot under 1st Avenue South Bridge, on the south side of Occidental Avenue South. Pile Contractors also sub-leases a portion of the gravel lot to store equipment parts and perform some repairs (Ecology 2006b and SPU 2007d).

Storm Drain System

V. Van Dyke's 1993 SWPPP does not include a description of the facility's storm drain system; however, a facility map and a sketch titled "Site Discharge Points" (provided as Figures 15 and 16) are included that illustrate four storm drains and a vehicle wash pad drain. Figure 16 provides a minimal illustration of the facility storm drain system, and notes that the "east drain" and the "southeast drain" have unknown discharge points (Buss 1993). The vehicle wash pad drain, shown in Figures 15 and 16, drains to the sanitary sewer (Ecology 1999). An additional drain was discovered on the west side of the "Haz Mat Area" (small shop building; see Figure 15) (Ecology 2007c). SPU gave V. Van Dyke permission to cap the drain (SPU 2007d), but whether the drain was actually capped is not known.

Potential Sources of Stormwater Pollutants

V. Van Dyke's 1993 SWPPP identifies potential stormwater pollutants, their locations of use within the facility, and their associated activity. Potential stormwater pollutants used in the "garage for vehicle maintenance" (apparently the large shop building) include acid and water, alkaline or corrosive battery fluid, antifreeze, battery acid, catalyst, cleaning solvents, lubricating oils, oil and water, paint (or varnish) remover or stripper, and paint thinner. Detergent is a potential stormwater pollutant used inside the "storage shed for vehicle maintenance." A potential stormwater pollutant used outside the shop for vehicle maintenance is waste (or slop) oil. Finally, a potential stormwater pollutant stored inside the "storage shed for facility maintenance" is weed killer (Buss 1993). However, the information reviewed did not indicate what type of weed killer was stored in the shed.

Activities that require use of BMPs include uncovered vehicle parking for 20 or more vehicles; washing or steam cleaning vehicles or equipment; fueling vehicles or equipment; storing raw materials, byproducts, or products of a manufacturing process outdoors; using pesticides, herbicides, or fertilizers; accumulating or managing used oil; and maintaining storm drains (Buss 1993).

4.3.1.2 Historical Use

A trucking facility has occupied the site since approximately 1955 (Adapt 2002). Mitchell Bros. Terminal Co. occupied the property until 2002, but the years of tenancy are not known (King County 2007a). Review of available information did not identify uses or ownership of the property prior to 1955.

4.3.1.3 Environmental Investigations and Cleanup Activities

Phase I Environmental Site Assessment, V. Van Dyke, Inc. (2002)

In September 2002, LSI Adapt (Adapt) conducted a *Phase I Environmental Site Assessment* (ESA). The *Phase I ESA* revealed that three USTs (mentioned in the introduction of Section 4.3.1) were reportedly removed from the V. Van Dyke property in 1988. The approximate location of the former USTs is shown in Figure 14. The company that removed the USTs reportedly did not observe any contamination and no soil sampling was conducted. The USTs were removed prior to current regulation requiring soil sampling to confirm a clean closure. Adapt stated that an undocumented release from the former USTs could have occurred unobserved during removal. Adapt also noted that there was an oil/water separator in the vehicle wash area, and that workers discovered heavy staining adjacent to the catch basin in the northeastern portion of the site. Adapt recommended that additional subsurface information be collected to evaluate the environmental liability associated with the former USTs, oil/water separator, and observed stained area near the catch basin (Adapt 2002).

Limited Phase II Environmental Site Assessment, V. Van Dyke, Inc. (2002)

In October 2002, Adapt conducted a *Limited Phase II ESA* to screen soil and groundwater beneath the property to verify the observed contaminants associated with past activities from former USTs and the fueling system and oil/water separator, and to verify the staining adjacent to the catch basin. Adapt advanced five borings (P-1 through P-5) to a depth of approximately 7 to 10 feet below ground surface (bgs) at locations shown in Figure 14. Soil and groundwater samples were collected at each location and analyzed for TPH in the gasoline-, diesel- and heavy-oil-range (TPH-G, TPH-D and TPH-O, respectively), with additional analysis for benzene, toluene, ethylbenzene, and total xylenes (BTEX) gasoline constituents. One soil sample (collected from P-3) was also analyzed for lead. Groundwater samples were additionally analyzed for VOCs (Adapt 2002).

Soil sampling results are shown in Figure 17. TPH-G and benzene were detected above MTCA Method A cleanup levels for industrial soil in a soil sample collected from P-3 at 4.5-5 feet; results were TPH-G (1,300 mg/kg) and benzene (0.097 mg/kg). In addition, toluene, ethylbenzene, and xylenes were detected above the standard laboratory reporting limits, but below MTCA Method A cleanup levels (Adapt 2002).

Groundwater was encountered from approximately 5 feet bgs in P1 to 8 feet in P3 and P5. Groundwater sampling results are shown in Figure 18. Gasoline-range petroleum hydrocarbons were found in groundwater beneath the former dispenser island and USTs pit above MTCA Method A cleanup levels for groundwater. At 7-11 feet in P-3, TPH-G was detected at 7,100 µg/L; also, at 7-11 feet in P-4, TPH-G was detected at 1,200 µg/L. Benzene (15 µg/L) was detected above MTCA Method A cleanup levels in P-3, collected from beneath the former dispenser island at 7-11 feet. Benzene beneath the former USTs was above laboratory reporting levels, but below MTCA Method A cleanup levels. Ethylbenzene and xylenes were found in groundwater samples collected from P-3 and P-4 above standard laboratory detection limits, but below MTCA Method A cleanup levels. In addition, acetone and 1,2,4-trimethylbenzene were identified in a groundwater sample collected from P-5 above standard laboratory detection limits, but below MTCA Method A cleanup levels. No petroleum hydrocarbons were exhibited in groundwater samples collected from P-1 and P-2, which were in the vicinity of the catch basin and oil/water separator, respectively (Adapt 2002).

During the *Limited Phase II ESA,* Adapt was given anecdotal information about two additional USTs that were closed in place beneath the southern shop building, and Adapt observed two holes in the floor of the southern shop building. According to V. Van Dyke, the two USTs were closed in place beneath the shop building by Glacier Environmental on September 24, 2002. The USTs were reportedly used for lube and waste oil storage. Analytical results from the soil sampling beneath the USTs after they were cleaned and rinsed indicated that diesel- and heavy oil-range petroleum hydrocarbons and noncarcinogenic polynuclear hydrocarbons were detected in the soil samples, but the concentrations did not exceed MTCA Method A cleanup levels. Adapt concluded that no further actions were warranted regarding the two decommissioned USTs (Adapt 2002).

The results of the *Limited Phase II ESA* indicated a historical release of petroleum hydrocarbons to on-site soil and groundwater in the vicinity of the former USTs and fueling island shown in Figure 14. Adapt concluded that contamination appeared limited; however, possible down-gradient-impacted areas remained undefined. Based on existing data, the impacted soil zone appeared to extend from approximately 4 feet to 10 feet beneath the former dispenser island, and from approximately 7 feet to 8.5 feet beneath the former USTs. Adapt stated that the lateral extent of the impacted soil was unknown and that it was possible, based on existing data, that some contamination was present beneath the existing office or carport approximately 20 feet to the southwest. Contaminated groundwater appeared to be present beneath the former dispenser island and USTs and appeared to extend to the south and southwest at least 15 to 20 feet. Adapt determined that impacted groundwater appeared to be localized to the vicinity of the former dispenser island and USTs; however, it was possible that impacted groundwater had migrated beneath the office and carport. Adapt recommended additional subsurface characterization to evaluate downgradient migration of petroleum-impacted groundwater off-site (Adapt 2002).

Groundwater Monitoring Well Installation and 1st Quarter Groundwater Quality Monitoring Report, V. Van Dyke Inc. (2003)

In December 2002, groundwater monitoring wells were installed and sampled in an attempt to evaluate the potential for observed on-site petroleum hydrocarbons in soil and groundwater to migrate off-site, and to delineate the lateral extent of the observed petroleum impacts. Four monitoring wells (MW-1 through MW-4) were installed to depths ranging from 14 to 15 feet bgs at locations depicted in Figure 14. Soil and groundwater samples were collected at each location and analyzed for gasoline-range petroleum hydrocarbons and BTEX (Adapt 2003).

Groundwater was encountered at depths ranging from approximately 6.5 feet bgs in MW-4 to 7.5 feet bgs in MW-2 at the time of drilling. Subsequent groundwater measurements indicated groundwater levels at approximately 4 to 5 feet below the top of casing. Based on observed water levels, groundwater flow direction appeared to fluctuate toward the north, northeast, and east. Adapt determined that, based on observed water levels and the close proximity to the LDW, groundwater flow directions beneath the property may be tidally influenced (Adapt 2003).

Gasoline-range hydrocarbons and BTEX compounds were not exhibited above laboratory detection levels in any of the soil samples collected. In addition, no gasoline-range hydrocarbons or BTEX compounds were detected above standard laboratory reporting limits in any of the four monitoring well groundwater samples. Adapt concluded that the petroleum hydrocarbon contamination identified in the vicinity of the former UST pit did not appear to have migrated off-site. Adapt suggested continued quarterly groundwater monitoring to develop a remediation strategy and to prepare for requesting site closure from Ecology (Adapt 2003).

4.3.1.4 Facility Inspections

Stormwater Compliance Inspection, V. Van Dyke Facility (June 1999)

On June 15, 1999, Ecology conducted a Stormwater Compliance Inspection, prompted by a diesel/oil-water mixture spill that had been discovered at the unfenced gravel lot across Occidental Avenue on June 2, 1999. The spill was presumably overnight dumping. Approximately 31 gallons of spilled material at the surface was placed in drums and disposed of off-site. Absorbents were used to soak up remaining spilled material. Contaminated ground material was hauled and disposed of off-site. To prevent stormwater contact, adjacent storm drains were cleaned (Ecology 1999).

Ecology noted that the "truck area" (which appears to be the "vehicle wash" area in Figure 16) was covered and drained to the sanitary sewer. In general the property was orderly with the following exceptions (Ecology 1999):

1. A number of 55-gallon drums containing vegetable oil on the east side of the "storage shed" (appears to be "storage" in Figure 15 and "tool shed" in Figure 16)

2. Two 5-gallon buckets of hydraulic oil in the same area

3. Two 5-gallon buckets of hydraulic oil south of the "storage shed"

4. Two 55-gallon drums of used engine oil under the roof attached to the south side of the storage shed

5. Two 55-gallon drums of unused lube oil also under the roof (spillage was apparent)

6. A 75-gallon portable fuel tank placed such that it was not under the roof

7. Two grout pumps, each of which were leaking hydraulic oil

8. A track crane belonging to "the piling company" (apparently Pile Contractors) was parked across the street and was leaking hydraulic oil

Based on the above observations, Ecology noted the following concerns and recommendations (Ecology 1999):

1. To prevent oil contamination of stormwater, the basic BMP of cover and containment must be implemented. Ecology stated that the containers listed in Items 1, 2, and 6 (above) were not under cover but should have been. Also, oil stains were evident in the area around the "storage shed." Ecology recommended that some of the contaminated soils near the southeast corner of the storage shed be cleaned up and legally disposed.

2. Ecology stated that the equipment listed in Items 7 and 8 was leaking and advised a designated parking area. Absorbent pads were in use, but were not performing adequately; Ecology suggested using drip pans for better control.

Joint Inspection and Stormwater Compliance Inspection, V. Van Dyke Facility (December 2006)

On December 1, 2006, SPU conducted a Joint Inspection as part of an SPU and King County Industrial Waste (KCIW) joint program that aims to help businesses reduce the amount of pollutants discharged to the LDW via the storm drain system and CSOs. Ecology conducted a Stormwater Compliance Inspection, prompted mainly by questionable reporting in the facility's DMRs.

Ecology was concerned about the frequent use of "No Qualifying Event" classifiers on the facility's DMRs, as the permit now allows for sampling during storm events of any size. V. Van Dyke said they had recently become aware of the modification and had begun sampling in accordance with the new condition. During the review of the facility's files, and contrary to the DMRs on Ecology's database, there were actual data for the first quarter of 2005, showing that zinc exceeded the benchmark value of 117 μg/L with a reading of 147 μg/L, oil & grease exceeded the benchmark value of 15 milligrams per liter (mg/L) with a reading of 20.2 mg/L, and turbidity exceeded the benchmark value of 25 NTUs with a reading of 64 NTUs. Also, according to the DMRs in Ecology's database, in the second quarter of 2004, zinc and oil & grease exceeded the benchmark values with readings of 351 μg/L and 55 NTUs, respectively (Ecology 2006c).

V. Van Dyke was questioned about complaints SPU had received about vehicle washing at the gravel lot across the street. V. Van Dyke assured SPU that vehicles are only washed on the vehicle wash pad on the main property. V. Van Dyke stated that it had repeatedly reported to the city of Seattle that drivers of unidentified trucks were changing their oil on South River Street, allowing oil to discharge to V. Van Dyke's stormwater monitoring location (Ecology 2006c). The following observations were made by Ecology during the Stormwater Compliance Inspection at the main V. Van Dyke property (Ecology 2006c):

1. The covered vehicle wash pad seemed appropriately graded and bermed to prevent stormwater contamination.

2. Oil sheens and caked oily buildup were noted in several locations on the property.

3. The “southeastern storm drain” (appears to be “southeast drain” in Figure 16) was fitted with filter fabric, but the fabric needed replacement because it was surrounded by a large buildup of sediment.

4. The “northeastern storm drain” (appears to be “east drain” in Figure 16) was near the door to the “Haz Mat Area” (as labeled in Figure 15; also labeled as “Shop #2” in Figure 14, and as “Used Oil” in Figure 16). Although an awning extended from the “Haz Mat Area” door, it covered only half of the equipment stored below (hoses, metal cable, assorted metal parts, and oily equipment). Additionally, multiple 55-gallon drums were stored exposed, and their contents were unobvious. The “northeastern storm drain” had no filter fabric, was partially blocked by a metal weight, and was surrounded by a large buildup of sediment.

5. The storm drain along the western perimeter (appears to be “west drain” in Figure 16, since the drain located in the vehicle wash pad area connects to the sanitary sewer) was fitted with filter fabric. A large buildup of sediment was observed surrounding the catch basin.

6. Another drain, with a grate similar to the monitoring point storm drain, was on the west side of the “Haz Mat Area.” This drain was not labeled on the SWPPP figure (Figure 15). Ecology stated that the facility should identify the drainage on-site and document the discharge location.

7. Some on-site equipment had evidence of leaking fluids.

8. There was exposed metal equipment stored along the base of the “Haz Mat Area” and along the eastern perimeter of the property. One outdoor storage rack had been covered with a tarp, which was heavily weathered.

The following additional observations were made by Ecology during the Stormwater Compliance Inspection at the gravel lot across Occidental Avenue, used by V. Van Dyke mainly for trailer storage (Ecology 2006c):

1. There was evidence of minor leaking from equipment throughout the lot. Specifically, a large piece of equipment whose leaking fluids were noted in the report from the last Stormwater Compliance Inspection performed on June 15, 1999 (described above) continued to leak fluids.

2. A sheen was observed in the stormwater flowing from the parcel into a catch basin along Occidental Avenue.

Based on the above observations, Ecology made the following recommendations (Ecology 2006c):

1. Change the stormwater sampling location to the “southeastern storm drain” because it would better represent stormwater associated with the facility’s operations.

2. Identify where the drain on the west side of the “Haz Mat Area” discharges, and update that information in the SWPPP.

3. Barrels and other liquid chemicals should be stored in secondary containment and under cover to prevent accidental spills.

4. DMRs submitted from the third quarter of 2004 through the third quarter of 2006 show that no samples were taken due to "no qualifying storm event." Although V. Van Dyke's industrial stormwater permit requires that a quarterly sample be taken based on specific storm criteria, if the specific storm criteria cannot be met that quarter, a sample must still be taken. If it did not rain in a quarter, a DMR must still be submitted with an explanation of why a sample was not taken.

5. Sample results above benchmark values prompt a Level One Response by the permittee. Copies of the results of these Level One Responses should be included with the DMR, as well as kept with the SWPPP.

6. Good housekeeping practices should be implemented on-site to reduce stormwater pollution potential from items such as stored leaky barrels and equipment. Monitor, maintain, and cover machinery stored outdoors to make sure fluid leaks are not contaminating soils or stormwater.

7. Maintain all catch basin socks to reduce contaminants entering the storm drains. Ecology also suggested removing the sediment buildup from around the storm drains, since the buildup could reduce turbidity of the facility's discharge, which past DMRs have shown to be above benchmark levels.

SPU identified the following required corrective actions to be addressed by V. Van Dyke (SPU 2006e):

1. Obtain spill containment and clean-up materials, state the location of the materials in the spill plan, and place the materials in an easily accessible location, clearly marked "Spill Kit."

2. Clean the catch basins identified for cleaning (appear to be "east drain" and "southeast drain" in Figure 16). Accumulated material within 18 inches of the bottom of the lowest pipe entering or exiting the structure must be removed and disposed of properly.

3. Label drums and containers that are stored outside. If the drum is empty, indicate so on the outside of the drum.

4. Use absorbent pads, granular sorbent, or rags to clean up leaks and spills as they occur. During the inspection, leaking equipment was observed in the leased space across from the V. Van Dyke property.

Joint Inspection (Follow-Up), V. Van Dyke Facility (February 2007)

On February 16, 2007, SPU conducted a follow-up Joint Inspection to ensure that the required corrective actions identified above had been completed. The following observations were made (SPU 2007b):

1. Catch basins were cleaned and filter fabric was installed.

2. A spill kit was placed in the shed next to the vehicle wash pad with a sign outside informing workers of the spill kit inside.

3. Drums that were next to the "welding shed" (assumed to be the "Haz Mat Area" referred to during previous inspection) were removed.

4. There was an "inlet" by the "welding shed" that did not seem to connect to anything (assumed to be the additional storm drain discovered on the west side of the "Haz Mat Area" during the previous inspection); SPU gave V. Van Dyke permission to cap it.

Joint Inspection (Follow-Up), V. Van Dyke Facility (March 2007)

On March 7, 2007, SPU conducted another follow-up Joint Inspection to ensure that the remaining corrective actions identified during previous inspections had been completed. The V. Van Dyke facility was then concluded by SPU to be in compliance (SPU 2007c).

Joint Inspection, Pile Contractors (March 2007)

Also on March 7, 2007, SPU conducted a Joint Inspection of Pile Contractors, following discovery during the Joint Inspection at V. Van Dyke that in addition to Pile Contractors sub-leasing space in the gravel lot under 1st Avenue South Bridge to store equipment parts and perform some repairs, Pile Contractors also sub-leased the small shop building on V. Van Dyke's main property for welding. SPU identified the following required corrective actions to be addressed by V. Van Dyke (SPU 2007d):

1. As a sub-leaser from V. Van Dyke, Inc., Pile Contractors must comply with the same operational source control requirement under V. Van Dyke's Department of Ecology Stormwater Permit.

2. Complete a written spill plan and post at appropriate locations at the facility (repair shop and outside equipment storage areas). Pile Contractors' operations include one or more of the high-risk pollution-generating activities listed in SMC 22.800. Accordingly, Pile Contractors must implement a spill plan.

3. Obtain spill containment and clean-up materials, state the location of the materials in the spill plan, and set out the materials in an easily accessible location, clearly marked "Spill Kit."

4. Educate employees about the spill plan and kit.

Joint Inspection (Follow-Up), Pile Contractors (April 2007)

On April 13, 2007, SPU conducted another follow-up Joint Inspection to ensure that the remaining corrective actions identified during previous inspections had been completed. Pile Contractors submitted a spill plan and stated that it will be using V. Van Dyke's spill kit, in the storage shed on the property. SPU concluded that Pile Contractors was now in compliance (SPU 2007e).

4.3.1.5 Potential Pathways of Contamination

Stormwater

V. Van Dyke's storm drain system is shown in Figures 15 and 16. Figure 4 apparently shows the storm drain system connects to the city's storm drain system and discharges to the LDW via the South River Street SD.

The V. Van Dyke facility discharges to the city storm drain system under the Industrial Stormwater General Permit. Although facility operations could be a source of stormwater pollution, a SWPPP is implemented, BMPs are employed to minimize the potential, and discharge monitoring is conducted. In addition, several inspections have been performed at the facility as discussed in Section 4.3.1.4 to address multiple stormwater pollution concerns at the property. However, the facility's stormwater discharge has exceeded permit benchmark values for zinc, oil & grease, and turbidity in the past, and stormwater pollutants could still discharge to the LDW within RM 2.0-2.3 East via the stormwater pathway.

V. Van Dyke's storm drain system does not appear to pass through petroleum hydrocarbon soil and groundwater contamination that exists in the vicinity of the former dispenser island and USTs (Figure 14). Figure 4 apparently shows storm drain lines at the facility pass to the east and north of the former dispenser island and USTs; however, according to the *Limited Phase II ESA*, the extent of soil and groundwater contamination is not clearly defined, and the facility's storm drain system is not clearly understood; at least two storm drains have unknown discharge points, and one storm drain may or may not have been taken offline. Therefore, soil and groundwater contamination at the property could infiltrate the storm drain system and discharge to the LDW within RM 2.0-2.3 East via the stormwater pathway.

Groundwater

In December 2002, Adapt determined that the groundwater flow direction at the V. Van Dyke property fluctuated toward the north, northeast, and east, and that groundwater flow directions appeared to be tidally influenced by the LDW.

In November 2002, Adapt discovered that soil and groundwater in the vicinity of the former dispenser island and USTs (Figure 14) contained concentrations of benzene and gasoline-range petroleum hydrocarbons above MTCA Method A cleanup levels. In December 2002, four monitoring wells were installed downgradient of the existing contamination on the property. Soil and groundwater samples from these wells indicated that the contamination had not migrated off-site. Continued quarterly groundwater monitoring was recommended, but whether it was completed and what the results were are not known.

Groundwater at the property has not been documented to flow toward the LDW, but groundwater has been documented to flow toward the LDW at nearby properties. Groundwater flowing from the V. Van Dyke property then most likely migrates to the LDW at least occasionally depending on tidal influences. Therefore, groundwater contamination could discharge to the LDW within RM 2.0-2.3 East via the groundwater pathway. Although the sampling from the monitoring well installations in 2002 did not indicate that groundwater contamination is migrating off-site, it is not certain this remains true. Quarterly groundwater monitoring is necessary to assess overall concentration stability and trends.

Spills

Operations at the V. Van Dyke facility could result in spills. However, since the facility is not adjacent to the LDW, spills could only reach the LDW via the stormwater pathway, discussed above. As discussed in Section 4.3.1.4 a spill of a diesel/oil-water mixture was discovered at the gravel lot across from the main V. Van Dyke property in June of 1999. However, the spill was apparently from overnight dumping, and existing information indicated the spill was handled properly.

Bank Erosion

The V. Van Dyke facility is not located along the banks of the LDW; therefore, bank erosion/leaching is not a potential pathway for contamination to reach LDW sediments.

Atmospheric Deposition

The information reviewed gave no indication that any activities at the V. Van Dyke facility may result in atmospheric deposition; therefore, atmospheric deposition is not considered to be a potential pathway for contamination to reach LDW sediments.

4.3.1.6 Data Gaps

The following data gaps have been identified for the V. Van Dyke property. These data gaps should be addressed before effective source control can be accomplished for the RM 2.0-2.3 East source control area.

- King County tax records show Doris Van Dyke has owned the property since at least 1989, but property ownership information is unclear; it appears that Doris Van Dyke owned the property before 1989, but it is not known for how long. Mitchell Bros. Terminal Co. was a tenant and may have owned the property for an unknown time ending in 2002. A trucking facility, presumably V. Van Dyke, has been thought to occupy the property since 1955; however, research for additional historical use information is needed to determine if site operations in the past may have been of concern to sediment recontamination.
- According to Ecology’s UST List, six USTs have been removed from the V. Van Dyke property; however, only five USTs were documented as removed from the property based on information available for review, three in 1988, and two (by Glacier Environmental) in 2002. This discrepancy should be resolved to assure an additional UST was not removed from the property without clean closure.
- According to the SWPPP available for review (from 1993), two storm drains had unknown discharge points; in addition, storm drain lines and connections to the city storm drain system were not identified. Furthermore, SPU reportedly gave V. Van Dyke permission to cap an additional drain discovered on the west side of the small shop building, but whether this was completed is not known. Finally, Figure 4 apparently

shows that storm drain lines at the facility pass to the east and north of the petroleum hydrocarbon soil and groundwater contamination that exists in the vicinity of the former dispenser island and USTs, and discharge to the LDW via the South River Street SD. More information is needed regarding the V. Van Dyke storm drain system and connection to the city storm drain system to determine whether contamination could pose a threat to LDW sediments via the stormwater pathway. In addition, Ecology should obtain an updated SWPPP from V. Van Dyke. The updated SWPPP should include more detailed information (e.g., Material Safety Data Sheets) about the types of fluids and products stored which may pose a threat to LDW sediments in the event of a spill.

- Discharge monitoring at the facility has been of concern to Ecology in the past, with numerous "No Qualifying Event" classifiers listed, and exceedances of permit benchmark values for zinc, oil & grease, and turbidity. DMRs for V. Van Dyke facility should be reviewed to ensure the facility has remained in compliance.
- In-line storm drain sampling may be needed within the V. Van Dyke storm drain system to determine whether contamination at the property could migrate to the LDW via the stormwater pathway.
- Adapt determined groundwater contaminated with petroleum hydrocarbons located in the vicinity of the former dispenser island and USTs was not likely migrating offsite; however, the extent of soil and groundwater contamination remains undefined. The extent of contamination is important in considering whether contaminants could possibly infiltrate the facility's storm drain system and migrate to the LDW via the stormwater pathway.
- Although Adapt determined groundwater contamination was not migrating off-site based on the first quarter of groundwater monitoring, Adapt suggested continued quarterly monitoring to characterize overall groundwater quality stability and trends. Whether quarterly monitoring was continued is unknown, but monitoring is important to ensure groundwater contamination is not migrating off-site.
- Adapt stated that groundwater flow direction at the V. Van Dyke property appeared to fluctuate toward the north, northwest, and east. Groundwater flow direction is important in considering whether groundwater contamination might migrate to the LDW. Adapt suggested that additional monitoring may be needed to document tidal effects on the groundwater flow beneath the property. Whether additional monitoring was performed to characterize tidal effects on groundwater flow direction is not known.

4.3.2 Riverside Industrial Park

Facility Summary: Riverside Industrial Park	
Address	6533 3rd Avenue South (shop building) 220 South River Street (office building)
Property Owner	Riverside Industrial Park LLC
Former/Alternative Property Names	Carmody Property
Former/Alternative Lessee/Operator Names (Shop Building)	LK Comstock Lion Trucking Dispatch (mezzanine) Big John's Truck Repair Highway Enterprises Royal Truck Repair Kurt's Enterprises Vacuum Truck Services
Former/Alternative Addresses	N/A
Tax Parcel No.	5367202200
Parcel Size	0.54 acres
NPDES Permit No.	N/A
EPA RCRA ID No.	WAD988519781 (inactive since 12/31/1998) and WAD021817796 (inactive since 4/18/1988)
EPA TRI Facility ID No.	N/A
Ecology Facility/Site ID No.	44383713 and 37289288
Ecology UST Site ID No.	97212
Ecology LUST Release ID No.	499583
Listed on Ecology CSCSL	Yes
Ecology VCP ID No.	NW1946 NW0350 (old)

The Riverside Industrial Park property is upland on the east side of the LDW at approximately RM 2.0. The property is bordered on the north by an asphalt-paved, fenced-in parking lot; Rosa's Apparel Manufacturing is north of the parking lot. An unpaved extension of 3rd Avenue South bounds the property to the east; across this road is a fenced-in storage yard containing truck trailers and steel beams. South River Street bounds the property to the south; across this road is the SCS Refrigerated Services property. A warehouse occupied by Elegant Stone, a building stone distributor, is immediately west of the southern portion of the Riverside Industrial Park property and south of the northwestern portion of the property. The northwestern portion of the property is bounded by 2nd Avenue South; across this road is a warehouse occupied by P.F. Industries and the J. L. Henderson Company (EAI 1999c).

According to King County tax records, Riverside Industrial Park LLC purchased the property from Carmody, W.F. and Patricia B. on January 5, 2000. The two structures on the property include a 6,764-square-foot manufacturing (shop) building and an 8,640-square-foot office building, both built in 1957 (King County 2007a).

The Riverside Industrial Park office building is listed under the 220 South River Street address, while the shop building is listed under the 6533 3rd Avenue South address. The shop building is the building of concern on the property. The most recent occupant of the shop building (not including the mezzanine) was Big John's Truck Repair, with similar businesses before that.

Big John's Truck Repair was first known to occupy the shop building in 1994; however, the year Big John's Truck Repair began operations is not known. Big John's Truck Repair occupied the shop building until sometime between November 1997 (when the *Phase I Environmental Audit and Limited Sampling* was performed) and May 1999 (when the *Tank Removal, Site Assessment and Cleanup Report* was completed). The latter of these two reports indicated the shop area was vacant at that time. As of May 1999, Lion Trucking Dispatch occupied the mezzanine of the shop building, and residents of the office building included the manufacturer's representatives of Carmody Co. and Hardesty & Co. (EAI 1999c). According to Ecology, LK Comstock, a subcontractor for Seattle's Sound Transit Light Rail System Project, currently occupies the shop building at 6533 3rd Avenue South (most likely the mezzanine) as of May 2008.

The Riverside Industrial Park property tax parcel is listed on the King County Property Tax Records Database (King County 2007a) under the 220 South River Street address. In the Facility/Site Database (Ecology 2007a), Big John's Truck Repair (Facility Site ID No. 44383713) is listed under the 6533 3rd Avenue South address, and Vacuum Truck Services (Facility Site ID No. 37289288) is listed under the 220 South River Street address. Apparently the shop building was occupied by Vacuum Truck Services prior to Big John's Truck Repair, and the office building address was used for site identification, rather than the shop building address.

Big John's Truck Repair is listed on Ecology's Hazardous Waste Facility Search Database (Ecology 2007d) with RCRA Site ID No. WAD988519781 (inactive since 12/31/1998) and Vacuum Truck Services is listed with RCRA Site ID No. WAD021817796 (inactive since 4/18/1988).

Vacuum Truck Services (Facility Site ID No. 37289288) is listed on Ecology's UST List with UST Site ID No. 97212. Three USTs were closed in place, discussed in Section 4.3.2.2 below. Vacuum Truck Services is also listed on Ecology's LUST List with Release ID No. 499583. Cleanup following the LUST release started on October 26, 1998 (Ecology 2007e).

Big John's Truck Repair (Facility Site ID No. 44383713) was entered onto Ecology's CSCSL on October 18, 1999, and is listed as having confirmed groundwater and soil contamination. Contaminants in groundwater are identified as non-halogenated solvents. Contaminants in soil are identified as petroleum products. Ecology's status on this site is listed as "awaiting site hazard assessment" (Ecology 2007e).

Big John's Truck Repair (Facility Site ID No. 44383713) is registered in the Voluntary Cleanup Program (VCP) (EPA 2007b).

4.3.2.1 Current Operations

The most current available facility map and surrounding area is illustrated in Figure 19, and a portion of the facility can be seen in Figure 6, which is an aerial photo of the Slip 3 Inlet area taken in July 2006. As of May 1999, the shop building was vacant, other than commercial use by Lion Trucking Dispatch in the mezzanine. The office building was used commercially by the manufacturing representatives of Carmody Co. and Hardesty & Co. (EAI 1999c).

According to Ecology, LK Comstock, a subcontractor for Seattle's Sound Transit Light Rail System Project, currently occupies the shop building at 6533 3rd Avenue South (most likely the mezzanine) as of May 2008. Whether the main area of the shop building is still vacant, or if the office building is still used commercially by the manufacturing representatives of Carmody Co. and Hardesty & Co., is not known.

According to the *Phase I Environmental Audit and Limited Sampling Report*, storm drain service is provided to the office building at 220 South River Street, but not to the shop building at 6533 3rd Avenue South, which reportedly connected to the sanitary sewer when the shop building was in operation (EAI 1997).

4.3.2.2 Historical Use

Environmental Associates, Inc., (EAI) completed a *Phase I Environmental Audit and Limited Sampling* of the Riverside Industrial Park property in December 1997. Aerial photographs were reviewed from 1936 through 1995. Residential dwellings were visible on the property from 1936 through 1956. The Riverside Industrial Park property was commercially developed in 1957, the year that the office building and manufacturing (shop) building were built (EAI 1997).

According to the *Phase I Environmental Audit and Limited Sampling Report,* Theodore B. Mullen purchased the property in 1956 and ownership changed in 1974, when W.F. and Patricia B. Carmody purchased the property. Several businesses have operated out of the shop building and/or office building since 1957, and are summarized in the table below through 1999. Property use since 1999 is not known, other than LK Comstock's current occupation of the mezzanine of the shop building. In the table below, some businesses listed under the office address appear to have actually operated out of the shop building; the shop building appears to have been vacant until at least 1981-1983, when apparently Kurt's Enterprises (truck repair) and/or Vacuum Truck Services (cleaner of ships) occupied the property. Kurt's Enterprises was listed as occupying the property in 1986, Royal Truck Repair was listed in 1990, and Highway Enterprises was listed in 1994 (EAI 1997).

Also according to the *Phase I Environmental Audit and Limited Sampling Report,* three 1,000-gallon diesel fuel USTs were closed in place east of the shop building in 1988. In February 1994, Big John's Truck Repair (formerly Highway Enterprises) was a registered generator of mineral spirits, oil, cadmium, and lead, and the estimated quantity of wastes generated was 134 pounds per month (EAI 1997).

Review of the above-mentioned reports indicates that Big John's Truck Repair was in operation at the Riverside Industrial Park shop building beginning in 1994 and vacated the building sometime in 1998.

Historical Businesses: Riverside Industrial Park		
Year	**Address**	**Businesses Listed**
1958 and 1960	6533 3rd Avenue South 220 South River Street	Vacant S.S. Mullen, Inc., building contractors
1965 and 1970	220 South River Street	S.S. Mullen, Inc.
1975	220 South River Street	Carmody Company, manufacturer's representative
1980	220 South River Street	Carmody Co. Hardesty & Company, manufacturer's representative Pacer Corporation, manufacturer's representative
1981 and 1983	220 South River Street	Carmody Co. Hardesty & Co. Kurt's Enterprises, truck repair H.R. Zilmer Distributors, manufacturer's representative Stars on the Sea, fire alarm sales Vacuum Truck Service, cleaner of ships McGrane Electrical, sales Cassidy Associates, Inc., manufacturer's representative
1986	220 South River Street	Carmody Co. Hardesty & Co. Kurt's Enterprises H.R. Zilmer Distributors Tool Engineering Company Jackson Willis Company
1990	220 South River Street	Carmody Co. Hardesty & Co. H.R. Zilmer Distributors Gifford and Associates, food manufacturers B.A. Barnes, Inc., accounting M.D. Fabre & Associates, architects and engineering Royal Truck Repair, Inc.
1994	6533 3rd Avenue South 220 South River Street	Highway Enterprises, Inc., trucking company Big John's Truck Repair Carmody Co. Hardesty & Co. Gifford and Associates
1999	6533 3rd Avenue South 220 South River Street	Vacant (shop area) Lion Trucking Dispatch (mezzanine) Carmody Co. Hardesty & Co.

4.3.2.3 Environmental Investigations and Cleanup Activities

Environmental investigations and cleanup activities were conducted at the Riverside Industrial Park property from 1997 through 1999 to address petroleum contamination discovered in soil and groundwater. Past releases from three USTs and an associated fuel dispenser island appear to be the main source of contamination at the property; these sources were removed in 1998. Quarterly groundwater monitoring was performed at the property in 1999.

Phase I Environmental Audit and Limited Sampling, Carmody Property (1997)

In December 1997, EAI conducted a *Phase I Environmental Audit and Limited Sampling* of the property to evaluate its potential sale. To make a preliminary evaluation of subsurface conditions at the property, three soil/floor drain solids samples were obtained, one from each of the floor drains in the shop building (north and south drain) and one from approximately 4 feet northwest of the diesel fuel AST on the west side of the shop building at a depth of approximately 6 inches. Figure 19 illustrates the three sample locations (7472-1 through 7472-3). Each sample was analyzed for TPH-G, TPH-D, TPH-O, and BTEX gasoline constituents. Analysis was also conducted for the presence of halogenated VOCs (also referred to as chlorinated solvents) in each sample (EAI 1997).

Sample results identified concentrations of TPH-D and TPH-O above MTCA Level A cleanup levels for industrial soil in all three samples. TPH-G was also detected at concentrations exceeding the MTCA Method A cleanup levels in each of the floor drain solids samples (7472-1 and 7472-2). Sample 7472-1 also yielded concentrations of ethylbenzene and total xylenes that exceeded MTCA Method A cleanup levels. Trichloroethene was detected at a concentration equivalent to the MTCA Method A cleanup level in sample 7472-1 and tetrachloroethene was detected above the MTCA Method A cleanup level in sample 7472-2 (EAI 1997).

In addition to the diesel fuel AST and two floor drains, EAI identified several other concerns at the property, including three diesel fuel USTs closed in place east of the shop building, several 55-gallon drums, and surficial oil stains on soil and on the concrete floor in the shop building. EAI concluded that the extent of contamination was unknown and suggested additional subsurface sampling to define lateral and vertical extents of contamination (EAI 1997).

Phase II Subsurface Exploration, Carmody Property (1998)

In April 1998, Geotech Consultants conducted a *Phase II Subsurface Exploration* of the property for the property owner at the time (Mr. Thomas Carmody) to further assess contamination discovered during the *Phase I Environmental Audit and Limited Sampling*. Geotech Consultants completed seven soil borings across the property (B1 through B7) at locations shown in Figure 20. Soil samples were collected at each location and groundwater samples were collected where groundwater was encountered. Each sample was analyzed for TPH-G, TPH-D, TPH-O, and BTEX gasoline constituents (Geotech 1998).

Sample results indicated soil downgradient from the three inactive USTs (B1 and B3) contained TPH-G, TPH-D, and TPH-O as well as BTEX compounds (benzene and xylenes) above MTCA Method A cleanup levels for industrial soil. Groundwater was discovered in this area at approximately 7 feet bgs and appeared to be similarly contaminated. Geotech Consultants determined that the contaminated soil extended from near the ground surface to approximately 7 to 9 feet in depth, covered roughly 30 feet (north-south) wide, and might extend beneath the shop building. Geotech Consultants recommended excavating contaminated soils and disposing them off-site (Geotech 1998).

Soil analyzed in the vicinity of the two floor drains (B4 and B5) and in the outdoor storage area (B6 and B7) contained no detectable concentrations of petroleum or halogenated hydrocarbons. Geotech Consultants noted that previously identified contamination was most likely limited to solids inside the floor drains and to stained soils near the surface in the outdoor storage area. Geotech Consultants recommended the floor drains be cleaned out by a licensed disposal company, and that an inspection be completed to check for ruptures or breaks in the drain walls, as well as to confirm the drains connection to the sanitary sewer (Geotech 1998).

Tank Removal, Site Assessment, and Cleanup Report, Carmody Property (1999)

In October 1998, to address the contamination discovered through the Phase I and II investigations described above, EAI completed removal of the three approximately 1,000-gallon capacity gasoline and diesel fuel USTs, an associated fuel dispenser island, the two shop floor drains, a floor drain outfall, and the approximately 500-gallon heating-oil AST. Petroleum-contaminated soil was excavated and disposed of off-site, and excavation floor and sidewall sampling was performed. In February 1999, EAI completed four groundwater monitoring wells (MW1 through MW-4) and performed groundwater sampling. Figure 21 illustrates the extent of each of the excavations and the locations of soil samples and groundwater monitoring wells (EAI 1999c).

While the USTs did not appear to contain any leakage points, physical evidence (odors and soil discoloration) indicated past releases of gasoline and diesel fuel into soils adjacent to the filler pipes and tanks. In addition, field screening and later laboratory analysis indicated that soils beneath the fuel-dispenser island contained gasoline and diesel fuel contaminants. Field screening indicated that oils near the heating-oil AST did not contain petroleum contaminants; this was later confirmed through laboratory analysis of soil adjacent to the tank (EAI 1999c).

Approximately 425 cy of soil contaminated with gasoline, gasoline-associated BTEX, and diesel/heavy oil was excavated from the tank pits, floor drain areas, floor drain outfall area, and surficial (extending from ground surface to approximately 2.5 feet bgs) release areas near the northwest and northeast corners of the shop building. An undetermined volume of petroleum-contaminated soil was left in-place below the east and west foundations of the shop structure and below the northeast corner of the adjacent “Elegant Stone” warehouse structure due to concerns about the proximity of the excavation sidewalls to the building foundation walls. EAI determined that the remaining contaminated soil posed little or no threat to human health or the environment due to current site use and because the soil was encapsulated by the shop building and warehouse structure and quarterly groundwater monitoring was planned (EAI 1999c).

Following contaminated soil excavation and additional excavation performed within the two shop building floor drain excavations in March 1999, results of samples obtained from the floor and sidewall areas of the cleanup excavations indicated that soil remaining in the excavation areas contained no detectable concentrations of petroleum contaminants exceeding MTCA Method A cleanup levels for industrial soil for gasoline, BTEX, diesel & oil, total lead, or halogenated organic compounds (EAI 1999c).

In February 1999, EAI returned to the property and installed groundwater monitoring wells MW-1 through MW-4 (shown in Figure 21), each to a depth of approximately 15 feet. Groundwater samples were collected from each well and sampled for TPH-G, BTEX gasoline constituents, TPH-D, and TPH-O.

Measurements of the groundwater table following the installation of monitoring wells revealed that shallow groundwater was present at approximately 5 to 6 feet bgs, and the gradient was very gentle (approximately 0.2 percent) with inferred groundwater flow being from the north-northeast toward the south-southwest, as shown in Figure 21 (EAI 1999c).

Concentrations of TPH-G, benzene, ethylbenzene, and xylenes were detected above Method A cleanup levels for groundwater at MW-1; results in parts per billion (ppb) were 2,700, 5.5, 46, and 137, respectively. EAI determined that gasoline-contaminated groundwater detected at MW-1 most likely would not migrate off-site, as groundwater sampled from MW-2 (downgradient from MW-1) did not reveal the presence of gasoline-range petroleum hydrocarbons or gasoline-associated BTEX constituents. However, EAI recommended sampling and testing groundwater for at least three more quarters to assess overall stability and trends (EAI 1999c).

Phase II Subsurface Soil and Groundwater Investigation, Carmody Property (1999)

In June 1999, PBS Environmental, Inc., completed a subsurface investigation of the property to identify the approximate lateral and vertical extent of potential petroleum-contaminated soil and groundwater remaining beneath the concrete slab of the shop building. PBS Environmental completed seven borings (SB-1 through SB-7) from 9 to 12 feet bgs at locations shown in Figure 22. Soil samples were collected at each location and two groundwater samples were collected (from SB-3 and SB-6). Each sample was analyzed for gasoline, stoddard solvent/mineral spirits, kensol (a series of refined petroleum products), kerosene/jet fuel, diesel/fuel oil, bunker C, and heavy oil (PBS 1999).

Groundwater was encountered in three borings from 11 to 12 feet bgs. Petroleum hydrocarbons were not detected in any soil or groundwater sample. PBS Environmental stated that the residual diesel-range contamination that remained in the sidewall of the former UST pit adjacent to the building did not appear to have migrated a significant distance beneath the shop building, and that continued quarterly monitoring of the existing wells would assess the groundwater quality for overall stability and trends (PBS 1999).

2nd and 3rd Quarter Groundwater Sampling and Testing, Carmody Property (1999)

In May and October 1999, EAI sampled the four existing monitoring wells in a second and third quarter of groundwater sampling, as was recommended during the *Tank Removal, Site Assessment, and Cleanup* to assess the groundwater quality for overall stability and trends. As in the first quarter (conducted during the *Tank Removal, Site Assessment, and Cleanup)*, groundwater samples were collected from each well (MW-1 through MW-4, see Figure 21) and analyzed for TPH-G, BTEX gasoline constituents, TPH-D, and TPH-O (EAI 1999b and EAI 1999a).

Shallow groundwater was encountered at approximately 3 feet bgs during both the second and third quarters. Groundwater appeared to be flowing generally from the north-northeast toward the south-southwest during both quarters, as was found during the first quarter.

During the second quarter, benzene was detected at 11 ppb at MW-2, which exceeded the MTCA Method A cleanup level (EAI 1999b). During the third quarter, no concentrations of gasoline-range petroleum hydrocarbons or associated BTEX constituents or diesel/oil-range petroleum contaminants were detected in groundwater from monitoring wells MW-1 through MW-4 at levels exceeding the MTCA Method A cleanup levels (EAI 1999a).

No Further Action Determination Review (2000)

In December 1999, Ecology visited the Riverside Industrial Park property to observe site conditions and reviewed the reports discussed above. Ecology determined that an NFA could be issued for soil and groundwater if two additional rounds of groundwater samples collected from MW-2 showed that contaminant levels are below MTCA Method A groundwater cleanup levels, demonstrating that groundwater has not been adversely affected by the soil contamination remaining near the former fuel USTs and dispenser island. A restrictive covenant prepared by Ecology would also need to be filed with the King County Tax Assessor's Office. In addition to the groundwater sampling and restrictive covenant, the owners of the adjacent "Elegant Stone" warehouse would need to be notified that contaminant concentrations above MTCA Method A cleanup levels for petroleum hydrocarbons were discovered below the northern portion of their warehouse (Trejo 2000).

4.3.2.4 Potential Pathways of Contamination

Stormwater

During the December 1997, *Phase I Environmental Audit and Limited Sampling* of the Riverside Industrial Park property, discussed in detail in Section 4.3.2.3, two floor drains (north and south) were identified in the shop building that lacked oil/water separators. A floor drain solid sample was collected from the 6 inches of solids buildup in each drain, and concentrations of TPH-G, TPH-D, TPH-O, ethylbenzene, total xylenes, trichloroethene, and tetrachloroethene were found in exceedance of MTCA Method A cleanup levels for industrial soil in one or both samples. EAI stated that the shop building was reportedly connected to the sanitary sewer system rather than to the storm drain system; however, Big John's Truck Repair could not confirm that the two floor drains were connected to the sanitary sewer. Reportedly, storm drain service was provided to the office building at 220 South River Street, but not to the shop building at 6533 3rd Avenue South (EAI 1997).

During the April 1998 *Phase II Subsurface Exploration* of the property, soil near the two floor drains (B4 and B5) and in the outdoor storage area (B6 and B7) was analyzed and found to contain no detectable concentrations of petroleum or halogenated hydrocarbons. Geotech Consultants noted that previously identified contamination was most likely limited to solids inside the floor drains and to stained soils near the surface in the outdoor storage area. Geotech Consultants recommended the floor drains be cleaned out by a licensed disposal company and that an inspection be completed to check for rupture or breaks in the drain walls and to confirm the drains' connection to the sanitary sewer (Geotech 1998).

During the October 1998 *Tank Removal, Site Assessment, and Cleanup* of the property, EAI removed and over-excavated the two shop floor drains. Results of samples obtained from the floor and sidewall areas of the cleanup excavations indicated that soil remaining in the excavation areas contained no detectable concentrations of petroleum contaminants exceeding MTCA Method A cleanup levels for industrial soil for gasoline, BTEX, diesel & oil, total lead, or halogenated organic compounds (EAI 1999c).

To fully assess the potential for sediment recontamination via the stormwater pathway, more information is needed describing Riverside Industrial Park's storm drain system. Operations have discontinued at the shop building, but petroleum contamination was found in former storm drain solids. These contaminated solids may have migrated to the LDW within RM 2.0-2.3 East if the former shop building floor drains were not connected to the sanitary sewer system. In addition, the city storm drain system is known to serve the office building at 220 South River Street. Figure 4 indicates that storm drain lines might run between the shop building and the office building, possibly through areas where contaminated soil has been excavated (Figure 21), and discharge to the LDW via the South River Street SD. Petroleum contaminated soil and groundwater remaining at the property could infiltrate the storm drain system and discharge to the LDW within RM 2.0-2.3 East via the stormwater pathway.

Groundwater

The topography near the Riverside Industrial Park property is level, with site elevations about 10 feet above mean sea level. Published geologic literature indicates the site is underlain by glacial till, which is a dense mixture of silt, sand, and gravel. During the April 1998 *Phase II Subsurface Exploration* of the property, soils consisting of dark brown, silty, medium- to fine-grained sand with gravel were found at depths from 2 to 7 feet bgs. Wet to saturated soils were encountered at approximately 6 to 7 feet bgs, with native, dense, silty sand encountered at 9 feet bgs (PBS 1999). Through several investigations described in Section 4.3.2.3, groundwater was typically encountered between 3 and 7 feet bgs flowing generally from the north-northeast to the south-southwest.

Quarterly groundwater monitoring was conducted at the Riverside Industrial Park property in February, May, and June 1999. In February 1999, following the October 1998 *Tank Removal, Site Assessment, and Cleanup* of the property, and included within that report, the first quarter of groundwater sampling was performed. Concentrations of TPH-G, benzene, ethylbenzene, and xylenes were detected above MTCA Method A cleanup levels for groundwater at MW-1. EAI determined that gasoline-contaminated groundwater detected at MW-1 (associated with the former three USTs and fuel dispenser island) most likely would not migrate off-site, as groundwater sampled from MW-2 (downgradient from MW-1) did not reveal the presence of gasoline-range petroleum hydrocarbons or gasoline-associated BTEX constituents. However, in May 1999 during the second quarter of groundwater sampling, benzene was detected at a concentration above MTCA Method A cleanup levels for groundwater at MW-2. In June 1999, no concentrations of gasoline-range petroleum hydrocarbons or associated BTEX constituents or diesel/oil-range petroleum contaminants were detected in groundwater from monitoring wells MW-1 through MW-4 at levels exceeding the MTCA Method A cleanup levels.

In December 1999, Ecology determined that an NFA could be issued for soil and groundwater if two additional rounds of groundwater samples collected from MW-2 showed contaminant levels below MTCA Method A groundwater cleanup levels.

To fully assess the potential for sediment recontamination via the groundwater pathway, additional groundwater monitoring data are needed, as determined by Ecology during the NFA review. Groundwater has been documented to flow directly toward the Slip 3 Inlet of the LDW (Figures 21 and 22), within RM 2.0-2.3 East; therefore, potential petroleum groundwater contamination remaining at the property could discharge to the LDW within RM 2.0-2.3 East via the groundwater pathway.

Spills

Spills are not considered a potential pathway for contamination to reach LDW sediments since the shop building is vacant. No activities are known to occur at the Riverside Industrial Park property that may result in spills.

Bank Erosion

The Riverside Industrial Park property is not located along the banks of the LDW; therefore, bank erosion/leaching is not a potential pathway for contamination to reach LDW sediments.

Atmospheric Deposition

The information reviewed gave no indication that any activities at the Riverside Industrial Park property may result in atmospheric deposition. Therefore, atmospheric deposition is not considered a potential pathway for contamination to reach LDW sediments within RM 2.0-2.3 East since the shop building is vacant.

4.3.2.5 Data Gaps

The following data gaps have been identified for the Riverside Industrial Park property. These should be addressed to facilitate effective source control for the RM 2.0-2.3 East source control area.

- Big John’s Truck Repair occupied the Riverside Industrial Park property shop building from 1994 to 1998. Prior lessees of the shop building included Highway Enterprises, Royal Truck Repair, Kurt’s Enterprises, and Vacuum Truck Services. However, site addresses for the shop and office buildings have been intermixed and the years of operation under each lessee is unclear. Little information was available describing facility operations by Big John’s Truck Repair or any other lessee. Research on additional historical use information is needed to determine if lessees other than Big John’s Truck Repair may have conducted activities at the property that concern sediment recontamination.
- Other than LK Comstock’s current occupation of the shop building, businesses in operation at the Riverside Industrial Park property since 1999 are not known. Presumably LK Comstock conducts business out of the mezzanine of the shop building, and the main area of the shop building has remained vacant since Big John’s Truck Repair ended operations around 1998, but this should be confirmed. Operations at the Riverside Industrial Park property since 1999 should be investigated and clarified.

- An undetermined volume of petroleum-contaminated soil was left in-place below the northeast corner of the Elegant Stone warehouse building (on the adjacent parcel to the west) due to concerns about the proximity of the excavation sidewalls at the Riverside Industrial Park property to the warehouse building foundation walls. It is unknown whether the former property owner, Mr. Carmody, has notified the Elegant Stone facility of the contamination that was discovered beneath the warehouse, or whether investigations have addressed the contamination. This data gap needs to be filled to determine whether remaining contamination poses a threat to LDW sediments through the groundwater or stormwater pathways.
- Apparently the shop building was formerly connected to the sanitary sewer. Storm drain solids were found in the two floor drains that have since been excavated. The facility should be inspected to confirm that the shop building was not connected to the city storm drain system. If it was connected to the city storm drain system, it is not clear whether any contamination remaining in the abandoned drain could still pose a threat to LDW sediments through the stormwater or groundwater pathway.
- While the office building itself was connected to the sanitary sewer, apparently the office building portion of the property connects to the city storm drain system. Figure 4 appears to show that storm drain lines run between the shop building and the office building, possibly through areas where contaminated soil has been excavated (Figure 21), and discharge to the LDW via the South River Street SD. More information is needed about the Riverside Industrial Park storm drain system to determine whether contamination could pose a threat to LDW sediments through the stormwater pathway.
- Ecology determined that an NFA could be issued for soil and groundwater at the Riverside Industrial Park property if two additional rounds of groundwater samples collected from MW-2 show that contaminant levels are below MTCA Method A groundwater cleanup levels. Whether this sampling was performed is unknown, but sampling is important to properly assess the potential of contaminated groundwater discharge from the property to LDW sediments.
- Additional information was received from Ecology late in the report-writing process, indicating that the former owner of the facility, Mr. Leon Cohen, submitted a new VCP application for LK Comstock, the business currently in operation at the shop building. The new VCP application created the new VCP ID No. NW1946, and is currently in review by Ecology. Follow-up should be conducted on the outcome of the VCP application review.

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4.3.3 Shultz Distributing

The Shultz Distributing property is upland on the east side of the LDW at approximately RM 2.3. The property is bordered on the north by South Brighton Street; north of which is the Seattle Distribution Center property, and on the south by South Willow Street, across from which is the Cascade Columbia Distribution property. East Marginal Way South bounds the property to the east, and Fox Avenue South bounds the property to the west. Railroad tracks run adjacent to the facility to the east and west. The Glacier Marine Services property is west of the Shultz Distributing facility, separating the Shultz Distributing facility from the LDW.

Facility Summary: Shultz Distributing	
Address	6851 East Marginal Way South
Property Owner	Emerson Enterprises LLC
Former/Alternative Property Names	Emerson GM Diesel
Former/Alternative Lessee/Operator Names	N/A
Former/Alternative Addresses	N/A
Tax Parcel No.	0001800159
Parcel Size	2.79 acres
NPDES Permit No.	SO3002346
EPA RCRA ID No.	WAD009492877 (inactive since 12/31/2003)
EPA TRI Facility ID No.	N/A
Ecology Facility/Site ID No.	95498891
Ecology UST Site ID No.	1391
Ecology LUST Release ID No.	N/A
Listed on Ecology CSCSL	No

The property was leased to Shultz Distributing in 1996. Shultz Distributing installed multiple ASTs on the property (Terra Vac and Floyd & Snider 2000). According to King County tax records, Emerson Enterprises LLC purchased the property from Delbert M. and Veronica Emerson on May 22, 1998. Four structures are on the property: a 27,800-square-foot industrial manufacturing building built in 1965, a 9,585-square-foot industrial manufacturing building built in 1940, a 19,092-square-foot industrial manufacturing building built in 1922, and a 3,750-square-foot industrial manufacturing building built in 1974 (King County 2007a).

The Shultz Distributing facility operates under Industrial Stormwater General Permit No. SO3002346, originally issued on December 18, 1995 and last scheduled to expire on November 18, 2005. Permit renewal information was not available and the most current SWPPP available for review was from 2001.

According to Ecology's UST List, one UST has been removed from the property. The UST stored between 111 and 1,100 gallons of an unspecified substance. The UST removal date was not listed (Ecology 2007e).

4.3.3.1 Current Operations

Shultz Distributing is a bulk oil storage and distributing company. The most current available facility layout is illustrated in Figure 23, and a portion of the facility can be seen in Figure 7, which is an aerial photo of the Slip 3 Inlet area taken in July 2006. Petroleum products, solvents, and antifreeze are delivered to the facility by truck and railcar and are either transferred to storage tanks or stored in the warehouse facility in 55-gallon drums. There are 26 ASTs with a total storage capacity of 250,900 gallons; 21 tanks are in the recessed tank farm on the south side of the property and five are in the northwest corner of the property. The tanks range from 6,000 to 11,900 gallons and most contain lube oil; one tank contains diesel. Tank locations are illustrated in Figure 24 (Shultz Distributing 2001).

Storm Drain System

Stormwater is collected in catch basins at various locations throughout the facility (Figures 23 and 24) (Shultz Distributing 2001). All stormwater from the tank area, rail tank car area, and loading dock area discharges to the impound basin, and in August 2006, it was pumped and disposed of by an outside company. A locked valve was in place and could be used to discharge the stormwater in the impound basin to an oil/water separator, from which stormwater could discharge to the city storm drain system. Conversely, a sump pump in the oil/water separator could be used to pump stormwater to the sanitary system (Ecology 2006b and SPU 2007a). In August 2006, SPU told Shultz Distributing to remove the pump from the oil/water separator because it had no use and was not allowing proper settling; reportedly the pump had been used to discharge vehicle wash water to the sanitary sewer system in the past, but vehicles were no longer washed at the property. With proper settling occurring in the oil/water separator, the stormwater could be discharged to the city storm drain system (Ecology 2006b and SPU 2006d). The review of files did not find any confirmation that the pump was removed from the oil/water separator and that stormwater now discharges to the city storm drain system.

According to Ecology, stormwater from areas other than the tank, rail tank car, and loading dock areas also drain to the city storm drain system (Ecology 2006b). In the recessed truck unloading area in the north central portion of the site is a catch basin. According to the 2001 SWPPP, it is not known where this basin discharges to. The discharge from the oil/water separator located "near the offices," however, was confirmed by review of the city of Seattle's Department of Engineering records to be connected to the sanitary sewer (Shultz Distributing 2001). Figure 23 shows the oil/water separator "near the offices" to be the catch basin and oil/water separator shown above the "Will Call Loading" area. Stormwater from the remaining western and eastern ends of the site appears to discharge to the city's storm drain system.

Potential Sources of Stormwater Pollution

According to the 2001 SWPPP, potential sources of pollution at the Shultz Distributing facility include (Shultz Distributing 2001):

- **Hazardous and Non-Hazardous Materials Storage:** Most of the hazardous and non-hazardous materials are stored in ASTs where contact with stormwater would be made only if a spill or leak occurred. Drums of finished product are either stored inside a covered building where they cannot contact stormwater or on wooden pallets on the asphalt loading area that is drained to the sanitary sewer system.
- **Loading/Unloading Operations:** The facility has three truck loading areas and a railcar loading area. The truck loading/unloading areas are either fully or partially covered. Facility personnel supervise all loading/unloading operations in case a spill occurs and to

ensure that proper handling procedures are used. Figures 23 and 24 show the location of the loading/unloading areas at the facility. These areas are potential sources of pollutant migration from the facility; however, any spill would be observed and immediate control measures would be taken.

- **Potential for Equipment Failure:** Routine operations at the facility are not prone to equipment failures sufficient to release a significant quantity of hazardous material. Secondary containment, site grading, drainage channels, and management practices all minimize the potential for discharge from the facility. In addition, facility personnel are trained to conduct daily inspections of the tanks for leaks and periodic tank integrity testing is conducted.
- **Potential Pollutants:** The potential pollutants present at this facility include multiple types of chemicals stored in the warehouse facility, such as solvents, blanket wash, lacquer thinner, paint remover, and so forth. Unless an uncontrolled spill occurs, none of these pollutants have a reasonable potential to be present in significant quantities in stormwater discharged from the facility.
- **Reportable and/or Significant Spills:** The facility has not had a reportable spill within the past three years. Information on any previous or future spills will be recorded by the facility.

The Shultz Distributing facility employs a variety of BMPs to minimize and control the potential sources of stormwater pollution described above. BMPs employed at the Shultz Distributing facility include (Shultz Distributing 2001):

- **Inspections:** Annual site compliance inspections, monthly inspections of oil/water separator systems, and semi-annual inspections of designated equipment and site areas (material storage and handling areas, spill response equipment, erosion and stormwater management controls) are performed.
- **Training:** Annual training to review the SWPPP and training in various hazardous materials management and emergency response is provided to employees.
- **Record Keeping and Reporting:** Inspection records and semi-annual sampling reports are maintained at the facility.
- **Housekeeping:** Housekeeping measures are employed to minimize release to the storm drain system.
- **Preventative Maintenance:** Preventative maintenance includes equipment inspections and testing.
- **Spill Prevention and Response:** A Spill Prevention, Countermeasures, and Control (SPCC) plan has been developed and is implemented at the facility; secondary containment systems for tanks have been constructed, and spill response equipment and materials are readily accessible.
- **Runoff Management:** Secondary containment is provided for all tanks, there are roofs over all loading/unloading areas, and stormwater is diverted from the material storage areas.

- **Sediment and Erosion Prevention:** Most of the facility is paved; erosion control is provided in the southern unpaved areas by the graded surface, which drains runoff to the center of the area.

4.3.3.2 Historical Use

The Shultz Distributing property was developed in the 1920s for the Gypsum Products Corporation. From the late 1930s until the 1960s, Federal Pipe manufactured wood pipes and tanks on the property. Its operations included a dip tank, drying kilns, and warehouse space. In 1964, a group of individuals, including members of the Emerson family, purchased the property. Emerson GM Diesel leased the property in the 1960s and performed maintenance and repair of diesel motors and trucks on the property. Pacific Detroit Diesel occupied the property between 1989 and 1997 (Terra Vac and Floyd & Snider 2000).

4.3.3.3 Environmental Investigations and Cleanup Activities

Environmental Consultation, Shultz Distributing Site (1999)

In November 1999, AGI Technologies (AGI) provided environmental consultation to Shultz Distributing regarding an accusation by the adjacent Cascade Columbia Distribution (formerly Great Western Chemical Company) property that the Shultz Distributing property was the source of a chlorinated solvent plume discovered on Cascade Columbia Distribution's property. The plume was confirmed to have migrated from the Shultz Distributing property during the *Northwest Corner Investigation* conducted at the Cascade Columbia Distribution property in 1999 and discussed in further detail in Section 4.3.4.4. AGI reviewed available information on the two properties and concluded that Shultz Distributing was unlikely the source of the plume for the following reasons (AGI 1999):

1. No chlorinated solvents such as perchloroethylene (PCE) or trichloroethylene (TCE) have been stored or used on the Shultz Distributing property, and no evidence exists suggesting they have been released to the environment on the property.

2. The *Northwest Corner Investigation* report stated that the investigation was undertaken to investigate the source of chlorinated solvents detected in wells B-13 and B-22, which can be seen on the west side of the Cascade Columbia Distribution property in Figure 25. A groundwater sample collected from well B-13 in 1990 contained 9,000 ppb PCE. This result indicated that the "secondary source" was present in 1990, and therefore was not the result of a recent release. The contamination was not previously identified as a separate source in 1990 and not investigated as such until the *Northwest Corner Investigation* in 1999. Furthermore, the highest groundwater concentrations were at well B-13 and not in any of the wells closer to the Shultz Distributing property; thus, the data indicated that the chlorinated solvent plume did not originate from the Shultz Distributing property.

3. AGI developed a groundwater elevation contour map using data from the *Northwest Corner Investigation* report and determined a westerly groundwater flow direction, which suggested that the contamination identified in the investigation was from a source west of well B-13.

AGI's review indicated that groundwater contamination from the Cascade Columbia Distribution property could have contaminated the Shultz Distributing property. However, no evidence was provided to indicate that the chlorinated solvents plume could have originated from a source on the Shultz Distributing property. AGI recommended installing monitoring wells and collecting groundwater samples on the property to determine the extent of groundwater contamination (AGI 1999).

Monitoring Well Installation, Shultz Distributing Site (2000)

In December 1999, AGI installed three monitoring wells to investigate groundwater contamination at the Shultz Distributing property and to support AGI's conclusion that Shultz Distributing property could not have been the source of the chlorinated solvent plume discovered on the adjacent Cascade Columbia Distribution property, discussed in Section 4.3.4. Monitoring wells MW-1 through MW-3 were installed at locations shown in Figure 26. One soil sample collected above the water table from each soil boring, and groundwater samples collected from each well, were analyzed for halogenated VOCs including trans-1,2-dichloroethene (trans-1,2-DCE), 1,1-dichloroethane (1,1-DCA), cis-1,2-DCE, 1,1,1-trichloroethane (1,1,1-TCA), TCE, and PCE (AGI 2000).

In all three borings, groundwater was encountered at approximately 10 feet bgs; the groundwater flow direction was to the southwest (Figure 26). No VOCs at or above laboratory detection limits were found in the soil samples with the exception of the soil sample collected at 5 feet bgs in the boring for MW-2, which contained PCE at 0.1 ppm, below the 1999 MTCA Method A cleanup level of 0.5 ppm for PCE in industrial soil. The groundwater samples collected from all three wells contained chlorinated solvents, primarily TCE and PCE. The MTCA Method A cleanup level of 5.0 µg/L for PCE was exceeded in the groundwater samples collected from all three monitoring wells: 7.4 µg/L at MW-1, 110 µg/L at MW-2, and 62 µg/L at MW-3 (AGI 2000).

Based on sample results, AGI concluded that groundwater contamination beneath the Shultz Distributing property was part of the chlorinated solvent plume emanating from the adjacent Cascade Columbia Distribution property. AGI determined that both the absence of chlorinated solvents in soil above the water table and the relatively low concentrations in groundwater at the Shultz Distributing property indicated that Shultz Distributing was not the source of the chlorinated solvents plume (AGI 2000).

Storm Drain System Investigation, Shultz Distributing (2001)

According to the 2001 SWPPP for Shultz Distributing, a "September 2001 Site Investigation" was performed by Shultz Distributing, which involved a review of the city of Seattle's Department of Engineering records on storm drain and/or sanitary sewer system connections at the facility, investigation of the piping in catch basins, and a dye tracer test. The dye tracer test was inconclusive because the city sewer and storm drain lines could not be accessed during the test. A request was made to the city of Seattle to confirm connections to the sanitary sewer and/or storm drain system (Shultz Distributing 2001).

According to the 2001 SWPPP, stormwater that fell in the area of the tank farm was collected in the impound basin and routed through the oil/water separator system west of the tank farm. The oil/water separator system was believed to discharge to the sanitary sewer system. However, the point of discharge from the catch basin in the recessed truck unloading area in the north central portion of the site could not be determined. The discharge from the oil/water separator near the offices, however, had been confirmed to be connected to the sanitary sewer by review of the city of Seattle's Department of Engineering records (Shultz Distributing 2001).

4.3.3.4 Facility Inspections

Joint Inspection, Shultz Distributing Facility (January 2006)

On January 27, 2006, SPU and Ecology conducted a Joint Inspection as part of an SPU and KCIW joint program that aims to assist businesses in reducing the amount of pollutants discharged to the LDW via the storm drain system and CSOs. SPU identified the following required corrective actions to be addressed by Shultz Distributing (SPU 2006a):

1. Clean the catch basin located at the northwest corner of the building in the loading area. Accumulated material within 18 inches of the bottom of the lowest pipe entering or exiting the catch basin must be removed and disposed of in accordance with state and local regulations. Inspect and maintain all catch basins regularly and keep records.

2. Install an outlet trap in the sump structure.

3. Clean both oil/water separators.

4. Provide secondary containment for the five 10,000-gallon tanks at the northwest corner of the yard. The pump for the oil transfer should be inside the secondary containment. Accumulated oil-contaminated runoff must be discharged to the sanitary sewer or disposed of properly in an alternative way. No overflow of the secondary containment or discharge of contaminated water should reach the storm drain system.

5. During the inspection, several areas of oil-contaminated soil were found between the rail and the concrete pad at the railroad car unloading area and underneath the two truck cisterns east of the railroad car unloading area. Clean these areas and dispose of the contaminated soil properly. Provide large drip/leak pans to place underneath the railroad cars and cisterns to avoid soil contamination during oil transfers.

6. Berm the covered oil transfer area east of the truck cisterns to prevent oil spills from reaching the soil.

7. Sweep the back yard on a regular basis and contain all small drips and spills to prevent runoff contamination.

Joint Inspection (Follow-Up), Shultz Distributing Facility (March 2006)

On March 31, 2006, SPU conducted a follow-up Joint Inspection to ensure that the required corrective actions identified above had been completed. The remaining corrective actions to be addressed were identified as follows (SPU 2006b):

1. Obtain spill containment and clean-up materials for the five oil-transfer tanks located outside.

2. Clean up and prevent any further contamination of soil on the ground beside the loading/unloading area by the railroad tracks. Install a trench drip pan between the loading/unloading area cement slab and the railroad tracks to prevent oil from leaking on the ground.

Joint Inspection (Follow-Up), Shultz Distributing Facility (July 2006)

On July 5, 2006, SPU conducted another follow-up Joint Inspection to ensure that the required corrective actions identified above had been completed. The inspectors were pleased with the work Shultz Distributing had completed to address the corrective actions outlined above. However, SPU became concerned about the sump pump outside of the tank area, which apparently pumped to an oil/water separator and then to a catch basin that discharged to the sanitary system during low flows and the storm drain system during high flows (SPU 2006c).

Joint Inspection (Follow-Up) and Stormwater Compliance Inspection, Shultz Distributing Facility (August 2006)

On August 21, 2006, SPU and KCIW conducted a follow-up Joint Inspection, which coincided with a Stormwater Compliance Inspection conducted by Ecology. The Shultz Distributing facility is covered under the Industrial Stormwater General Permit and had not been previously inspected by Ecology. The inspections were performed to address the uncertainty of the facility’s connection to the storm drain and/or sanitary sewer system.

According to Ecology, all stormwater from the tank area, rail tank car area, and loading dock area entered a large concrete vault (impound basin as shown Figures 23 and 24). A locked valve could be used to discharge the stormwater in the vault to an oil/water separator, which was no longer operational. A sump pump in the oil/water separator could be used to pump stormwater from the oil/water separator to a manhole near the street (Ecology 2006b).

SPU performed a dye test to determine whether stormwater from the facility discharged to the LDW. Dye was added to the oil/water separator, the sump pump was turned on, and dye was seen entering the manhole near the street. The dye was then observed in the street storm drain system, which discharges to the LDW. Stormwater from areas other than the tank, rail, and loading dock areas also drain to the street storm drain system (Ecology 2006b).

A pump was observed in the manhole on the street, but it was no longer operational. The pump appeared to discharge to the sanitary sewer. Shultz Distributing stated that the pump was probably used to discharge vehicle wash water to the sanitary sewer, but vehicles were no longer washed at the property (Ecology 2006b).

Because the oil/water separator was no longer operational and the stormwater could be very contaminated with oil & grease from the tank area, Ecology informed Shultz Distributing never to discharge stormwater from the vault to the street storm drain system. Shultz Distributing replied that it used a company to pump the contaminated stormwater out and dispose of it properly. KCIW told Shultz Distributing that it could obtain a permit from King County to discharge the vault stormwater to the sanitary sewer, but Shultz Distributing would need to repair the oil/water separator. Shultz Distributing opted to continue pumping and disposing of the vault stormwater (Ecology 2006b).

SPU identified the following required corrective actions to be addressed by Shultz Distributing (SPU 2006d):

1. Have the pump removed from the oil/water separator because it is not allowing proper settling and is thus negating the intended beneficial effects of the treatment system.

2. Fix the pump by the yard entrance to allow confirmation of discharge to the sanitary sewer system.

Ecology noted the following concerns and recommendations (Ecology 2006b):

1. According to Ecology's database, no stormwater DMRs were submitted for 2005 or for the first quarter of 2006. Ecology requested that Shultz Distributing submit the required DMRs as soon as possible.

2. Ecology stated that 2005 and 2006 DMRs must be reviewed to determine if any sampling results were above benchmark values or action levels.

3. Ecology required that the valve not be opened to discharge stormwater from the vault to the manhole near the street.

Joint Inspection (Follow-Up), Shultz Distributing Facility (January 2007)

On January 4, 2007, SPU conducted another follow-up Joint Inspection to ensure that the required corrective actions identified above had been completed. The pump by the yard entrance had been fixed and it was confirmed that when the pump turned on, water discharged to the sanitary system. When the pump was not on, water was discharged to the storm drain system. It was concluded that the Shultz Distributing facility had achieved compliance (SPU 2007a).

4.3.3.5 Potential Pathways of Contamination

Stormwater

Shultz Distributing's storm drain system is shown in Figures 23 and 24. Figure 4 apparently shows that the storm drain system connects to the city's storm drain system and discharges to the LDW via the South Brighton Street CSO/SD.

The Shultz Distributing facility discharges to the city storm drain system under the Industrial Stormwater General Permit, and although facility operations could be a source of stormwater pollution, a SWPPP is implemented, BMPs are employed to minimize the potential, and discharge monitoring is conducted. In addition, several inspections have been performed at the facility as discussed in Section 4.3.3.4 to address multiple stormwater pollution concerns. However, stormwater pollutants could discharge to the LDW within RM 2.0-2.3 East via the stormwater pathway.

Shultz Distributing's storm drain system appears to pass through an area of chlorinated solvent groundwater contamination near the tank farm (Figures 25 and 26) that purportedly emanates from the Cascade Columbia Distribution property to the south. Groundwater contamination at the property could infiltrate the storm drain system and discharge to the LDW within RM 2.0-2.3 East via the stormwater pathway.

Groundwater

Groundwater flow direction at the Shultz Distributing property was found to be to the west in November 1999 using existing data and to the southwest in December 1999 through AGI's groundwater investigation.

In December 1999, groundwater samples collected from monitoring wells MW-1 through MW-3 (Figure 26) contained chlorinated solvents, primarily TCE and PCE. The MTCA Method A cleanup level for PCE was exceeded in all three wells. Since groundwater has been documented to flow toward the LDW, groundwater contamination could discharge to the LDW within RM 2.0-2.3 East via the groundwater pathway.

Spills

Operations at the Shultz Distributing facility could result in spills. However, since the facility is not adjacent to the LDW, spills could only reach the LDW via the stormwater pathway, discussed above. According to the 2001 SWPPP, the Shultz Distributing facility had not had a reportable spill within the last three years (Shultz Distributing 2001).

Bank Erosion

The Shultz Distributing facility is not located along the banks of the LDW; therefore, bank erosion/leaching is not a potential pathway for contamination to reach LDW sediments.

Atmospheric Deposition

The information reviewed gave no indication that any activities at the Shultz Distributing facility may result in atmospheric deposition; therefore, atmospheric deposition is not considered a potential pathway for contamination to reach LDW sediments.

4.3.3.6 Data Gaps

The following data gaps have been identified for the Shultz Distributing property. These data gaps should be addressed before source control efforts begin for the RM 2.0-2.3 East source control area.

- Information on site history and operations before 1996 is needed to be sure chlorinated solvents were never used at the site, potentially contributing to groundwater contamination.
- According to the 2001 SWPPP available for review some uncertainties remain regarding the facility's storm drain system and connection to the city storm drain and sanitary sewer

system. Figures 4, 25, and 26 apparently show that storm drain lines at the facility pass through an area of chlorinated solvent groundwater contamination near the tank farm that purportedly emanates from the Cascade Columbia Distribution property to the south, and discharge to the LDW via the South Brighton Street CSO/SD. More information is needed on the Shultz Distributing storm drain system and connection to the city storm drain and sanitary sewer systems to determine whether contamination could pose a threat to LDW sediments via the stormwater pathway. In addition, Ecology should obtain an updated SWPPP from Shultz Distributing.

- During the Joint Inspection performed at the facility on August 21, 2006, SPU told Shultz Distributing to remove the pump from the oil/water separator because it was no longer of any use and was not allowing proper settling. Because Shultz Distributing was listed as "in compliance" after the January 4, 2007 Joint Follow-Up Inspection, it is believed that the pump was removed as required; however, the inspection notes did not confirm this specifically. Whether the pump was removed from the oil/water separator, and stormwater now discharges to the city storm drain system, needs to be confirmed to be sure stormwater is discharged as cleanly as possible to the city storm drain system.
- A Stormwater Compliance Inspection was performed at the facility on August 21, 2006. The Stormwater Compliance Inspection Report stated that no stormwater DMRs had been submitted for 2005 or for the first quarter of 2006. Whether Shultz Distributing submitted the DMRs to Ecology, and whether the sampling results were above benchmark values or action levels, is unknown; having this information is important for ensuring stormwater pollutants do not pose a threat to LDW sediments. DMRs for the Shultz Distributing facility should be reviewed to ensure the facility has remained in compliance.
- In-line storm drain sampling may be needed within the Shultz Distributing storm drain system to determine whether contamination at the site may migrate to the LDW via the stormwater pathway.
- AGI reviewed existing information, installed monitoring wells, and performed soil and groundwater sampling in response to the accusation that the Shultz Distributing property contributed to chlorinated solvent-contaminated groundwater at the Cascade Columbia Distribution property. AGI concluded that Shultz Distributing did have groundwater contamination on-site, but that the contamination was part of the chlorinated solvents plume emanating from the Cascade Columbia Distribution property. Based on available information, only three monitoring wells were installed, and groundwater direction appeared to flow toward, not away from, the Cascade Columbia Distribution property. Relatively high concentrations of PCE, TCE, and vinyl chloride (VC) were also found at the eastern end of the Shultz Distributing property in well B-1, as shown in Figure 26. Whether additional sampling or investigations were performed at the Shultz Distributing property following AGI's December 1999 investigation is not known. AGI's results and conclusions should be reviewed, and/or additional investigations should be performed to be certain that groundwater contamination at the property is emanating from the Cascade Columbia Distribution property.

4.3.4 Cascade Columbia Distribution

Facility Summary: Cascade Columbia Distribution	
Address	6900 Fox Avenue South
Property Owner	Fox Avenue Building LLC
Former/Alternative Property Names	Fox Avenue Building Great Western International (GWI) Great Western Chemical Company (GWC) Republic Steel Round-Seattle Chain Company Seattle Chain and Manufacturing Co.
Former/Alternative Lessee/Operator Names	Tyee Lumber Company Campbell Chain Company Western Salvage Company (Lot 11) Nelson Trucking (Lot 11)
Former/Alternative Addresses	N/A
Tax Parcel No.	0001800087 0001800089 (Lot 11; no longer considered part of main property)
Parcel Size	2.53 acres 1.19 acres (Lot 11)
NPDES Permit No.	N/A
EPA RCRA ID No.	WAD008957961
EPA TRI Facility ID No.	98108CSCDC69FXA (2005) 98108GRTWS6900F (1998 and 1999)
Ecology Facility/Site ID No.	2282
Ecology UST Site ID No.	3803
Ecology LUST Release ID No.	N/A
Listed on Ecology CSCSL	Yes

Cascade Columbia Distribution is located upland, on the east side of the LDW, between RM 2.3 and 2.4. The property is bordered on the east by an empty lot referred to as "Lot 11." East of Lot 11 is East Marginal Way South. South Willow Street borders the property to the north. North of South Willow Street is Shultz Distributing. The property is bounded on the west by Fox Avenue South. West of Fox Avenue South is the Bunge Foods property. Finally, the Cascade Columbia Distribution property is bordered on the south by the former South Frontenac Street and the "Whitehead Property," which historically was occupied by the Tyee Lumber Company.

According to King County tax records, Fox Avenue Building LLC purchased the Cascade Columbia Distribution property shown in Figures 2 through 4 from Marian Properties LLC on May 8, 2003, after Great Western Chemical (GWC) Company filed for bankruptcy protection in 2001. It is unclear whether "Fox Avenue Building LLC" is the same entity as "Fox Avenue LLC", the current owner of the Glacier Marine Services property, discussed in Section 4.2.3. The two structures on the property include a 38,650-square-foot distribution warehouse built in 1959 and a 4,000-square-foot distribution warehouse built in 1929 (King County 2007a).

Fox Avenue Building LLC also purchased "Lot 11" (shown in Figures 2 through 4) from GWC Properties LLC on February 18, 2005 (King County 2007a). Buildings on Lot 11 were demolished in 1969, and since that time the property has been used by a truck and heavy equipment recycler and as parking and container storage area (Terra Vac and Floyd & Snider 2000).

According to EPA's TRI database, Cascade Columbia Distribution is listed under TRI Facility ID No. 98108CSCDC69FXA in 2005, but no release or waste transfer information is provided. GWC is listed under TRI Facility ID No. 98108GRTWS6900F in 1998 and 1999. According to the 1998 Release Report, GWC released 250 pounds of methanol in air emissions. The 1999 Release Report indicates GWC released another 250 pounds of methanol in air emissions. According to the 1998 Waste Transfer Report, GWC had 250 pounds of methanol transferred to energy recovery and 250 pounds transferred to treatments, for a total of 500 pounds transferred off-site for further waste management. According to the 1998 Waste Quantity Report, GWC had 73 pounds of methanol disposed of or otherwise released on- and off-site, for a total of 73 pounds of total production-related waste managed. According to the 1999 Waste Quantity Report, GWC had 35 pounds of methanol transferred to energy recovery on-site, 50 pounds treated on-site, and 16 pounds disposed of or otherwise released on- and off-site, for a total of 101 pounds of total production-related waste managed (EPA 2007a).

According to Ecology's UST List, 20 USTs were removed and 6 USTs were closed in place when the facility was in operation as GWC. UST removal dates are not listed (Ecology 2007e).

The Cascade Columbia Distribution property was entered onto Ecology's CSCSL on October 11, 1990 under the facility name Fox Avenue Building, and is listed as having confirmed groundwater and soil contamination. Contaminants in groundwater and soil are identified as halogenated organic compounds, petroleum products, non-halogenated solvents, and PAHs. A site discovery/report, early notice letter, and initial investigation were completed in 1990. A hazardous sites listing and site hazard assessment were completed in 1994. An interim action is listed as in progress; apparently the interim action began in December 1993 and is to be completed by January 2010. Ecology's status on this site is remedial action in progress (Ecology 2007e).

GWC entered into Agreed Order No. DE TC91-N203 with Ecology effective September 30, 1991 (Terra Vac and Floyd & Snider 2000). Under the Agreed Order with Ecology, GWI agreed to conduct a RI/FS, and a *Remedial Investigation and Preliminary Risk Assessment Report* (RI/PRA) was completed in 1993. In 2000, a *Supplemental Remedial Investigation and Feasibility Study* (SRI/FS) (Terra Vac and Floyd & Snider 2000) was completed to document information gathered and work conducted at the site since the RI/PRA.

GWC was issued Minor Discharge Authorization No. 319 from the King County Industrial Waste Program (KCIWP) to discharge contaminated stormwater to the sanitary sewer and the West Point WWTP. This authorization was effective November 4, 1996 through November 4, 2001.

GWC was issued Major Discharge Authorization No. 498 to discharge wastewater generated from a groundwater remediation system installed at the site under a MTCA Consent Order with Ecology. Approximately 6 gallons per minute were to be removed from the subsurface, pre-treated through an air stripper, biological treatment, and carbon polish, and then discharged to the sanitary sewer in compliance with local discharge limits. This authorization was effective March 13, 1997 through March 13, 2002.

The facility names GWC and GWI appear to refer to the same facility, and are used interchangeably in various documents and databases.

4.3.4.1 Current Operations

A chemical distribution facility called Cascade Columbia Distribution currently occupies the property, which is owned and operated by Fox Avenue Building LLC (ERM 2003). The most current available facility map is included as Figure 27, from 2003, under Fox Avenue Building LLC ownership.

4.3.4.2 Historical Use

The Cascade Columbia Distribution property and the property labeled "Lot 11" in Figures 2 through 4 were first developed for industrial use in 1918 by the Seattle Chain and Manufacturing Company, which leased the property from King County from 1918 until purchasing the property in 1937. Seattle Chain and Manufacturing Company and its successor companies operated coke-fired and oil-fired furnaces and warehouses. Ownership of Seattle Chain and Manufacturing Company was transferred in the late 1940s and the company was renamed the Round-Seattle Chain Company. This company was purchased in 1954 by Republic Steel. Republic Steel sold the property to Marian Enterprises in 1956, though Republic Steel continued operations in a warehouse on the northern part of the facility via a lease-back agreement (Terra Vac and Floyd & Snider 2000).

GWI began leasing property from Marian Enterprises in 1956. Initially, GWI operations took place in portions of the former Seattle Chain and Manufacturing Company main building, and at a drumming dock located parallel to a road spur along the former South Frontenac Street (shown in Figures 2 through 4), which had originally served Seattle Chain and Manufacturing Company. GWI constructed a new warehouse and office building on the west end of the property in 1959. A sump in the drumming area was connected to a subsurface drain pipe that ran to the southern edge of the dock (Terra Vac and Floyd & Snider 2000).

Other lessees of the property during the 1950s and 1960s included Campbell Chain Company, which leased and used a warehouse in the northern part of the facility abutting South Willow Street, and Tyee Lumber Company, which leased parts of Lot 11 and the Seattle Chain and Manufacturing Company building for storage and product assembly (Terra Vac and Floyd & Snider 2000).

GWI completed major facility modifications in the 1960s and 1970s, including replacement of and upgrades to existing structures; installation of a concrete AST pad east of the warehouse/office; and replacement of the sump and drain system in the drumming area. In 1976, both the tank and the drumming facilities were expanded considerably, including the construction in the dock area of two concrete and metal sheds for drum storage. The dock area itself was also enlarged at that time, to the configuration that existed in 2000, which is shown in Figure 28 (Terra Vac and Floyd & Snider 2000).

In 1969, the former Seattle Chain and Manufacturing Company buildings present on "Lot 11" were demolished, and Tyee Lumber Company's operations terminated. The property was cleared and leased in the 1970s and early 1980s by Western Salvage Company, a truck and heavy equipment recycler. The property was subsequently leased to Nelson Trucking as a parking area, and in 2000 it was used for container storage (Terra Vac and Floyd & Snider 2000).

In 1989, GWI began renovations to the GWI facility. These renovations included decommissioning and closure of all USTs, reconditioning of ASTs, a partial demolition of the north warehouse, and a subsequent repaving of the north warehouse area for use as a truck loading and unloading area. In 1990, the main tank farm area USTs were removed (see Figure 28).

Materials Handled at the Facility

The GWI facility had been used since 1956 for storage, repackaging, and distribution of chemical and petroleum products. Until the late 1980s, GWI supplied chemicals and supplies to the laundry and dry cleaning industry. This aspect, as well as most of its petroleum product handling, was phased out by 1990 (Terra Vac and Floyd & Snider 2000).

Materials at GWI were received, handled, and shipped in drums, in bulk for storage tank transfer, and as packaged dry chemical products. Both rail and truck transport was used at the facility. GWI transferred and drummed products principally in the vicinity of the drum shed (see Figure 28). Pump lines from USTs and ASTs in the drumming area ran above and under the ground. GWI handled the following chemical classes and product types at the property (Terra Vac and Floyd & Snider 2000):

- Ketones: methyl ethyl ketone, methyl *iso*-butyl ketone, and acetone;
- Monocyclic Aromatic Solvents: toluene and xylenes;
- Alcohols and glycols: isopropyl alcohol, ethyl alcohol, methyl alcohol, ethylene glycol, and propylene glycol;
- Mineral Spirits/Petroleum Solvents: kerosene and Chevron solvents 325, 350-B, 410, and 450;
- Chlorinated Compounds: methylene chloride, PCE, pentachlorophenol (PCP or penta), TCE, and 1,1,1-TCE;
- Acids: nitric, sulfuric, and muriatic (hydrochloric) acids;
- Dry Products: phosphates, soda ash, titanium dioxide, borax, and boric acid; and
- Miscellaneous: ferric and ammonium chloride etchants, phenols, hydrogen peroxide, and linseed oil.

GWI began handling PCP (penta) on the property in 1966. Product was stored in one of the 12,000-gallon tank compartments. For one to two years, penta was blended with Stoddard solvents or mineral spirits in a small AST north and west of the drum shed. From 1969 until the late 1970s or early 1980s, GWI purchased mixed penta in drums from outside vendors. Product was delivered to customers in vendor-packaged drums or transferred to a tanker truck and delivered in bulk (Terra Vac and Floyd & Snider 2000).

In 2000, GWI warehoused liquid and dry products, including vendor pre-packaged containers and GWI-packaged containers. Inventory included hazardous products and non-hazardous products, including food products. Products were stored according to hazard class, product type, and chemical compatibility. The facility packaged liquid chemical products into containers (drums or totes) from tanker trucks. Products transferred in this manner included the following (Terra Vac and Floyd & Snider 2000):

- Sodium chlorate
- Sulfuric acid
- Hydrochloric acid
- methyl iso-butyl ketone
- Ferric chloride
- Potassium carbonate
- Caustic soda

GWI transferred hydrogen peroxide from drums to totes. The facility also transferred liquid chemical product from rail cars, including transferring methanol to common carrier tanker trucks. The facility transferred dry product, such as calcium chloride and calcium sulfate, from rail car to the warehouse for storage and delivery to customers by truck or customer Will Call pick-up (Terra Vac and Floyd & Snider 2000).

Facility Underground and Aboveground Storage Tanks

GWI had historically used a variety of USTs and ASTs at the facility. Figure 28 identifies the sizes and locations of all known USTs in 2000 and the dates of their installation, decommissioning, and removal (where known). Most USTs and ASTs were used for a variety of products, depending on demand (Terra Vac and Floyd & Snider 2000).

The six original USTs at the facility, installed in 1956, were 10,000-gallon, single-compartment tanks, located beneath the drum shed along the former South Frontenac Street. These tanks, referred to as the “old” tank farm, were decommissioned in 1989. They remain in place beneath a concrete pad under the drum shed in the southeastern corner of the facility. In 1976, 10 double-compartment USTs, each with a 12,000-gallon capacity, were installed in the central part of the facility. These tanks, which formed the “main” tank farm, remained in use until they were decommissioned in 1989 and removed in the fall of 1990. A 1,000-gallon UST near the Fox Avenue South loading dock area was used for storage of diesel fuel; it was decommissioned in place in 1989. A 500-gallon heating oil UST, installed in the northwestern portion of the property during the early years of GWI’s operations, remained in use in 2000 (Terra Vac and Floyd & Snider 2000).

In 1959, GWI installed an AST in the southwestern corner of the loading dock area to store sulfuric acid. Two smaller 1,000-gallon, aboveground “wing tanks” were also used historically on the loading dock: one contained PCE and the other stored methanol. Portable, vertical ASTs called “tote bins” used for product storage were stored on pallets in the vicinity of the old tank farm. In 1976, GWI constructed a bermed AST acid storage area, with sumps, adjacent to the warehouse/office. Five ASTs were installed in this area by 1980. In the 1970s and 1980s, GWI used three blending and/or storage ASTs located near the main tank farm (Terra Vac and Floyd & Snider 2000).

4.3.4.3 Summary of Site Geology and Hydrology

The Cascade Columbia Distribution facility is underlain by fill, with depths ranging from 5 to 10 feet bgs. Underlying the fill material are younger alluvial channel and floodplain deposits laid down by the LDW. Underlying the younger alluvial deposits are older sedimentary alluvial deposits typical of deltaic and estuarine environments. These two primary, low-permeability alluvial deposits have been observed at depths ranging from 10 to 50 feet bgs, and are named the 1st silt horizon (SH) (uppermost silt horizon) and the 2nd SH (Terra Vac and Floyd & Snider 2000).

The 1st SH and 2nd SH contain what have been designated regionally as the upper groundwater zone (contained in both the 1st SH and 2nd SH) and the lower groundwater zone (found only in the 2nd SH). Locally, beneath the Cascade Columbia Distribution facility, these groundwater-bearing zones play an important role in groundwater flow direction and contaminant transport, and are referred to, respectively, as the 1st water-bearing zone (WBZ) and the 2nd WBZ. The 1st WBZ is unconfined, with a depth to the water table ranging from 7 to 13 feet bgs; it is the most vulnerable to impacts from surface activities. The 2nd WBZ ranges in depth from 15 to 45 feet bgs, and is contained within a semi-confined (locally unconfined) aquifer (Terra Vac and Floyd & Snider 2000).

Where present, the 1st SH separates the 1st WBZ and the 2nd WBZ. The 2nd SH, where present, is located at depths of 30 to 40 feet beneath the 1st SH. Where persistent, the 1st SH and 2nd SH can serve as shallow aquitards, impeding contaminant transport to lower aquifers (Terra Vac and Floyd & Snider 2000).

The 1st SH is present beneath a majority of the Cascade Columbia Distribution facility, with the exception of a small area northwest of the former main UST farm. The thickness of the 1st SH ranges between 0.5 and 2.5 feet. The 1st SH is absent in B-1, and is thickest in the area of B-16/B-17 (see Figure 16). Based on available data, the 1st SH appears to be absent or discontinuous south and east of the Cascade Columbia Distribution facility; however, detailed subsurface information is lacking in these areas. The absence of the 1st SH south of the Cascade Columbia Distribution facility has been defined as a hole in the unit, which allows groundwater and contaminants to move between the 1st WBZ and 2nd WBZ. Southwest of the hole, the 1st SH has been encountered in B-35/B-36 and B-64/B-65. B-34, located southwest of B-64/B-65, indicates that the 1st SH terminates at the South Myrtle Street Embayment. West of B-34, the 1st SH is absent because the unit was excavated during installation of underground utilities. The 1st SH appears to be present west of Fox Avenue and acts as a confining layer (Terra Vac and Floyd & Snider 2000).

The 2nd SH, where present, forms the base of the 2nd WBZ. The thickness of the 2nd SH ranges between 1 and 5 feet. The 2nd SH is discontinuous and has primarily been encountered east of Fox Avenue. Based on available data, the 2nd SH appears to be absent or discontinuous west of Fox Avenue; however, detailed subsurface information is lacking in these areas. Available data suggest that it is unlikely that contaminants would reach deeper sections of the regional groundwater-bearing zones (Terra Vac and Floyd & Snider 2000).

4.3.4.4 Summary of Environmental Investigations and Cleanup Activities (1989-2000)

Site investigation activities completed since 1989 have identified several contaminants in soil and groundwater at the Cascade Columbia Distribution property and at locations to the south and west. This contamination is attributed to GWI's handling and storage of materials at the site, prior to the Fox Avenue Building LLC ownership. The primary contaminants found in soil and groundwater are the chlorinated volatile organic compounds (CVOCs) PCE, TCE, and their associated degradation products, 1,2-DCE and VC, and PCP and petroleum hydrocarbons (ERM 2003).

Soil contamination was discovered in the main tank farm area of the facility from 1989 to 1990 during GWI facility renovations and the removal of USTs from the main tank farm area (see Figure 28). Subsequent soil and groundwater borings encountered contamination near the loading dock UST and the USTs under the drum shed, as well as at other locations around the facility. Additional investigations were undertaken to determine the nature and extent of contamination at the GWI property; adjacent and nearby properties have also been investigated to determine the nature and extent of contamination beyond the GWI property. Several interim remedial measures have been conducted at and around the Cascade Columbia Distribution property since 1989. Figure 28 illustrates where interim remedial measures have been performed, and Figure 29 depicts locations of soil sampling, a groundwater monitoring well, and soil vapor sampling. A timeline showing approximate periods for major events at the GWI facility, such as environmental investigations and cleanup activities, is included as Figure 30.

Investigations performed at adjacent properties outside of the RM 2.0-2.3 East source control area have been provided or will be provided in other reports. A supplemental investigation known to have been performed at the Whitehead Property (former Tyee Lumber Company; shown in Figures 2 through 4), will be included in the Data Gaps Report for RM 2.3-2.8 East (Seattle Boiler Works to Slip 4).

Furthermore, groundwater contamination migrating from the GWI property has been determined to reach LDW sediments near the Myrtle Street Embayment (shown in Figures 2 through 4) where South Myrtle Street intersects the LDW. The Myrtle Street Embayment is in the adjacent RM 2.3-2.8 East source control area, so additional groundwater investigations and data gaps are identified in the Data Gaps Report for that area. Groundwater investigation information is summarized in this report only to the extent necessary to provide an overall picture of the investigations performed, to describe the nature and extent of contamination, and to identify data gaps for RM 2.0-2.3 East.

Following the initial UST removal in 1990, Hart Crowser conducted multiple investigations at the GWI facility and surrounding area to establish the nature and extent of contamination. GWI retained Terra Vac in 1997 to conduct interim remedial measures, evaluate remedial alternatives, and assist GWI in selecting a preferred alternative for site cleanup. Terra Vac continued the annual groundwater, surface water, and mussel tissue monitoring program initiated by Hart Crowser and initiated a number of additional, discreet investigations to collect additional data needed to fill critical data gaps concerning the nature and extent of contamination and evaluate remedial alternatives (Terra Vac and Floyd & Snider 2000).

A summary of the purpose and scope of each investigation or cleanup activity conducted at the GWI facility from 1989 to 2000 is provided in the following sections. Due to the large quantity of data from these investigations, numerical results are provided in the figures accompanying the summary of the nature and extent of contamination section that follows. Since the locations and values of the data points together are more descriptive of the extents of contamination than the numerical concentrations alone, concentration values are only presented in the figures.

Decommissioning of the Main Tank Farm (1990)

The main tank farm was located in the central part of the GWI property, as shown in Figure 28. It consisted of 10 double-compartment product USTs with a nominal capacity of 12,000 gallons per tank (6,000-gallon capacity in each compartment). These tanks were identified by the numbering of compartments (UST 1/2, UST 3/4, and so forth) and were designated as USTs 1/2 through 19/20. These tanks were installed in 1976, taken out of service in the late 1980s, and formally decommissioned in September 1990. Decommissioning of the main tank farm included the activities summarized in the following subsections (Terra Vac and Floyd & Snider 2000).

Approximately 9,000 gallons of residual liquids were removed from the main tank farm USTs and stored in two Baker tanks prior to disposal. The tanks were cleaned and all residuals, including liquids, rinse water, and sludges, were disposed of off-site. The ten double-compartment USTs and associated vent and product piping were removed following tank cleaning. The USTs and piping were comprised of steel and were transported off-site for scrap metal salvage (Terra Vac and Floyd & Snider 2000).

Concrete pavement and the concrete UST hold-down devices that were removed during decommissioning were demolished on-site with a hydraulic breaker. The majority of the concrete debris was hauled off-site for salvage. Approximately 25 cubic yards of concrete was stained or contained VOC contamination, based on photo ionization detection readings. This concrete was stockpiled on-site in a Visqueen-lined and covered stockpile prior to disposal off-site (Terra Vac and Floyd & Snider 2000).

Soil excavated during removal of the USTs was placed in two separate bermed, lined, and covered stockpiles. Soils were distinguished based on field observations of visual staining and soil vapor screening levels measured using a hand-held photo ionization detector. One stockpile contained approximately 75 cubic yards of soil, the other approximately 200 cubic yards of soil. Additional excavation of soil was not attempted during removal of the USTs because of the presence of existing structures in close proximity to the excavation, ongoing facility operations, and the apparent need for additional remediation outside of the main tank farm area. The soil from the two stockpiles was disposed of off-site. Sampling and analysis were performed on soil remaining after the main tank farm excavation to characterize contaminant concentrations upon completion of tank removal activities (Terra Vac and Floyd & Snider 2000).

At the time of the main tank farm closure, soil vapor extraction was identified as a reasonable means of remediating unsaturated zone soil contamination; therefore, components of a soil vapor extraction system were installed in the main tank farm excavation for future remediation use. A series of perforated soil vapor extraction pipes with non-perforated riser pipes was installed at the base of the main tank farm excavation. The perforated pipes were placed horizontally on approximately 10-foot centers running north-south, with a single riser (4-inch diameter schedule 80 PVC) for each pair of horizontal vapor extraction pipes. The soil vapor extraction piping was covered with clean gravelly sand and a layer of visqueen was placed across the excavation to restrict the downward inflow of air. The main tank farm excavation was then backfilled with clean compacted soil imported by barge (Terra Vac and Floyd & Snider 2000).

Removal of Product Piping West of the Drum Shed (1990)

During the decommissioning of the main tank farm in September 1990, three pipelines were removed from the western side of the drum shed (Figure 28). Soil removed during the excavation of these lines was stained and/or had a solvent-like odor. The excavated soil and concrete pavement that was removed to provide access to the piping were placed in bermed, visqueen-lined, and covered stockpiles. Approximately six to eight cy of soil was removed during the pipe trench excavations and placed in a stockpile. No attempt was made to excavate all the contaminated soil in the pipe trench area west of the drum shed because additional investigation was being performed to evaluate the extent of contamination at the site. Following removal of the piping, the trench excavations west of the drum shed were lined with visqueen and backfilled with imported soil. The soil excavated from west of the drum shed was disposed of off-site. Sampling and analysis were performed on soil remaining in the pipe trench excavations to characterize contaminant concentrations upon completion of pipe removal (Terra Vac and Floyd & Snider 2000).

Initial Site Assessment (1989-1990)

Soil contamination was discovered in the main tank farm area of the facility during 1989 and 1990, during GWI facility renovations and the removal of USTs from the main tank farm area (see Figure 28). Before the renovations began, Hart Crowser advanced an exploratory boring (B-1) west of the central UST area to obtain soil data and groundwater elevations. Samples from this boring were screened for VOCs and results indicated the presence of benzene, toluene, PCE, and TCE. This boring was subsequently completed as a groundwater monitoring well, shown in Figure 29 (Terra Vac and Floyd & Snider 2000).

In May 1990, Hart Crowser completed three additional borings (B-2, B-3, and B-4) in the area of the Fox Avenue South loading dock (see Figure 29). Sampling of these borings also confirmed the presence of soil impacted by VOCs (Terra Vac and Floyd & Snider 2000).

In August 1990, GWI began removing USTs in the central part of the GWI facility. The area was backfilled with clean fill in October 1990. Following the UST removal, Hart Crowser sampled six test pits, nine additional monitoring wells (B-5, B-6, B-8, B-9, B-10, B-11, B-12, B-13, and B-14) and 10 additional soil borings (B-7 and SB-1 through SB-9). Four of the nine additional monitoring wells (B-5, B-6, B-8, and B-9) were installed into the 2nd WBZ, while the remainder (B-10, B-11, B-12, B-13 and B-14) were installed into the 1st WBZ. Soil boring and monitoring well locations are shown in Figure 29 (Terra Vac and Floyd & Snider 2000).

Stormwater Investigation (1991)

In 1992, Hart Crowser prepared a technical memorandum for stormwater management at the GWI facility. Information was presented on existing and proposed storm drains and sanitary sewers to be used for management and disposal of stormwater following the discovery of soil contamination at the site. Hart Crowser documented areas of overland flow, ponding, and apparent infiltration. Dye was used to investigate whether drainage from on-site catch basins went into adjacent storm and sanitary sewers during a dry period in September 1991 (Hart Crowser 1992).

Principal stormwater discharge from the facility was found to be surface water runoff, primarily toward the west, at least part of which entered city of Seattle storm sewer catch basins in Fox Avenue South. Most of the site was paved or roofed. Infiltration primarily occurred in limited areas on the north and east sides of the facility not used for chemical storage. Infiltration also occurred in the area near the center of the facility and west of the drum shed, where USTs and piping were removed in 1990, and in limited areas of deteriorated pavement along the southern side of the facility (Hart Crowser 1992).

Precipitation falling into an existing AST bermed area was discharged into a King County sanitary sewer under a stormwater discharge authorization dated November 4, 1991. GWI planned to implement engineering plans for future stormwater management at the facility, including discharge of runoff from chemical storage and handling areas to the sanitary sewer, and discharge of runoff from other areas to the storm sewer (Hart Crowser 1992).

In 1992, GWI hired the engineering firm Olympic Associates Co. to provide civil engineering services for renovation of the facility. Part of this work included on-site drainage improvement and connection to an existing storm sewer and a new sanitary sewer to be located in South Willow Street on the north side of the facility. The engineering plans showed runoff control and separate drainage to the sanitary and storm sewers for areas where chemicals were and were not handled or stored, respectively. Both the proposed storm and sanitary sewer discharge systems included manholes at the property line where discharge sampling could be accomplished if necessary. Drainage improvements at the facility to have been constructed in the summer of 1992 consisted of paving the area between the main elevated dock and South Willow Street to provide truck access to the recently remodeled wood warehouse building on the north side of the facility. This paved area would also be used for unloading tanker trucks handling bulk liquids when the new AST farm was to begin operation in the central part of the facility. Stormwater from these areas would be discharged to the sanitary sewer. Construction of new drains and containment areas on the main elevated dock, future truck unloading area on the west and east side of the facility, and elsewhere was anticipated to occur as part of the cleanup action plan following completion of the 1993 RI/FS (Hart Crowser 1992).

Remedial Investigation/Preliminary Risk Assessment (1992)

Hart Crowser conducted several sampling activities for the *RI/PRA*, including well installation and soil sampling, groundwater and surface water sampling, and soil vapor sampling, as described below (Terra Vac and Floyd & Snider 2000).

Well Installation and Soil Sampling

In 1991, Hart Crowser installed soil borings and monitoring wells along South Frontenac Street and in the interior portion of the GWI facility, as depicted in Figure 29. Three soil borings (SB-10 through SB-12) and a monitoring well (B-15) were installed in the vicinity of South Frontenac Street and the drum shed. Two observation well borings (B-16 in the 1st WBZ and B-17 in the 2nd WBZ) were also installed to assess chemical contaminant concentrations in the main tank farm area. In addition, Hart Crowser collected surface soil samples and samples from two shallow hand auger borings in a proposed truck unloading area along South Willow Street, and tests were performed on soil excavated from the pipe trench area after SVOCs were identified as potential contaminants (Terra Vac and Floyd & Snider 2000).

In March and April 1992, additional wells were installed to assess upgradient water quality (B-24 through B-27) and downgradient groundwater quality (B-18 through B-23) and to further assess groundwater quality and gradients in the center of the facility (B-28 through B-31).

In September and October 1992, eleven additional monitoring wells were installed. Three monitoring well clusters (1st WBZ Wells B-34, B-36, and B-38; 2nd WBZ Wells B-33A, B-35, and B-37) were installed outside the GWI facility boundary and five additional 1st WBZ Wells (B-38 through B-42) were installed at the facility (Terra Vac and Floyd & Snider 2000).

Groundwater and Surface Water Sampling

Throughout 1992, groundwater samples were collected across the site to provide data on seasonal variations in groundwater quality. In addition to groundwater sampling, LDW surface and stormwater samples were collected near the South Myrtle Street Embayment (Terra Vac and Floyd & Snider 2000).

Soil Vapor Sampling

From April through September 1992, Hart Crowser obtained information on soil vapor in the vadose zone from various locations at or near the GWI facility, shown in Figure 29. Two vapor probes (SVP-1 and SVP-2) were installed in the GWI warehouse to assess the potential for a vadose zone pathway beneath structures. Three vapor probes (P-1, P-2, and P-3) were completed near MW B-30 for use in an air injection test. Five vapor probes (VP-2, VP-6, VP-7, VP-9, and VP-11) were completed in sewer backfill to test for potential preferential off-site migration of VOCs through sewer trench backfill. VP-2 and VP-6 were installed in the sanitary sewer backfill in Fox Avenue South and VP-7, VP-9, and VP-11 were installed in the storm sewer backfill in Fox Avenue South (Terra Vac and Floyd & Snider 2000).

Post RI/PRA Investigations (1993-1999)

Following submittal of the RI/PRA to Ecology in 1993, Hart Crowser performed three additional investigations described below.

Extent of Contamination Near Monitoring Well B-12

In 1993, Hart Crowser installed 10 monitoring wells (B-43 through B-52) with 2-inch diameters in the immediate vicinity of MW B-12, shown in Figure 29. These wells were intended to define both site stratigraphy and the extent of dense non-aqueous phase liquid (DNAPL) at this location. Of the 10 new monitoring wells, nine (all except MW B-45) were installed in the 1st WBZ, and none of the wells encountered DNAPL (Terra Vac and Floyd & Snider 2000).

Surface Water, Seep, and Mussel Tissue Sampling

In 1994, Hart Crowser resumed collecting samples of LDW surface water seeps and mussel tissue. Sample collection was conducted both in the LDW and at the South Myrtle Street Embayment located directly downgradient of the GWI facility. Mussel tissue, surface water, and seep sampling continued at these locations annually through 1999 (Terra Vac and Floyd & Snider 2000).

Annual Soil Vapor and Groundwater Sampling

From 1993 through 1996, following the installation of monitoring wells B-43 through B-52, Hart Crowser began an annual soil vapor and groundwater sampling program in select wells both on and off the GWI facility property (Terra Vac and Floyd & Snider 2000).

Decommissioning of the Old Tank Farm (1995)

The old tank farm is located beneath the drum shed on the southeastern portion of the GWI property, shown in Figure 28. The old tank farm consisted of six single-compartment USTs with a nominal capacity of 10,000 gallons each, numbered UST 21 through UST 26 (see Figure 28). These tanks were installed in 1956, taken out of service and formally decommissioned in 1989, and closed in place in 1995 (Terra Vac and Floyd & Snider 2000).

Hart Crowser determined that significant structural underpinning would have been required to remove the tanks from beneath the existing drum shed, and substantial over-excavation of contaminated soil to remove contaminant source material would not likely have been possible; therefore, the USTs comprising the old tank farm were closed in place (Terra Vac and Floyd & Snider 2000).

Approximately 2,500 gallons of residual liquids were removed from the old tank farm USTs and stored in two Baker tanks prior to disposal. The tanks were cleaned and all residuals, including liquids, rinse water, and sludges, were disposed of off-site (Terra Vac and Floyd & Snider 2000).

Permanent closure of the USTs in the old tank farm was performed as part of the source control interim remedial measure. The USTs were perforated and piping and controls were installed so that the tank shells would function as part of the soil vapor extraction system (Terra Vac and Floyd & Snider 2000).

Source Control Intermediate Remedial Measure (1995-1996)

A soil vapor and groundwater extraction and treatment system was installed on the GWI facility property as an interim source control measure while final cleanup plans were being evaluated for the remainder of the site. The system consisted of components installed during decommissioning of the main tank farm and when modifications were made to the old tank farm USTs and additional extraction and treatment equipment (Terra Vac and Floyd & Snider 2000).

Two horizontal groundwater extraction wells and three horizontal soil vapor extraction wells were installed where DNAPL was present beneath the southwest portion of the GWI facility. Additionally, a monitoring well (B-12) installed during the site investigation was modified for use in the soil vapor and groundwater extraction system. These system components were designed to lower the groundwater elevation near monitoring well B-12 and expose the DNAPL present in the first silt layer to make it responsive to treatment by vapor extraction. Interim remedial measure system components are shown in Figure 28 (Terra Vac and Floyd & Snider 2000).

The soil vapor extraction system was designed to use a regenerative blower to extract contaminated soil vapor from the following system components and areas (Terra Vac and Floyd & Snider 2000):

- Five horizontal vents installed in the former main tank farm area.
- Six perforated USTs under the drum shed.
- Two horizontal vents (believed to be HC-1 and HC-2 in Figure 28) under South Frontenac Street in the vicinity of monitoring well B-12 as well as through monitoring well B-12 itself.
- One horizontal “trench” vent in the monitoring well B-31 “catch basin” area.

Groundwater was to be extracted using dual diaphragm pumps from the following components (Terra Vac and Floyd & Snider 2000):

- Two horizontal extraction wells (believed to be HGW-1 and HGW-2 in Figure 28) under South Frontenac Street in the vicinity of monitoring well B-12.
- The converted monitoring well B-12.

Soil vapor from the extraction points was to be piped to a treatment facility where a vapor/liquid separator, or knockout pot, would remove entrained water droplets. After leaving the knockout pot, vapor would be mixed with vapor from a groundwater air stripping tower and would enter a catalytic oxidizer for treatment. Combustion of chlorinated compounds by the oxidizer would produce hydrochloric acid, carbon dioxide, and water. Hydrochloric acid would be removed from the vapor stream by a conventional scrubber before the treated vapor was discharged to the atmosphere. The water effluent from the scrubber, containing sodium chloride, would be discharged to the sanitary sewer under permit from King County (Terra Vac and Floyd & Snider 2000).

The water that accumulated in the knockout pot would be pumped to a DNAPL separator tank, and then routed to an air-stripping tower. Water from the stripping tower would then be routed to a series of bio-treatment tanks designed to remove ketones and penta not removed by air stripping. Upon exiting the bio-treatment tanks, water would be sent through a set of activated carbon filters for polishing. Treated water was to be discharged to the sanitary sewer under permit from King County (Terra Vac and Floyd & Snider 2000).

Following the initial start-up of the system in spring 1996, a number of problems developed related to vapor destruction efficiency. The soil vapor extraction and groundwater treatment system was unable to meet long-term air quality discharge standards. Consequently, the system was unable to operate on a routine basis. Efforts to correct the problem ended in April 1997 (Terra Vac and Floyd & Snider 2000).

Pilot Study (1998)

In spring1998, Terra Vac conducted a successful dual vacuum extraction/OxyVac pilot test at the GWI facility to evaluate the system's effectiveness in remediating soil and groundwater contaminated with VOCs and SVOCs. The OxyVac process combines injection of concentrated oxidants (in-situ oxidant injection) with vacuum extraction to distribute oxidants in the subsurface better and then capture the off-gasses that result from the exothermic reaction. Terra Vac also tested the efficacy of injecting hydrogen peroxide to reduce VOC and SVOC concentrations in groundwater at the facility. Hydrogen peroxide was injected into three GWI monitoring wells (B-12, B-31, and B-39) and analytical samples were taken one day and one week after the injection. Groundwater analytical results indicated a dramatic decrease in both VOC and SVOC concentrations (Terra Vac and Floyd & Snider 2000).

South Myrtle Street Embayment Study (1998)

October through December 1998, Terra Vac conducted an investigation to determine whether groundwater was discharging into the South Myrtle Street Embayment through a finite number of seeps, such as those already identified in the RI, or through broad areas of groundwater upwelling through the South Myrtle Street Embayment sediments. The goal was to distinguish between the two types of discharge and identify areas of considerable discharge so the discharge points could be sampled during other SRI activities. Terra Vac sampled three separate times between October and December 1998 to measure and map the distribution of chlorinated ethenes in sediment porewater (Terra Vac and Floyd & Snider 2000).

Decommissioning of a 1,000-Gallon UST at the Fox Avenue South Loading Dock (1998)

In November 1998, a 1,000-gallon gasoline UST and pump dispenser adjacent to the main warehouse loading dock structural footings (Figure 28) along Fox Avenue South were decommissioned. They had been in operation since the 1970s. Substantial underpinning would have been required to for removal, so instead the UST and associated piping were permanently closed in place (Terra Vac and Floyd & Snider 2000).

Excavation uncovered the top of the tank. Approximately 500 gallons of residual fuel and water were pumped from the tank into 55-gallon drums. The top of the tank was cut off, the tank was cleaned to remove about 20 gallons of residual sludge, and the tank and associated piping were filled with concrete. The excavation was backfilled with concrete from the top of the tank to the ground surface. The soil and asphalt that had been removed and the recovered liquids and sludge were disposed of off-site. Soil sampling and analysis was performed prior to tank decommissioning (Terra Vac and Floyd & Snider 2000).

Northwest Corner Investigation (1999)

During the annual groundwater monitoring in 1998 and subsequent resampling in early 1999, elevated concentrations of PCE and moderate concentrations of TCE and DCE were detected at monitoring wells B-13 and B-22, shown in Figure 29. These wells are cross-gradient of the GWI original source area. The source area corresponds generally to the former main UST area and the location of the drum shed, old tank farm, and associated underground piping near South Frontenac Street. Further analysis of the data revealed that the plume signature at monitoring wells B-13 and B-22 was not consistent with the ratios of chlorinated VOCs seen in the GWI original source area (Terra Vac and Floyd & Snider 2000).

Terra Vac performed the "Northwest Corner Investigation" in early 1999 to evaluate the source of the elevated PCE concentrations in monitoring wells B-13 and B-22. The purpose of the investigation was to assess existing soil and groundwater quality upgradient of wells in the northwestern corner of the GWI facility. The following tasks were performed as part of the investigation (Terra Vac and Floyd & Snider 2000):

- Four soil borings were advanced and completed as temporary monitoring wells in January 1999. Results from samples collected from the temporary wells indicated that shallow groundwater was impacted by chlorinated solvents.
- Five additional borings were advanced and completed as permanent groundwater monitoring wells B-53 through B-57, shown in Figure 29. These wells were sampled 48 hours following installation and again in April 1999. Groundwater samples confirmed the presence of chlorinated solvents in shallow groundwater to the south of Shultz Distributing and across the northwest corner of GWI's property.
- The 12-inch sewer line running parallel to South Willow Street between Shultz Distributing and GWI was visually inspected and was determined not to be leaking.

Tidal Influence Study (1999)

In March 1999, Terra Vac performed a "Tidal Influence Study" of the area adjacent to the GWI facility. The purpose of this study was to assess and document the impact of LDW tidal fluctuations on groundwater flow direction and hydraulic gradients at the South Myrtle Street Embayment and the hole in 1st SH and to provide information relevant to contaminant transport in both the upper and lower subsurface water-bearing zones (1st and 2nd WBZs) identified previously (Terra Vac and Floyd & Snider 2000).

As part of the study, Terra Vac conducted a site survey to measure relative elevations of five existing monitoring wells and the location and elevation of seeps where groundwater entered the South Myrtle Street Embayment. Terra Vac also installed six pressure transducers, five in existing groundwater monitoring wells and one in a temporary embayment stilling well. This transducer data indicated relative fluctuations in groundwater elevations in relation to LDW surface level changes with the tide (Terra Vac and Floyd & Snider 2000).

Fox/Myrtle Street Investigation (1999)

Previous investigations, conducted off-property and downgradient of the GWI facility, identified the presence of a hole in the 1st SH separating the 1st WBZ and 2nd WBZ and a connection between the two water-bearing zones near the intersection of Fox Avenue South and South Frontenac Street, in the vicinity of monitoring wells B-20 and B-45 (locations are shown in Figure 29). The goal of the Fox/Myrtle Street Investigation was to determine the extent of connection between the 1st and 2nd WBZ and the size of the hole in the 1st SH (Terra Vac and Floyd & Snider 2000).

In July 1999, as part of the investigation, Terra Vac installed eight permanent and six temporary monitoring wells along the Fox Avenue South and South Myrtle Street right-of-ways. Soil and groundwater samples were collected for VOC analysis for lithologic characterization (Terra Vac and Floyd & Snider 2000).

1999 Annual Groundwater Monitoring

Terra Vac sampled all monitoring well, seep/surface water and mussel tissue locations during the annual groundwater monitoring event in October and November 1999. This sampling was performed to provide a site-wide synoptic view of groundwater contaminant concentrations (Terra Vac and Floyd & Snider 2000).

4.3.4.5 Summary of Nature and Extent of Contamination Based on Investigations Conducted from 1989 to 2000

The *SRI/FS*, completed by Terra Vac and Floyd & Snider in October 2000, extensively describes the nature and extent of contamination at the former GWI facility and is summarized here by medium, including soil (and soil vapor) and groundwater, as well as by the COCs that could affect one or both of these media.

In the *SRI/FS*, initial screening was performed to identify potential COCs or specific chemicals to further investigate for possible presence at concentrations requiring cleanup. Initial screening included comparing chemical concentrations to background concentrations for metals and inorganics; evaluating detection frequencies and evaluating risk; and, for soil and groundwater, screening against MTCA Method B cleanup levels.

Following the initial screening, fate and transport were evaluated for each potential COC and site-specific cleanup levels were derived under MTCA. Potential COCs with concentrations exceeding site-specific cleanup levels were retained as COCs for the site.

Refer to the *SRI/FS* (Terra Vac and Floyd & Snider 2000) for more detailed information on the nature and extent of contamination.

Nature and Extent of Contamination Summarized by Medium and Identification of Potential Chemicals of Concern

Soil

Over 200 soil samples were collected from 99 sample stations at the GWI facility and on adjacent properties during the GWI site investigation. Most of the samples were collected on the GWI facility in the original and secondary source areas. The original source area refers generally to the former main UST area and the location of the drum shed, old tank farm, and associated underground piping near South Frontenac Street. The secondary source area refers generally to the area beneath the facility in the vicinity of MW B-12. Sample locations are shown in Figure 29. Soil samples were analyzed for EPA's target analyte list of compounds including VOCs and SVOCs, metals, and petroleum hydrocarbons. A small number of soil samples in the areas with the highest concentrations were also analyzed for glycols, alcohols, and chlorinated dioxins/furans. The following chemicals or classes of chemicals were detected in soil samples (Terra Vac and Floyd & Snider 2000):

- Chlorinated solvents: PCE and TCA and their degradation products
- Volatile aromatic hydrocarbons (the BTEX family)
- Other volatile solvents, such as methylene chloride
- Chlorinated benzenes and phenols, including PCP (penta)
- Dioxins and furans
- Petroleum fuels and solvents and their constituents
- PAHs
- Other SVOCs, including phthalates and glycols
- Metals

The following chemicals were identified as potential COCs for soil at the GWI facility (Terra Vac and Floyd & Snider 2000):

- Chlorinated solvents and their degradation products: PCE and TCE (soil samples) and VC and cis-1,2-DCE (soil vapor samples)
- PCP (penta)
- Chlorinated dioxins and furans
- Total petroleum hydrocarbons (TPHs) (solvent-range)
- BTEX family: benzene and toluene (soil vapor samples)
- Methylene chloride

The following chemicals were retained as COCs for soil at the GWI facility (Terra Vac and Floyd & Snider 2000):

- PCE, TCE, VC, and cis-1,2-DCE
- Benzene and TPH
- Methylene chloride
- PCP

Groundwater

A total of 57 groundwater monitoring wells have been installed at the GWI facility property. Locations of monitoring wells are shown in Figure 29. Extensive sampling has included analyses for EPA's target analyte list chemicals including metals, VOCs, and SVOCs. Additionally, several rounds of sampling have included TPHs. The following chemicals or classes of chemicals were detected in groundwater in more than five percent of samples (Terra Vac and Floyd & Snider 2000):

- Chlorinated solvents and their degradation products
- Volatile aromatics (the BTEX family) and petroleum hydrocarbons
- Chlorinated benzenes
- PCP (penta)
- Dioxins and furans
- SVOCs, specifically PAHs associated with the petroleum products, phthalates (common plasticizers), and phenols
- Metals

The following chemicals were identified as potential COCs for groundwater at the GWI facility (Terra Vac and Floyd & Snider 2000):

- Chlorinated solvents and their degradation products: PCE, TCE, VC, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, 1,1,1-TCA, and 1,2-DCA
- PCP
- TPHs (solvent-range)
- BTEX family: benzene, toluene, and ethyl benzene
- Methylene chloride
- 1,4-dichlorobenzene (DCB; exceedances are in central area wells only)

The following chemicals were retained as COCs for groundwater at the GWI facility (Terra Vac and Floyd & Snider 2000):

- PCE, TCE, VC, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, 1,1,1-TCA, and 1,2-DCA

- PCP
- 1,4-DCB
- TPH
- BTEX family: benzene, toluene, and ethyl benzene

Nature and Extent of Contamination Summarized by Potential Chemicals of Concern

Most contaminants at the GWI facility are co-located in a few source areas and in plumes that extend from the source areas. "Original source area" corresponds generally to the former main UST area and the location of the drum shed, old tank farm, and associated underground piping near South Frontenac Street; the "secondary source area" refers generally to the area beneath the facility in the vicinity of MW B-12. However, in the following sections, original and secondary source areas are sometimes defined differently depending on the potential COC.

Volatile and mobile contaminants, such as the chlorinated ethenes, have migrated in groundwater to the South Myrtle Street Embayment. Less mobile contaminants, such as penta, remain localized near their source areas. The following sections describe the extent of the potential COCs at the GWI property (Terra Vac and Floyd & Snider 2000). Each potential COC section is further divided into the relevant media components (including the original source area, soil, soil vapor, and groundwater).

<u>Chlorinated Solvents</u>

Many cleanup decisions at the site will involve chlorinated solvents. Chlorinated solvents and their degradation products present at the site include PCE, TCE, and VC in soil; cis-1,2-DCE in soil vapor; and PCE, TCE, VC, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, 1,1,1-TCA, and 1,2-DCA in groundwater.

Original Source Area

The GWI Facility Source Area. The original source area for the chlorinated solvents at the GWI facility corresponds generally to the former main UST area and the location of the drum shed, old tank farm, and associated underground piping near South Frontenac Street, as shown in Figure 31. Operational releases, including UST and line leaks, appear to have contributed significant contamination to the surrounding soil and groundwater in these areas. As discussed above, these areas have undergone significant interim remedial measures, including decommissioning of USTs and piping, removal of portions of the contaminated soil, and a partially successful interim action to remove VOCs from the original source area. Although residual contamination remains in the vadose zone and the underlying saturated soil, there is no ongoing operational source of these compounds, as all of the USTs in the former main tank farm have been decommissioned and the handling of chemical products for the dry cleaning business (the principal PCE source) was discontinued in 1992 (Terra Vac and Floyd & Snider 2000).

The Secondary Source Area in the 1st SH. Historical releases at the facility appear to have contributed to a secondary source area beneath the facility in the vicinity of MW B-12. This source area is shown in Figure 31. Solvent leaks from the original source area on the property appear to have resulted in "streamers" of residual DNAPL sinking through the 1st WBZ and encountering the 1st SH. The product slowly saturated parts of the silt horizon, especially in the topographic depression in the silt horizon near MW B-12 (Terra Vac and Floyd & Snider 2000).

Recoverable DNAPL has been encountered only in MW B-12 and not in the adjacent wells; however, it is likely that the silt in this area is partially saturated with solvent and acts as an ongoing source. This source is referred to as the "secondary source area" to distinguish it from the original source area at the facility. As Figure 31 shows, this secondary source area extends from the southern part of the GWI facility beneath the railroad tracks on South Frontenac Street and under a small northern section of the former Tyee Lumber facility. The secondary source area represents the principal ongoing source of chlorinated solvents to groundwater at the GWI facility (Terra Vac and Floyd & Snider 2000).

Methylene chloride is found associated with the chlorinated solvents. This association is probably due to similar historical handling and storage practices on-site and to methylene chloride's chemical properties and behavior in the environment. It is not a parent or a product of PCE degradation, but it is co-located with the plume of PCE and its degradation products (Terra Vac and Floyd & Snider 2000).

The Northwest Corner Source Area. More recently, a second plume of chlorinated solvents was identified in the 1st WBZ, referred to as the "NW Corner Plume" because it is in the northwest corner of the GWI facility. Existing data indicates the plume is limited to the 1st WBZ. Its source area appears to be near or upgradient of MW B-54. The source itself is unknown; however, it appears to be unrelated to the plume originating around MW B-12 (Terra Vac and Floyd & Snider 2000).

Soil

Most of the soil data were collected during the remedial investigation and interim remedial measures from 1988 to 1993, so this summary may overstate the current concentrations of chemicals remaining in soil because site releases stopped in the late 1980s, the interim remedial measure has been in operation, and natural degradation has been occurring (Terra Vac and Floyd & Snider 2000). Historical and recent soil data are shown in Figure 32.

The highest concentrations of PCE (18,000 mg/kg) and TCE (1,100 mg/kg) were detected in samples collected from Station SB-10 at the former location of the pump sheds. The concentrations of PCE and TCE that exceeded MTCA Method B screening levels were found in an area around the old tank farm beneath the drum shed and the former location of the pump sheds. Only PCE concentrations exceeded the MTCA Method B screening level outside of the original source area (Terra Vac and Floyd & Snider 2000).

Soil Vapor

Soil vapor samples have been collected from numerous stations at the GWI facility to evaluate chemical concentrations in soil vapor. Soil vapor was most recently monitored in 1995 and 1996. Soil vapor samples were analyzed for specific chlorinated solvents and their degradation products including PCE, TCE, 1,1-DCE, and VC. Soil vapor results are shown in Figure 33. The highest concentrations were found near the GWI facility original source area associated with the main tank farm and associated piping and the secondary source area in the 1st SH. In general, results were consistent with the following conceptual model: soil vapor concentrations will be influenced by residual contamination in the vadose soil by off-gassing from the 1st WBZ into the vadose and by degradation (both biotic in the capillary fringe and abiotic) within the vadose zone. Therefore, the highest concentrations in soil vapor should be in areas with vadose zone soil contamination and/or the highest groundwater concentrations (Terra Vac and Floyd & Snider 2000).

Groundwater

Figures 31 and 34 show the degradation and migration of PCE in groundwater at the site in the 1st and 2nd WBZs. In both the 1st and 2nd WBZs the highest concentrations coincide with the secondary source area. However, the highest concentrations in the 1st WBZ are approximately 35 times greater than the highest concentrations in the 2nd WBZ.

<u>Petroleum Hydrocarbons and Their Constituents</u>

Original Source Area

The original source area for petroleum hydrocarbons and their constituents at the GWI facility has been identified as the old tank farm area. Gasoline, diesel, and a variety of petroleum solvents were stored in the USTs in this area at various times prior to their decommissioning. Additionally, a small leaking heating oil tank was located near B-10A. All the USTs in the former tank farm areas have been removed or decommissioned. Based on product usage, the most likely petroleum products released would have been heating oil (a light-end petroleum product similar to kerosene) and various petroleum solvents. In addition to the petroleum products, toluene and xylenes were handled at the GWI facility and stored in various USTs. Consequently, they may be present in soil and/or groundwater either because they were stored and handled as products themselves or because of their presence in light-end petroleum products (Terra Vac and Floyd & Snider 2000).

In 1999, groundwater monitoring uncovered a petroleum light non-aqueous phase liquid (LNAPL) in MW B-38, located south of the GWI facility along South Myrtle Street, just south of where Tyee Lumber Company operated a PCP dip tank. The historical Tyee Lumber Company facility, now known as the Whitehead Property, is shown in Figure 2 and is addressed in the Data Gaps Report for RM 2.3-2.8 East. The LNAPL was analyzed despite weathering and seemed to be a mixture of mineral spirits and diesel No. 2 (Terra Vac and Floyd & Snider 2000).

Most petroleum hydrocarbon contamination has been found within the old tank farm area. Petroleum contamination of groundwater at the GWI facility follows a pattern similar to that seen for chlorinated solvents (Terra Vac and Floyd & Snider 2000).

<u>Chlorinated Phenols</u>

Penta was the chlorinated phenol detected most frequently at the GWI facility. It was detected in both soil and groundwater (Figures 35 and 36). Several other chlorinated phenols have been detected, but at much lower concentrations and frequencies. They are co-located with penta, which is consistent with their presence in technical grade penta and their formation as degradation products of penta. The occurrence of penta at the facility is consistent with its mixing and sale at the GWI facility and with its use for wood treatment at the adjacent historical Tyee Lumber Company facility (Terra Vac and Floyd & Snider 2000).

Original Source Areas

Two original source areas were identified for penta. The first is in the south central portion of the GWI facility adjacent to the South Frontenac Street right-of-way (Figure 35). The source includes the penta storage and handling areas at GWI and the adjacent swale along South Frontenac Street. Penta handling at the GWI facility began in approximately 1966 and ended in the early 1980s. The second penta source area is outside of the GWI site and was identified during installation of the groundwater wells B-38 and B-39. This second area is near the dip tank that was present at the former Tyee Lumber facility adjacent to South Myrtle Street (Figure 35). The area includes the previous location of a wood-treating dip-tank in which lumber was "dipped" into the penta/mineral spirits treating solution to preserve the wood. Additionally, the area included a UST for stored penta that was removed from the former Tyee Lumber facility in 1986 (Terra Vac and Floyd & Snider 2000).

Soil

Analyses for chlorinated phenols (penta, 2,4-dichlorophenol, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, and tetrachlorophenol) were performed on 60 soil samples. Another 50 soil samples were analyzed for penta only. Three soil samples collected from within the penta original source areas were analyzed for dioxins and furans. Dioxins and furans are by-products of penta manufacturing (Terra Vac and Floyd & Snider 2000).

Pentachlorophenol. Penta was detected in approximately 40 percent of soil samples analyzed for penta. Penta sampling results are shown in Figure 35. Penta concentrations detected in soil samples collected in the original source areas ranged from 0.00047 to 29 mg/kg. The highest penta concentration was detected in near-surface soil collected from SB-10, located at the southern end of the site between the west shed and the drum shed (Terra Vac and Floyd & Snider 2000).

Other Chlorinated Phenols. Chlorinated phenols other than penta include 2,4-dichlorophenol, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, and tetrachlorophenol. 2,4-dichlorophenol was detected in 16 of 60 soil samples. The other chlorinated phenols were each detected in a range of three to five soil samples. All detected concentrations of other chlorinated phenols were between two and five orders of magnitude less than the MTCA Method B screening levels (Terra Vac and Floyd & Snider 2000).

Dioxins and Furans. Two samples collected from Station B-30 and one sample from Station B-31 were analyzed for dioxin and furan. The 2,3,7,8-TCDD and the 2,3,7,8-TCDF equivalences were calculated for each sample. The 2,3,7,8-TCDD equivalence concentrations at Station B-30 exceeded the Method B cleanup level, but the other two equivalence concentrations were either less than the Method B cleanup level or less than the Method B and Method C cleanup levels (Terra Vac and Floyd & Snider 2000).

Groundwater

Groundwater samples were analyzed for chlorinated phenols with some selected samples analyzed only for penta. Results are shown in Figure 36 for the 1st WBZ. The locations of two source areas are evident in the figure. The first source area exists along the South Frontenac Street right-of-way from B-11 by the drum shed to the edge of the 1st SH at MW B-45. Subsequent movement of the penta in groundwater has followed the direction of groundwater flow. The second source area by the former Tyee dip tank is also evident in both groundwater concentrations and in the presence of LNAPL containing approximately five percent penta. Contamination from the two source areas is separated by an area of unimpacted groundwater defined by B-19, B-62, B-63, B-20A, and B-21 (Terra Vac and Floyd & Snider 2000).

<u>Dichlorobenzenes</u>

Original Source Areas

The source for DCBs at the facility is unknown, but likely was associated with the location of the drum shed and associated underground piping near South Frontenac Street. These areas have undergone significant interim remedial measures, including decommissioning of USTs and piping and removal of portions of the contaminated soil (Terra Vac and Floyd & Snider 2000).

Soil

Although residual contamination exists on the vadose zone and the underlying saturated soil, there is no ongoing operational source of these compounds, as all of the USTs in the former main tank farm have been decommissioned. None of the residual contamination exceeds MTCA Method B screening levels (Terra Vac and Floyd & Snider 2000).

Groundwater

One of the DCBs, 1,4-DCB, exceeded the MTCA Method B screening level in groundwater. Its maximum concentration was in MW B-42, in the central section of the secondary source area in the 1st SH. It is assumed that the area near B-42 represents a residual source of 1,4-DCB to groundwater (Terra Vac and Floyd & Snider 2000).

Summary of the Nature and Extent of Contamination for Remediation Alternative Selection

This section summarizes the VOC and SVOC impacts to soil and groundwater that have resulted from historic releases of COCs within the GWI facility areas of concern (AOCs) as it pertains to remediation alternative selection for the entire GWI facility.

<u>Area of VOC Impacts</u>

The source of the VOCs at the GWI facility includes DNAPL-impacted soil with local free DNAPL in and above the 1st SH. The free DNAPL was located primarily on the 1st SH in the vicinity of MW B-12. The residual DNAPL was composed of chlorinated solvents, penta, and petroleum solvents. DNAPL has leached into groundwater from contaminated soil. Most soil impact in the source area occurred beneath the "elevated pad" and beneath the former South Frontenac Street (Terra Vac and Floyd & Snider 2000).

Data from comprehensive groundwater monitoring performed in the fall 1999 indicates that groundwater plumes have formed two distinct ongoing solvent sources (Figures 37 through 44). The area with the highest groundwater concentrations of VOCs resulted from releases associated with historical GWI facility operations and originates primarily from below the elevated pad, the drum shed, and the former South Frontenac Street (Figure 45). This area is referred to as the "VOC AOC" and it includes both vadose soil (0-8 feet bgs) and saturated soil (8-15 feet bgs). The VOC AOC covers approximately 45,000 square feet and includes at least 5,000 square feet south of the GWI property line. In 2000, this area was owned by the Whitehead Corporation. A second, smaller area of groundwater impact is present near the northwestern corner of the GWI property (Terra Vac and Floyd & Snider 2000).

The VOC AOC contains over 26,000 cubic yards of soil when measured to a depth of 15 feet bgs, with concentrations of the primary VOCs (PCE, TCE, cis-1,2-DCE, and VC) up to 18,000 mg/kg. The source area also contains groundwater within the 1st WBZ with VOC concentrations up to 69,000 µg/L PCE, 21,000 µg/L TCE, 33,000 µg/L DCE, and 3,100 µg/L VC (Terra Vac and Floyd & Snider 2000).

<u>Area of SVOC Impacts</u>

The area of soil and groundwater impacted by SVOCs is depicted in Figure 46. Included in this area is a portion of the 1st SH presumed to contain penta commingled with chlorinated solvent DNAPL. Soil contaminated by SVOCs (primarily penta) exceeding the cleanup level for penta (0.79 mg/kg to protect surface water) is present beneath the elevated pad and the former South Frontenac Street (that is, contaminated soil beneath South Frontenac Street is primarily under the containment swale of the rail spur, along the southern edge of the elevated pad). Additional penta-impacted soil is present beneath the elevated pad and in the unpaved lot south of South Frontenac Street. In 2000, this lot was leased to Seattle Iron and Metals Corporation and was owned by Whitehead Corporation (Terra Vac and Floyd & Snider 2000).

The source area leaches contaminants to groundwater within the SVOC AOC, with limited downgradient impacts, based on the results of the 1999 groundwater sampling event referred to above. The principal groundwater impacts from the GWI facility originated near the rail spur swale, South Frontenac Street, and near MW B-12. Contamination in these areas may also be associated with site operations at the former Tyee Lumber facility (Terra Vac and Floyd & Snider 2000).

A separate penta source appears to be near well B-38 on South Myrtle Street. This well is adjacent to the former location of a dip tank operated by Tyee Lumber Company. The tank is known to have contained 5 percent penta in mineral spirits. An LNAPL was discovered in this well during the 1999 groundwater sampling event, confirming the presence of penta and mineral spirits. Remediation of this LNAPL is not included in the *SRI/FS* because it appears to be from a source off the GWI property and does not appear to be commingled with the GWI plume. Contamination at the Tyee Lumber Company (Whitehead Property) will be discussed further in the Data Gaps Report for RM 2.3-2.8 East (Terra Vac and Floyd & Snider 2000).

In 2000, the penta source area covered approximately 31,000 square feet (including approximately 10,000 square feet south of South Frontenac Street) and contained groundwater (within the 1st WBZ) and approximately 17,000 cubic yards of soil to a depth of 15 feet bgs. The groundwater contained up to 1,900 µg/L penta (based on 1999 data) and the upper 15 feet of soil contained up to 29 mg/kg penta (based on 1992 data) (Terra Vac and Floyd & Snider 2000).

Downgradient Groundwater VOC Impacts

A plume containing VOCs at concentrations exceeding the cleanup levels is present in the 2nd WBZ between the GWI property and the South Myrtle Street Embayment of the LDW. The area of downgradient impact in the 2nd WBZ is shown in Figure 47. This downgradient area is outside of RM 2.0-2.3 East and will be addressed in greater detail in the Data Gaps Report for RM 2.3-2.8 East; however, it is discussed here to provide an overall picture of the contamination migrating from the GWI facility (Terra Vac and Floyd & Snider 2000).

The downgradient plume results from groundwater transport and biological breakdown of VOCs from the VOC AOC. PCE enters the 2nd WBZ through the hole in the 1st SH. Reductive dechlorination of PCE in the 2nd WBZ forms the daughter products TCE, DCE, and VC as the groundwater flows toward the South Myrtle Street Embayment (Terra Vac and Floyd & Snider 2000).

Complete destruction of DCE and VC is inhibited due to the reducing conditions in the 2nd WBZ between Fox Avenue South and South Myrtle Street. As a result, high concentrations of DCE and VC exceeding cleanup levels remain in the 2nd WBZ groundwater and discharge into the South Myrtle Street Embayment (Terra Vac and Floyd & Snider 2000).

The plume is present in the 2nd WBZ, which is located approximately 14 to 45 feet bgs. The off-property plume underlies approximately 190,000 square feet of pervious and impervious surfaces. The plume impacts approximately 1.8 million cubic feet of groundwater within the 2nd WBZ with one or more of the VOCs at concentrations greater than the cleanup levels. The concentrations of VOCs in this plume are up to 1,400 µg/L for PCE, up to 4,000 µg/L for TCE, up to 40,000 µg/L for DCE, and up to 23,000 µg/L for VC (Terra Vac and Floyd & Snider 2000).

4.3.4.6 Summary of Post-SRI/FS Investigations and Interim Remedial Actions (After 2000)

Section 4.3.4.4 summarizes investigations and cleanup activities conducted at the GWI facility from 1989 through 2000, and Section 4.3.4.5 summarizes the nature and extent of contamination at the GWI facility based on the results of the investigations and cleanup activities conducted through 2000. This section summarizes investigations and interim remedial actions conducted after 2000, in order to highlight supplemental information to be used in conjunction with the nature and extent of contamination as it was described in 2000.

Supplemental Investigation of the South Willow Street Right-of-Way (2000)

In July 2000, Terra Vac performed this supplemental investigation to further assess and document the nature and extent of VOCs in soil and groundwater within the South Willow Street right-of-way, north of the GWI facility property. Twelve temporary wells (NW-1 through NW-12, shown in Figure 48) were installed in the South Willow Street right-of-way; 33 soil samples and 21 groundwater samples were collected during the investigation and selected samples were analyzed for VOCs, TPHs, and non-aqueous phase liquid (NAPL). PCE concentrations found in soil and groundwater are presented in Figures 48 and 49 (Terra Vac and Floyd & Snider 2001).

Consistent with the results of previous investigations, results of the South Willow Street right-of-way investigation concluded that most of the total VOC load in soil was from PCE. Although the chemical signatures of PCE and its breakdown products in this supplemental investigation area differ from those observed in GWI source areas, the nature and extent of VOCs in the supplemental investigation area do not indicate an off-site source but instead support the likelihood of a more localized release. The shallow depth at which these impacts were detected indicates surface releases may have occurred. None of the soil samples collected contained COCs with concentrations that exceed cleanup levels proposed in the SRI/FS. Groundwater data collected during this supplemental investigation indicate VOC impacts present in groundwater beneath the South Willow Street right-of-way are connected to a source within the GWI property or the South Willow Street right-of-way (Terra Vac and Floyd & Snider 2001).

Fox Avenue Pilot Study (2003)

In accordance with the Agreed Order No. DE TC91-N203 between the Fox Avenue Building LLC and Ecology, Environmental Resources Management, Inc., (ERM) produced a work plan for the *Fox Avenue Pilot Study* in 2003. The pilot study was for *in situ* chemical oxidation, to evaluate the effectiveness of potassium permanganate injection as a remedy for CVOCs in groundwater at the Fox Avenue Building property (ERM 2003).

After performing an initial pilot study at the site from December 2003 through March 2004, ERM outlined a program to implement *in situ* chemical oxidation on an expanded scale, to test and possibly install a soil vapor extraction (SVE) system, and to evaluate the results of these activities to better define key design parameters for the full-scale groundwater remediation program. The expanded pilot study was designed to ensure that the full-scale groundwater remediation program results in sustained reduction in contaminant concentrations (ERM 2004).

An SVE pilot study was conducted by ERM in November 2004. The pilot study showed that SVE is a technically feasible approach for remediation of the CVOCs in the unsaturated soil and has the potential to remove a significant mass of CVOCs from the unsaturated zone (ERM 2005).

In May 2005, ERM outlined a program to implement an expanded SVE pilot study to reduce contaminant mass in the unsaturated zone during the expanded *in situ* chemical oxidation pilot test, thereby removing a secondary source of groundwater contamination and increasing the likelihood of sustained reductions in groundwater contaminant concentrations. A successful expanded SVE pilot study would verify that a combination of SVE and a large-scale permanganate injection program could produce sustained reductions in groundwater contaminant concentrations at the site, and that the combination of systems is a feasible cleanup method (ERM 2005).

Summary of Contamination for the Fox Avenue Pilot Study

Site background and contamination information pertaining to the Fox Avenue Pilot Study was summarized as follows (ERM 2003):

- The current distribution of contaminants in soil and groundwater consist primarily of CVOCs adsorbed to soil in the vadose and saturated zones and as a dissolved phase in groundwater;
- The current distribution of DNAPL in the Secondary Source Area is minimal as defined in the *SRI/FS*. Only slight evidence of DNAPL was encountered based on various field screening methods;
- Concentrations of CVOCs were highest in the 1st WBZ to the south and southeast of the West Shed (Figure 27). Concentrations were as high as 74 mg/L in this area; and
- The highest concentrations of CVOCs in the 2nd WBZ were encountered off-site on the Whitehead property south of the Secondary Source Area.

Approximate lateral distribution of CVOC concentrations in the 1st WBZ is shown in Figures 50 through 53. Approximate lateral distribution of CVOC concentrations in the 2nd WBZ is shown in Figures 54 through 57.

4.3.4.7 Facility Inspections

Dangerous Waste Compliance Inspection, Great Western Chemical (April 2001)

On April 11, 2001, Ecology conducted a Dangerous Waste Compliance Inspection at the Cascade Columbia Distribution facility, which at the time was in operation as GWC. Ecology noted that 108 55-gallon drums of Dangerous Waste (soil borings and water samples from monitoring wells) from the facility's MTCA cleanup were being stored on-site, apparently from as far back as 1992. Ecology's Area of Contamination policy allows for storage of contaminated soil and debris on-site without triggering Dangerous Waste regulations as long as the wastes are stored within the Area of Contamination (the portion of the site that contains continuous contamination) (Ecology 2001).

4.3.4.8 Potential Pathways of Contamination

Stormwater

Figure 27 illustrates the most current site configuration and depicts the sanitary sewer line, the storm drain line, and some manholes, but a description of the Cascade Columbia Distribution facility's current storm drain system was not found in the files. Figure 4 indicates that the facility's storm drain system may connect to the city's storm drain system; some stormwater from the Cascade Columbia Distribution facility may also discharge to the LDW via the South Brighton Street CSO/SD.

In 1992, GWI planned to improve stormwater drainage at the facility and connect to an existing storm sewer and a new sanitary sewer to be located in South Willow Street on the north side of the facility; however, information documenting the completion of drainage improvements at the facility was not found in files.

The Cascade Columbia Distribution facility is not covered under the Industrial Stormwater General Permit. From 1996 through 2001, GWC was authorized to discharge contaminated stormwater to the sanitary sewer, and from 1997 through 2002, GWC was authorized to discharge wastewater generated from a groundwater remediation system to the sanitary sewer. Therefore, facility stormwater potentially discharges to the sanitary sewer system, in which case stormwater would not be a potential pathway of contamination to the LDW within RM 2.0-2.3 East. However, if the facility does discharge to the city's storm drain system, extensive soil and groundwater contamination at the property could infiltrate the storm drain system and discharge to the LDW within RM 2.0-2.3 East. Furthermore, stormwater pollutants from facility operations could enter the storm drain system and discharge to the LDW.

Groundwater

Extensive groundwater contamination exists at the Cascade Columbia Distribution facility and has been determined to reach LDW sediments in the vicinity of the Myrtle Street Embayment (shown in Figures 2 through 4) where South Myrtle Street intersects the LDW. Since the Myrtle Street Embayment is located in the RM 2.3-2.8 East source control area, groundwater investigations, the groundwater pathway, and relevant data gaps are summarized in the Data Gaps Report for that source control area.

Spills

Operations at the Cascade Columbia Distribution facility could result in spills. However, since the facility is not adjacent to the LDW, spills could only reach the LDW via the stormwater pathway, and then only if the facility discharges to the city storm drain system rather than the sanitary sewer.

Bank Erosion

The Cascade Columbia Distribution facility is not located along the banks of the LDW; therefore, bank erosion/leaching is not considered a potential pathway for contamination to reach LDW sediments.

Atmospheric Deposition

The information reviewed gave no indication that any activities at the Cascade Columbia Distribution facility may result in atmospheric deposition; therefore, atmospheric deposition is not considered a potential pathway for contamination to reach LDW sediments.

4.3.4.9 Data Gaps

The following data gaps have been identified for the Cascade Columbia Distribution property. Since it has been determined that groundwater reaches LDW sediments in the vicinity of the Myrtle Street Embayment south of RM 2.0-2.3 East, data gaps pertaining to the groundwater pathway are identified in the Data Gaps Report for the RM 2.3-2.8 East source control area. The following data gaps should be addressed before effective source control can be accomplished for the RM 2.0-2.3 East source control area.

- Cascade Columbia Distribution is a chemical distribution facility, but its specific site operations and differences between its operations and GWC operations should be identified.
- Information pertaining to historical operations at the site allowed identification of a sump GWI installed in the "drumming area" in 1959 that connected to a subsurface drain pipe running to the southern edge of "the dock." Apparently GWI replaced the sump and drain system in the "drumming area" during facility modifications in the 1960s and 1970s. The location of the former sump and subsurface drain pipe was not identified on a figure in the information reviewed. The former location should be determined. Depending on facility operations, these structures could have contributed contamination to LDW sediments in the past and may require further demolition.
- A second plume of chlorinated solvents was identified in the 1st WBZ in the northwestern corner of the GWI facility and is referred to as the "NW Corner Plume." The source appears to be near or upgradient of MW B-54, but as of 2000, the source was still unknown. Further investigation of the "NW Corner Plume" is needed.
- Limited information was found pertaining to dioxin and furan contamination at the property; more information is needed to determine the threat of dioxin and furan contamination to LDW sediments.
- Limited information was found pertaining to the facility's current storm drain system. Evidence suggests the facility discharges its stormwater to the sanitary sewer. However, no documentation was found to confirm this. The facility's storm drain system should be evaluated to confirm it is only discharging to the sanitary sewer system and not to a storm drain that discharges to the LDW.
- If the facility discharges to the city's storm drain system, in-line storm drain solids should be sampled within the Cascade Columbia Distribution facility storm drain system to determine whether contamination at the site could migrate to the LDW via the stormwater pathway.
- According to Hart Crowser, GWI planned to make drainage improvements at the facility in 1992; information is needed to determine what, if any, improvements were actually made at the facility.
- An SVE pilot study was designed in May 2005 that, if successful, would have verified that a combination of an SVE and a large-scale permanganate injection program was a feasible cleanup method. Information is needed to determine whether the study was performed, whether it was successful, and what has occurred at the site since 2005.

4.4 Other Data Gaps

The following data gaps have been identified for the RM 2.0-2.3 East source control area in general, in addition to the data gaps identified specifically for the South Brighton Street CSO/SD, South River Street SD, and facilities of concern. The following data gaps should be addressed before effective source control can be accomplished for the RM 2.0-2.3 East source control area:

- GIS data provided by SPU from September 9, 2003, identified "LDW Outfall Locations," shown in Figure 4. The location "Outfall #2025 and Seep" appeared to mark both an outfall and a seep at this location, but the data are unclear. This information should be confirmed.
- Three facilities of concern were identified in Table 4 and are depicted on Figure 4. No information pertaining to these sites was found within the scope of this report. The facilities are Bunge Foods, Muckleshoot Seafood Products (identified in the November 2007 *Lower Duwamish Waterway Phase 2 Remedial Investigation Draft Report* as Silver Bay Logging), and Rainier Petroleum Products. These facilities should be investigated for potential sources of sediment recontamination.
- Additional information was received from Ecology and reviewed late in the report-writing process. This information included an informal summary of available information pertaining to the Glacier Marine Services facility. Within this summary, additional possible sources of sediment contamination in Slip 3 were identified, but could not be further evaluated for inclusion within this report, so they are included here as a data gap. The summary identified the following:
    - Morton Marine Equipment/Workboats Northwest was on the northwest shore of Slip 3. This facility repaired steel and aluminum hulls and removed and installed engines. Complaint files for MP&E included an oil spill complaint at Morton Marine. The location of the Morton Marine facility and the time period of their operations are not known; the facility should be further investigated as a potential source of sediment recontamination.
    - South River Street SD, which discharges to RM 2.0-2.3 East (shown in Figure 4 and discussed in Section 4.1.2), was identified as serving Morton Marine and R.A. Barnes, Inc., a facility that supplied sandblasting materials ("Tuff-Kut") to shipyards and other industries. R.A. Barnes received at least three complaints of sandblast grit being spilled or washed into catch basins. "Tuff-Kut" is a copper slag grit with metals levels of 90-120 mg/kg arsenic, 3200-7000 mg/kg chromium, 4400-5000 mg/kg copper, 400-1000 mg/kg lead, and 7000-12000 mg/kg zinc. The location of the R.A. Barnes facility and the time period of their operations are not known; the facility should be further investigated as a potential source of sediment recontamination.
- The shoreline within RM 2.0-2.3 East should be investigated to confirm existing outfall locations and to determine whether additional private outfalls to the LDW may exist that have not yet been documented.
- Storm water runoff from rooftops has not been investigated for potential contamination. If rooftop runoff goes to storm drains discharging to the LDW and if roofing material is unknown then building owners need to supply records verifying their roofs are constructed with non-hazardous material. If roofing material is known to consist of hazardous material (for example, paints containing PCBs) and its runoff drains to the LDW, then samples of rooftop runoff should be analyzed for potential COCs.

- Surface runoff, bank erosion/leaching, and atmospheric deposition should be further investigated as potential pathways for sediment recontamination from facilities directly adjacent to the LDW.

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6.0 Tables

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Table 1
CSO/EOF Discharges to the LDW

Outfall	Type/Owner	Discharge Serial Number	Location	Average Overflow Frequency (events/year) 1999 to 2005	Annual Average Volume (mgy) 1999 to 2005
Diagonal Avenue S.[1]	CSO (SPU/King County)	NA	RM 0.5 E	20.1	15.82
	SD (SPU)				
Hanford No. 1[3]	CSO (King County)	31	RM 0.5 E	5.5	10.4
Duwamish pump station East	CSO (King County)	35	RM 0.5 E	0.2	0.67
Duwamish pump station West	CSO (King County)	34	RM 0.5 W	1	0.58
S. Brandon Street	CSO (King County)	41	RM 1.1 E	26.3	31
Terminal 115	CSO (King County)	38	RM 1.9 W	2	3.17
S. Brighton Street	CSO (SPU)	NA	RM 2.1 E	NA[7]	NA
	SD (SPU)				
King County Airport SD#3/PS44 EOF[4]	SD (King County)	NA	RM 2.8 E	NA	NA
	EOF (SPU)				
E. Marginal Way S. pump station	EOF (King County)	43	RM 2.8 E	None recorded	NA
8th Avenue S.	CSO (King County)	40	RM 2.8 W	0	0
King County Airport SD#2/PS78 EOF[5]	SD (King County)	NA	RM 3.8 E	NA	NA
	EOF (SPU)				
Michigan	CSO (King County)	39	RM 1.9 E	8.1	19
W. Michigan	CSO (King County)	42	RM 2.0 W	3.6	0.98
Norfolk	CSO (King County)	44	RM 4.8 E	1.1	0.28
	SD (King County)				
	EOF (SPU)[6]				

Key:

CSO - combined sewer overflow
EOF - emergency overflow
mgy - million gallons per year
NA - Not available
SD - storm drain

Notes:

1. The Diagonal Avenue S. SD outfall is shared by stormwater and seven separate overflow points, including the City's Diagonal CSOs and the County's Hanford No. 1 CSO. The overflow frequency and volume listed are for the Diagonal CSOs only.

2. This average volume does not include the contribution from King County's Hanford No. 1 CSO, but does include the remaining seven overflow points that discharge through the Diagonal Avenue S. CSO/SD.

3. Hanford No. 1 discharges to the LDW through the Diagonal Avenue S. SD.

4. SPU Pump Station 44 discharges via EOF No. 117 to King County Airport SD#3 at Slip 4.

5. SPU Pump Station 78 discharges via EOF No. 156 to King County Airport SD#2, near Boeing Isaacson.

6. SPU Pump Station 17 discharges to the Norfolk CSO/SD.

7. Has not overflowed since monitoring began in March 2000.

Table 2
Contaminants Above Screening Levels in Surface Sediment
RM 2.0-2.3 East

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
Metals and Trace Elements														
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Arsenic	80.9	mg/kg dw		2.08		57	93	mg/kg dw	1.4	
PAHs														
DR112	2.1	EPA SI	8/19/1998	Fluoranthene	5.3	mg/kg dw		2.64	200	160	1200	mg/kg OC	1.3	
PCBs														
DR111	2.1	EPA SI	8/19/1998	PCBs (total calc'd)	0.311	mg/kg dw		2.26	13.8	12	65	mg/kg OC	1.2	
DR148	2.1	EPA SI	8/18/1998	PCBs (total calc'd)	279	ug/kg dw	J	4.51		130	1000	ug/kg dw	2.1	
B6b	2.2	LDWRI-Benthic	9/18/2004	PCBs (total calc'd)	0.42	mg/kg dw		2.96	14	12	65	mg/kg OC	1.2	
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	PCBs (total calc'd)	0.124	mg/kg dw		0.972	12.8	12	65	mg/kg OC	1.1	
Other SVOCs														
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzyl alcohol	150	ug/kg dw		2.43		57	73	ug/kg dw	2.6	2.1

Key:

DW - Dry weight
CSL - Cleanup Screening Level
PAH - Polynuclear aromatic hydrocarbon
PCB - Polychlorinated biphenyl
OC - Organic carbon
TOC - Total organic carbon
SQS - Sediment Quality Standard
SVOC - Semivolatile organic compound

Notes:

1. SQS and CSL values are substituted with AET values for dry weight comparison where organic compounds are not OC-normalized (when TOC % DW is outside of the 0.5-4.0% range).
2. Exceedance factors are the ratio of the detected concentration to the CSL or SQS (or to AET values where applicable); exceedance factors are shown only if they are greater than 1.

Source:

Lower Duwamish Waterway Group, 2007. Online Lower Duwamish Waterway Group Draft Remedial Investigation Report (November 2007) Database. http://www.ldwg.org.

Table 3
Contaminants Above Screening Levels in Subsurface Sediment
RM 2.0-2.3 East

Sample Location Name	Sample River Mile Location	Sample Depth Interval (feet)	Sampling Event	Sampling Event Year	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
Metals and Trace Elements															
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Arsenic	150	mg/kg dw		2.25		57	93	mg/kg dw	2.6	1.6
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Arsenic	121	mg/kg dw		2.67		57	93	mg/kg dw	2.1	1.3
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Arsenic	2000	mg/kg dw		2.24		57	93	mg/kg dw	35	22
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Copper	2940	mg/kg dw		2.24		390	390	mg/kg dw	7.5	7.5
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Lead	3520	mg/kg dw	J	2.24		450	530	mg/kg dw	7.8	6.6
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Mercury	0.45	mg/kg dw	J	2.67		0.41	0.59	mg/kg dw	1.1	
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Zinc	490	mg/kg dw		2.67		410	960	mg/kg dw	1.2	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Zinc	4720	mg/kg dw		2.24		410	960	mg/kg dw	12	4.9
PAHs															
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Acenaphthene	0.62	mg/kg dw		2.24	28	16	57	mg/kg OC	1.8	
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(a)anthracene	3.1	mg/kg dw		2.67	120	110	270	mg/kg OC	1.1	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Benzo(a)anthracene	4.5	mg/kg dw		2.24	200	110	270	mg/kg OC	1.8	
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(a)pyrene	5.3	mg/kg dw		2.67	200	99	210	mg/kg OC	2.0	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Benzo(a)pyrene	4	mg/kg dw		2.24	180	99	210	mg/kg OC	1.8	
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(g,h,i)perylene	1	mg/kg dw		2.67	37	31	78	mg/kg OC	1.2	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Benzo(g,h,i)perylene	0.83	mg/kg dw		2.24	37	31	78	mg/kg OC	1.2	
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzofluoranthenes (total-calc'd)	10.2	mg/kg dw		2.67	380	230	450	mg/kg OC	1.7	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Benzofluoranthenes (total-calc'd)	9.1	mg/kg dw		2.24	410	230	450	mg/kg OC	1.8	
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Chrysene	4.8	mg/kg dw		2.67	180	110	460	mg/kg OC	1.6	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Chrysene	5	mg/kg dw		2.24	220	110	460	mg/kg OC	2.0	
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Dibenzo(a,h)anthracene	0.36	mg/kg dw		2.67	13	12	33	mg/kg OC	1.1	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Dibenzofuran	0.57	mg/kg dw		2.24	25	15	58	mg/kg OC	1.7	
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Fluoranthene	4.5	mg/kg dw		2.67	170	160	1200	mg/kg OC	1.1	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Fluoranthene	13	mg/kg dw		2.24	580	160	1200	mg/kg OC	3.6	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Fluorene	0.75	mg/kg dw		2.24	33	23	79	mg/kg OC	1.4	
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Indeno(1,2,3-cd)pyrene	1.5	mg/kg dw		2.67	56	34	88	mg/kg OC	1.6	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Indeno(1,2,3-cd)pyrene	1.2	mg/kg dw		2.24	54	34	88	mg/kg OC	1.6	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Phenanthrene	7.5	mg/kg dw		2.24	330	100	480	mg/kg OC	3.3	
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Total HPAH (calc'd)	40	mg/kg dw		2.67	1500	960	5300	mg/kg OC	1.6	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Total HPAH (calc'd)	47	mg/kg dw		2.24	2100	960	5300	mg/kg OC	2.2	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Total LPAH (calc'd)	10.5	mg/kg dw	J	2.24	470	370	780	mg/kg OC	1.3	
PCBs															
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	PCBs (total calc'd)	0.45	mg/kg dw		2.25	20	12	65	mg/kg OC	1.7	
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	PCBs (total calc'd)	0.95	mg/kg dw	J	2.67	36	12	65	mg/kg OC	3.0	
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	PCBs (total calc'd)	0.55	mg/kg dw		2.24	25	12	65	mg/kg OC	2.1	
TPHs															
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	1,2,4-Trichlorobenzene	0.046	mg/kg dw		2.24	2.1	0.81	1.8	mg/kg OC	2.6	1.2
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	1,2-Dichlorobenzene	0.15	mg/kg dw		2.24	6.7	2.3	2.3	mg/kg OC	2.9	2.9

Key:
DW - Dry weight
CSL - Cleanup Screening Level
PAH - Polynuclear aromatic hydrocarbon
PCB - Polychlorinated biphenyl
OC - Organic carbon
TOC - Total organic carbon
TPH - Total petroleum hydrocarbon
SQS - Sediment Quality Standard
SVOC - Semivolatile organic compound

Notes:
1. SQS and CSL values are substituted with AET values for dry weight comparison where organic compounds are not OC-normalized (when TOC % DW is outside of the 0.5-4.0% range).
2. Exceedance factors are the ratio of the detected concentration to the CSL or SQS (or to AET values where applicable); exceedance factors are shown only if they are greater than 1.

Source:
Lower Duwamish Waterway Group, 2007. Online Lower Duwamish Waterway Group Draft Remedial Investigation Report (November 2007) Database. http://www.ldwg.org.

Table 4
Facilities of Concern Identification
RM 2.0-2.3 East

Facility Identified	Identification Source	Facility Address[1]	Facility/Site ID No.	Included/Excluded	Updates and Corrections Needed
Big John's Truck Repair	Ecology's files and Facility/Site Database	6533 3rd Ave. S, Seattle, WA, 98108	44383713	Included as Riverside Industrial Park.	
Evergreen Marine Leasing - Parcel E	Ecology's files and Facility/Site Database	7343 E Marginal Way S, Seattle, WA, 98108	2462	Excluded because located outside of RM 2.0-2.3 East, at approximately RM 2.9.	The map location shown in the Facility/Site Database appears to be incorrect. The facility was determined to be located on tax parcel 2924049043, owned by Emerald Services. Ecology's files for this facility were intermixed with files for Northland Services because Evergreen Marine Leasing is a former owner of the Northland Services property.
Fox Avenue Building	Ecology's files and Facility/Site Database	6900 Fox Ave. S, Seattle, WA, 98108	2282	Included as Cascade Columbia Distribution.	The map location shown in the Facility/Site Database appears to be incorrect. Cascade Columbia Distribution was determined to be located south of S Willow Street and east of Fox Avenue S, on tax parcel 0001800087.
Northland Services	Ecology's files and Facility/Site Database	6701 Fox Ave. S, Seattle, WA, 98108	22653378	Included as Glacier Marine Services.	
Shultz Distributing	Ecology's files and Facility/Site Database	6851 E Marginal Way S, Seattle, WA, 98108	95498891	Included.	The map location shown in the Facility/Site Database appears to be incorrect. Shultz Distributing was determined to be located between S Brighton Street and S Willow Street, with Fox Avenue S bordering the facility to the west and East Marginal Way S bordering the property to the east.
United Marine Shipbuilding	Ecology's files and Facility/Site Database	5055 E Marginal Way, Seattle, WA, 98108	1523145	Excluded because located outside of RM 2.0-2.3 East, between RM 0.6 and 0.9.	
V. Van Dyke	Ecology's files and Facility/Site Database	150 S River St., Seattle, WA, 98108	68427684	Included.	The map location shown in the Facility/Site Database appears to be incorrect. V. Van Dyke was determined to be located just east of Occidental Avenue S and north of S River Street, on tax parcel 5367202270.
Bunge Foods	Based on vicinity to LDW from figures and maps reviewed			Included as a data gap in Section 4.4 because no information pertaining to the site was found for review.	
Silver Bay Logging (now known as Muckleshoot Seafood Products)	Nov 2007 LDW RI Report			Included as a data gap in Section 4.4 because no information pertaining to the site was found for review.	
Rainier Petroleum Corporation	Nov 2007 LDW RI Report			Included as a data gap in Section 4.4 because no information pertaining to the site was found for review.	
Seattle Cold Storage Company	Nov 2007 LDW RI Report			Included as SCS Refrigerated Services.	
Seattle Distribution Center	Nov 2007 LDW RI Report			Included.	
Glacier Marine Services	Nov 2007 LDW RI Report			Included.	
Seatac Marine Services	Nov 2007 LDW RI Report			Included as Glacier Marine Services; also same facility as Northland Services.	
Remarkable Tire	Facility/Site Database	7115 East Marginal Way S, Seattle, WA, 98108	65141181	Excluded because actually located south of RM 2.0-2.3 East.	The map location shown in the Facility/Site Database appears to be incorrect. Remarkable Tire was determined to be located at approximately the intersection of S Myrtle Street and East Marginal Way S.

Table 4
Facilities of Concern Identification
RM 2.0-2.3 East

Facility Identified	Identification Source	Facility Address[1]	Facility/Site ID No.	Included/Excluded	Updates and Corrections Needed
Vacuum Truck Services	Facility/Site Database	220 S River Street, Seattle, WA, 98108	37289288	Included as Riverside Industrial Park; also same facility as Big John's Truck Repair.	Vacuum Truck Services and Big John's Truck Repair appear to be the same facility, entered into the Facility/Site Database twice; the facility was formerly known as Vacuum Truck Services and appeared to be listed under the office building address rather than the shop building address, as Big John's Truck Repair was.
WA DNR Corson Ave Site Hat Boots	Facility/Site Database	6800 East Marginal Way S, Seattle, WA 98108	61845527	Included as Hat n' Boots, but as a facility of concern located within the South Brighton Street CSO Basin.	The map location shown in the Facility/Site Database appears to be incorrect. Hat n' Boots was determined to actually be located within the South Brighton Street CSO Basin, at approximately the intersection of East Marginal Way S and Corson Ave. S.
South Brighton Street CSO Basin Facilities of Concern					
Arrow Transportation	Facility/Site Database	6737 Corson Ave. S, Seattle, WA, 98108	69693852	Included as former facility at South Seattle Community College Property.	
Ben's Truck Parts	Facility/Site Database	6655 Corson Ave. S, Seattle, WA, 98108	74169521	Included as former facility at South Seattle Community College Property.	Ben's Truck Parts appeared to be located on the same tax parcel as Arrow Transportation and Inland Transportation Company, which is now occupied by South Seattle Community College.
Inland Transportation Company	Facility/Site Database	6737 Corson S, Seattle, WA, 98108	2134	Included as former facility at South Seattle Community College Property.	Inland Transportation Company and Arrow Transportation appear to have the same address and to be located on the same tax parcel, which is now occupied by South Seattle Community College; whether they are the same facility or were just located on the same tax parcel is unknown.
Hat n' Boots Gas Station	Facility/Site Database	6800 East Marginal Way S, Seattle, WA 98108	61845527	Included as former facility at South Seattle Community College Property.	The map location shown in the Facility/Site Database appears to be incorrect. Hat n' Boots was determined to actually be located within the South Brighton Street CSO Basin, at approximately the intersection of East Marginal Way S and Corson Ave. S.

Notes:

1. Addresses were not provided in the November 2007 Lower Duwamish Waterway Phase 2 Remedial Investigation Draft Report (Windward 2007) for facilities that were listed as primary upland properties in the vicinity of RM 2.0-2.3 East.

7.0 Figures

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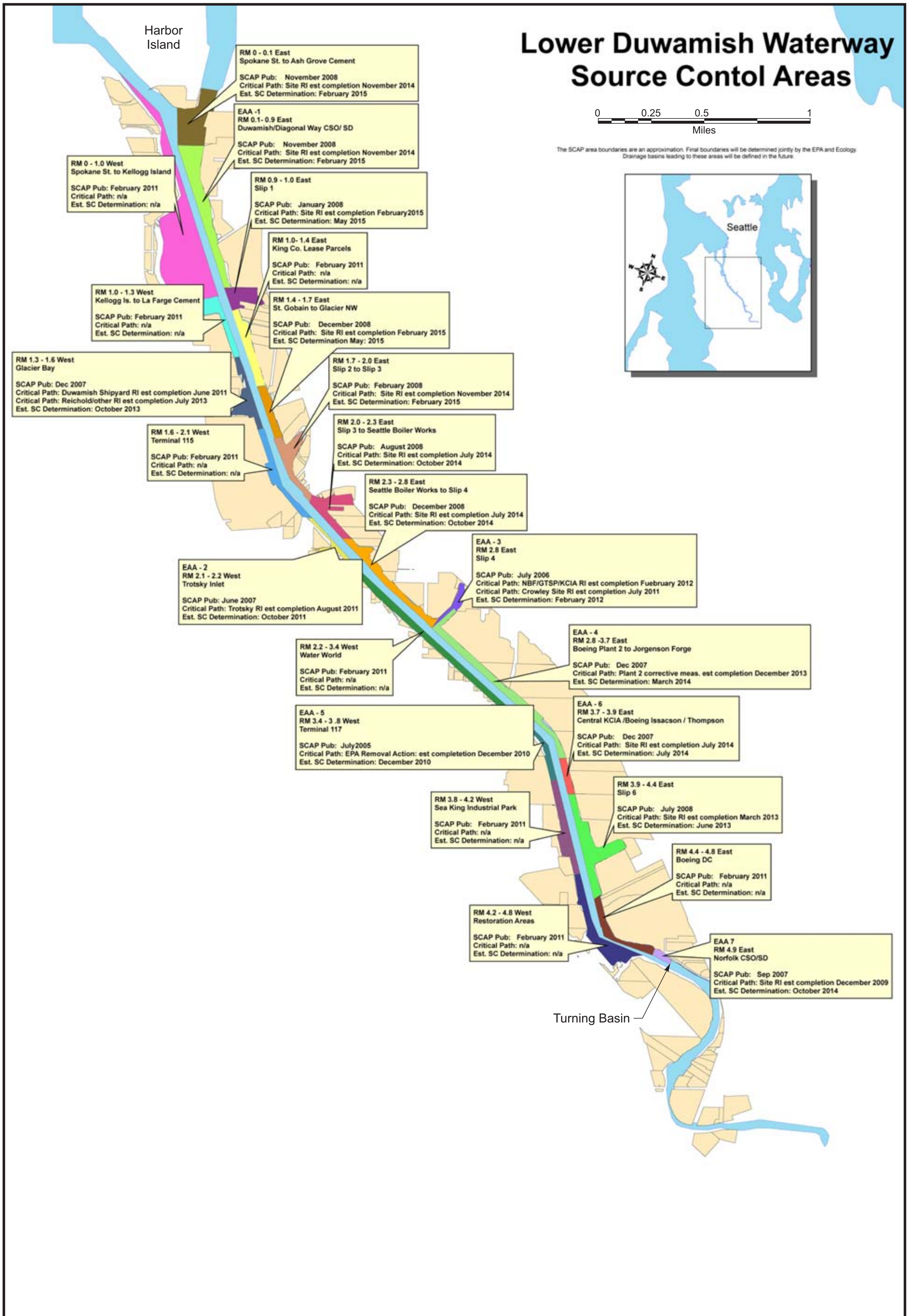
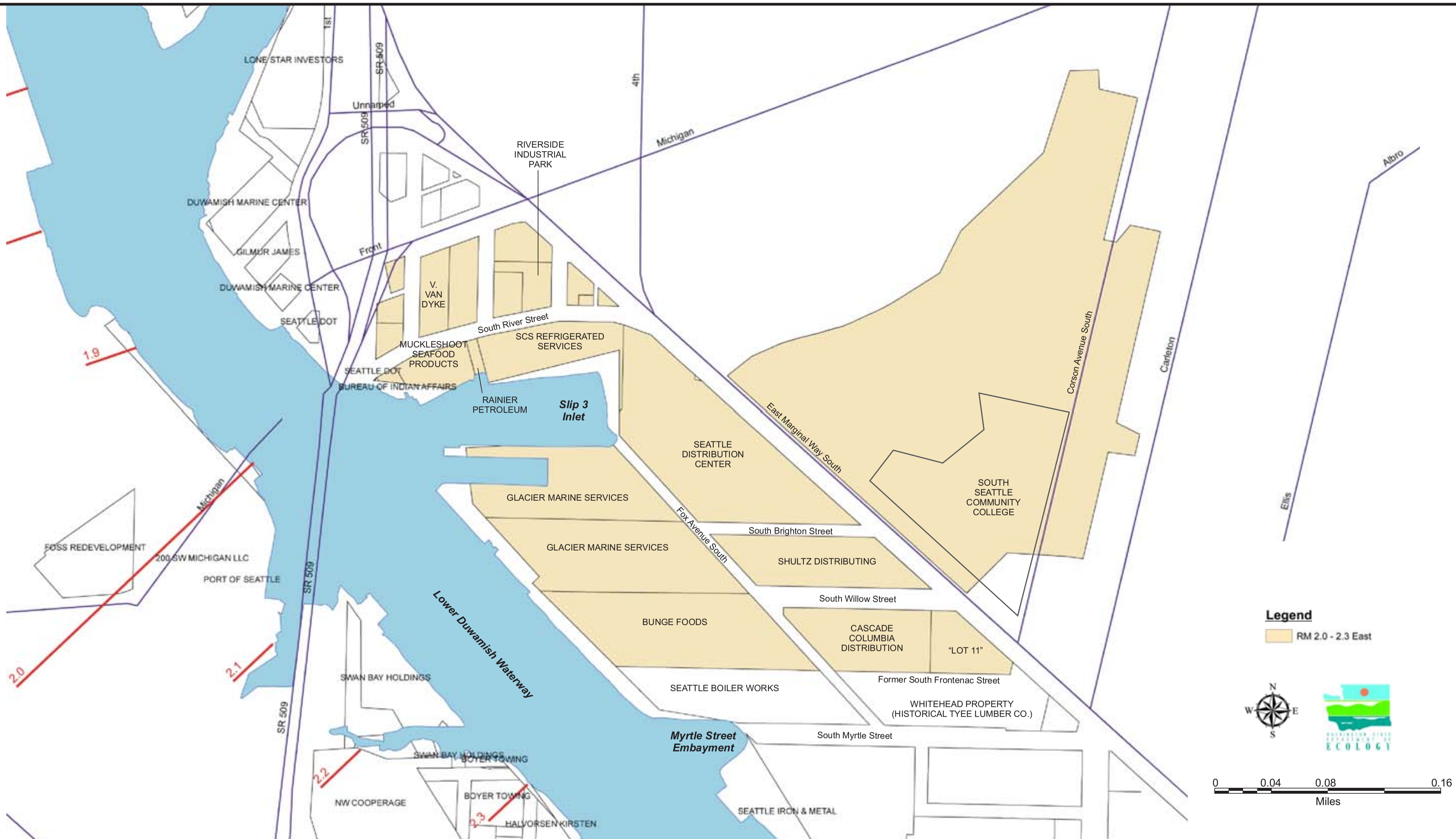


Base Map Reference: Department of Ecology, 2008.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington	Figure 1 LOWER DUWAMISH WATERWAY SOURCE CONTROL AREAS		
		Date: 5/21/08	Drawn by: AES	10:002330WD1403\fig 1



ecology and environment, inc.

International Specialists in the Environment
Seattle, Washington

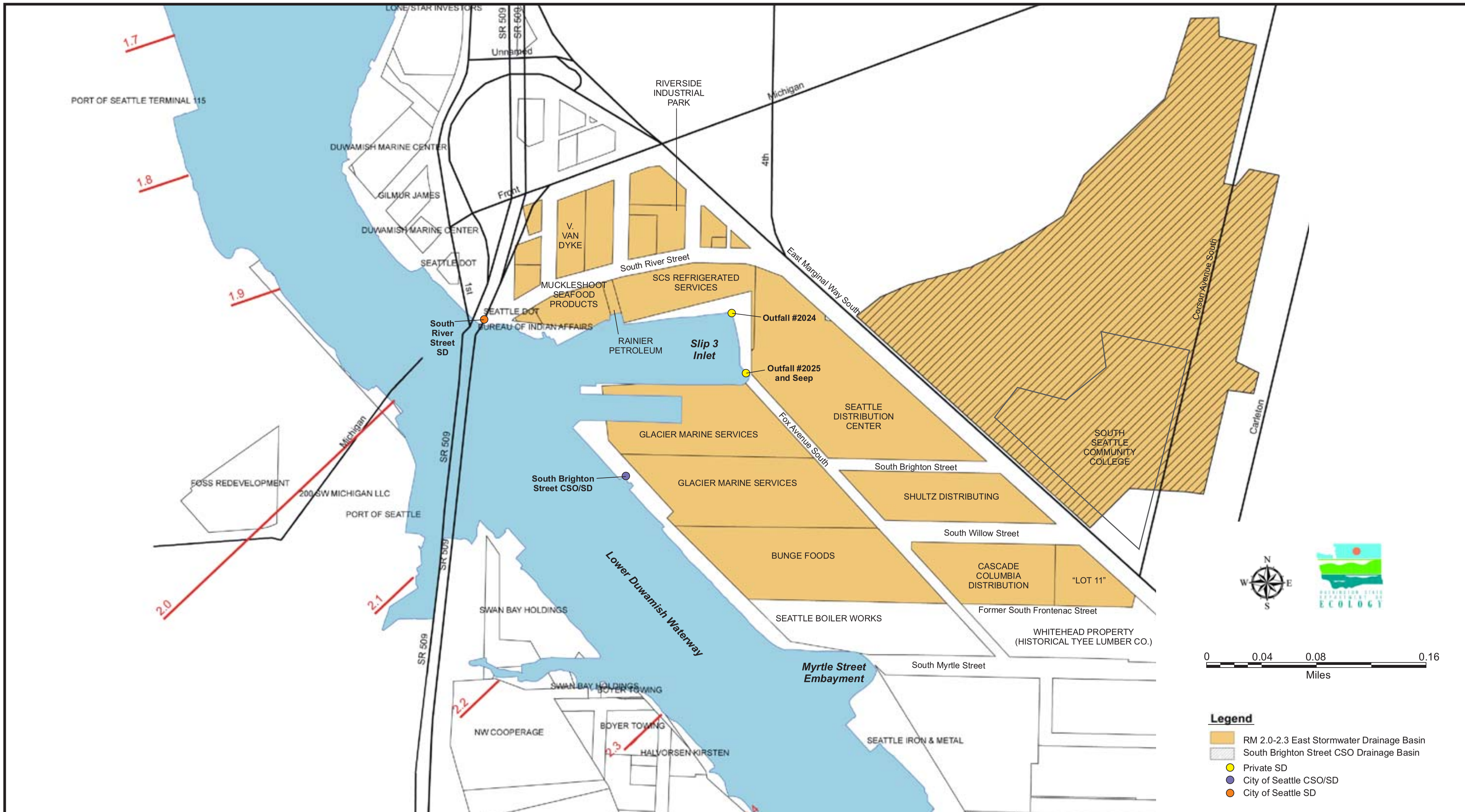
Base Map Reference: Department of Ecology, 2008.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 2

RM 2.0-2.3 EAST SOURCE CONTROL AREA

Date:	Drawn by:	
6/10/08	AES	10:002330WD1403\fig 2



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

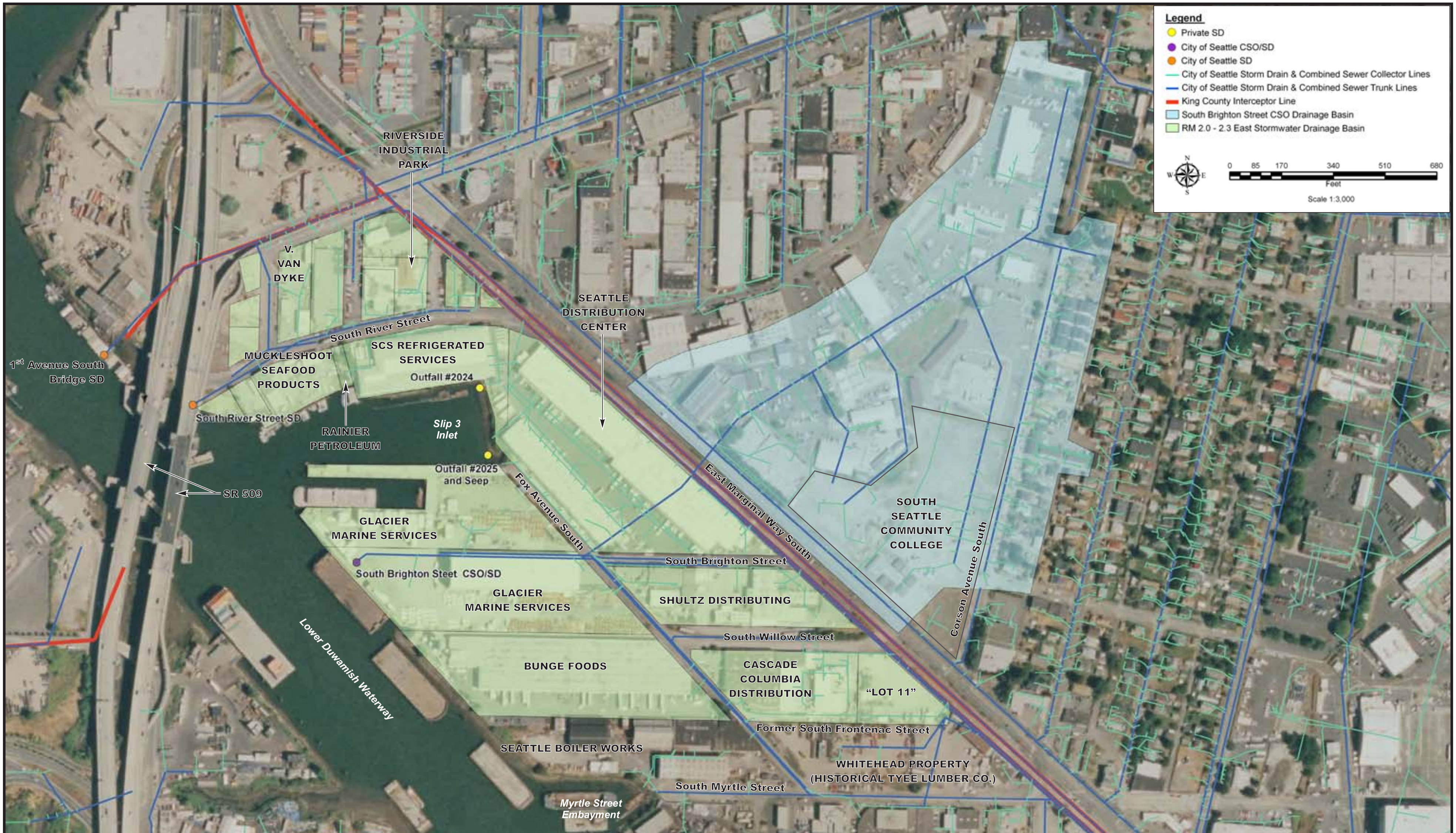
Base Map Reference: Department of Ecology, 2008.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 3

RM 2.0-2.3 EAST STORMWATER DRAINAGE BASIN WITH SOUTH BRIGHTON STREET CSO DRAINAGE BASIN IDENTIFIED

Date:	Drawn by:	
6/10/08	AES	10:002330WD1403\fig 3



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Base Map Reference: Ecology and Environment, Inc., GIS department, 2008.

GIS layer depicting LDW outfalls and "seep" location provided by Seattle Public Utilities, dated September 9, 2003.

GIS layers depicting storm drain and sewer lines provided by Seattle Public Utilities and King County.

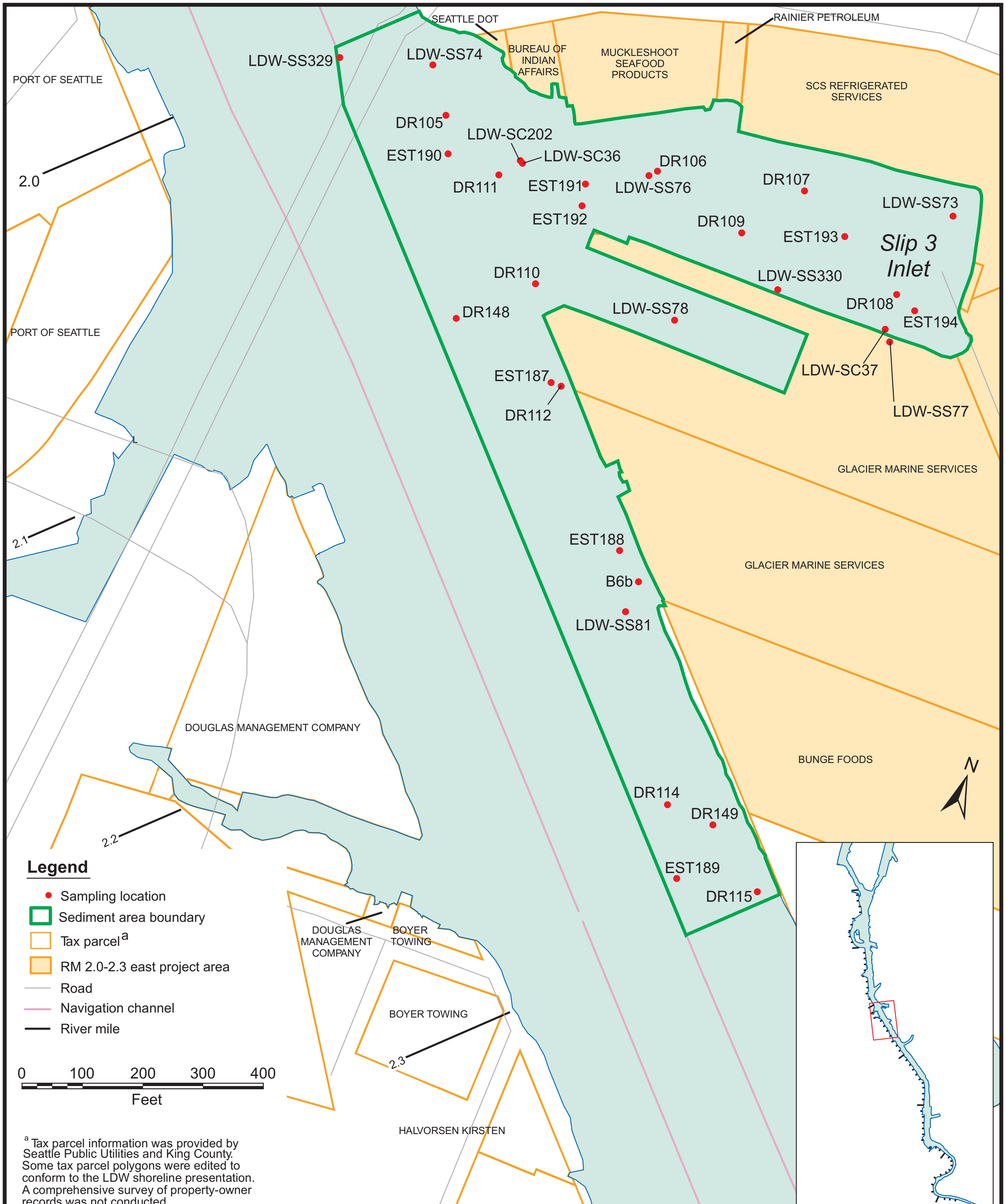
GIS layers depicting tax parcels and drainage basins provided by Seattle Public Utilities and King County. Some tax parcel polygons were edited to conform to the LDW shoreline presentation.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

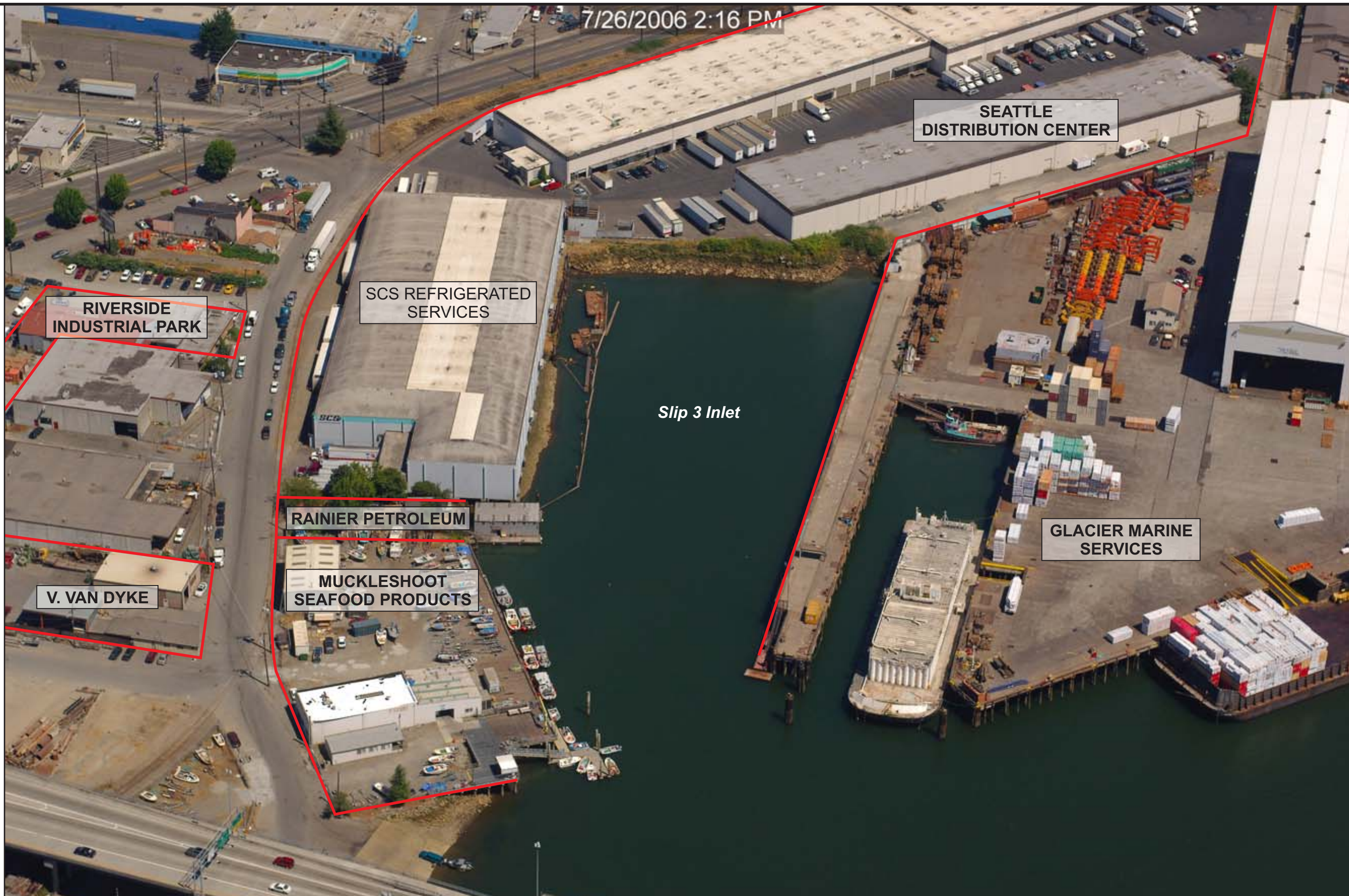
Figure 4

STORM DRAIN SYSTEM WITHIN RM 2.0-2.3 EAST

Date:	Drawn by:	
5/30/08	AES	10:002330WD1403\fig 4



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington			Figure 5 RM 2.0-2.3 EAST SEDIMENT SAMPLING LOCATIONS
	Base Map Reference: Windward 2007.	Date: 5-21-08	Drawn by: AES	10:002330WD1403\fig 5



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Aerial Photograph Reference: Department of Ecology.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 6
AERIAL PHOTO OF THE SLIP 3 INLET AREA (NORTH)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig 6

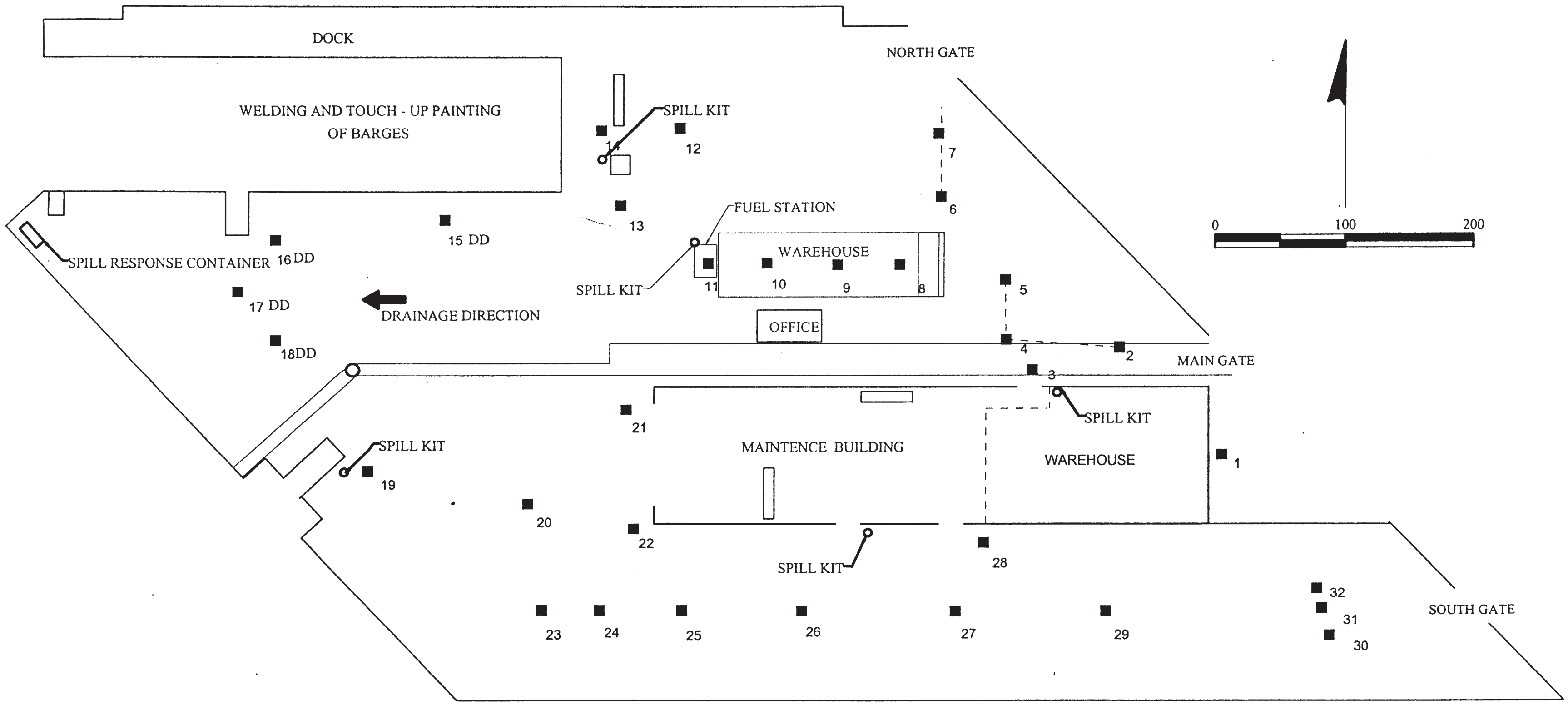
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Aerial Photograph Reference: Department of Ecology.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 7
AERIAL PHOTO OF THE SLIP 3 INLET AREA (SOUTH)

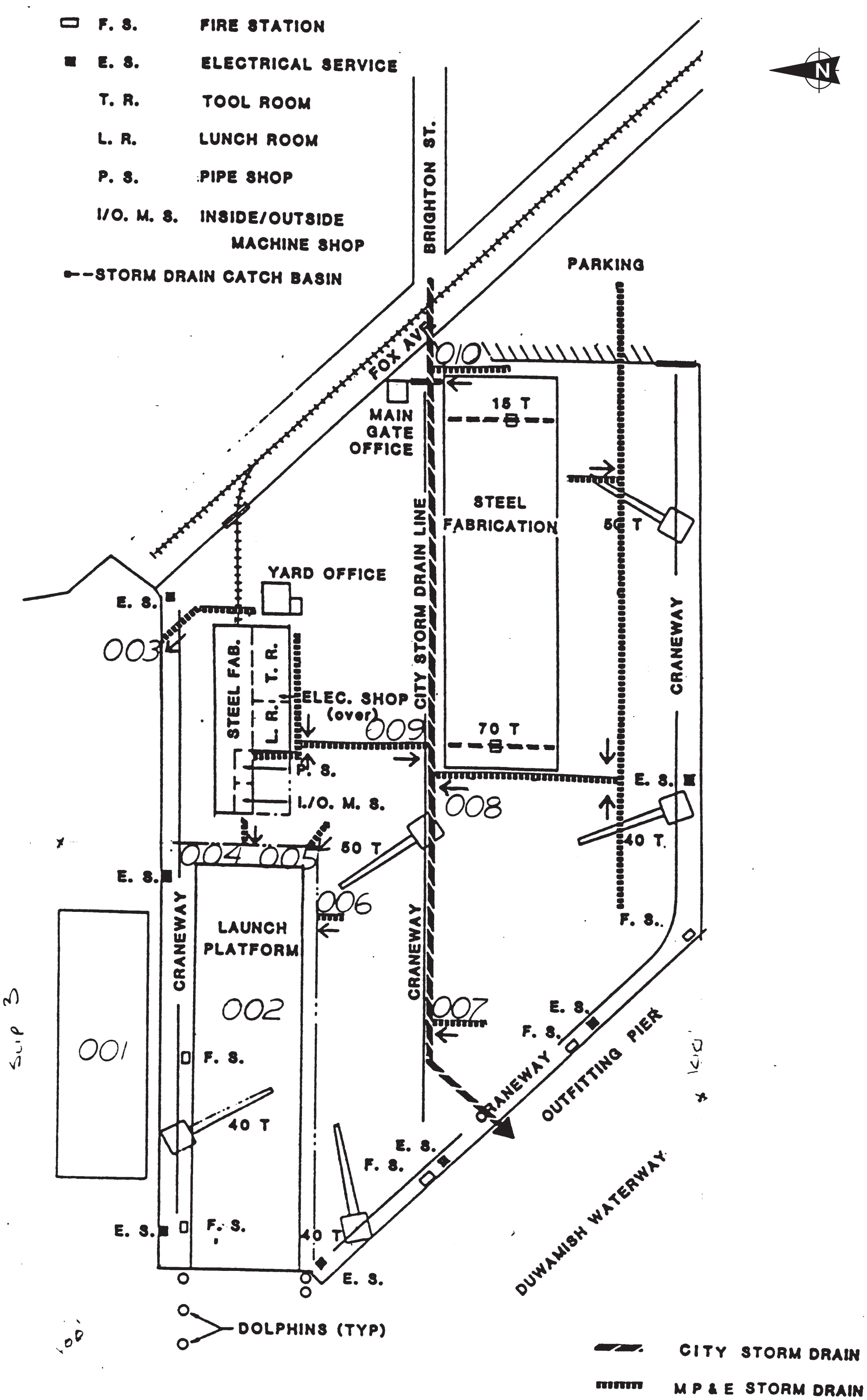
Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig 7



Northland Services Terminal
6701 Fox Ave. South

NOTE: CATCH BASIN LOCATIONS ARE NOT EXACT

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington	Figure 8 FACILITY MAP - GLACIER MARINE SERVICES (IN OPERATION AS NORTHLAND SERVICES)
	Base Map Reference: Northland Services, Inc., 2001.	Date: 5/21/08 · Drawn by: AES · 10:002330WD1403\fig8



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International Specialists in the Environment
Seattle, Washington

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

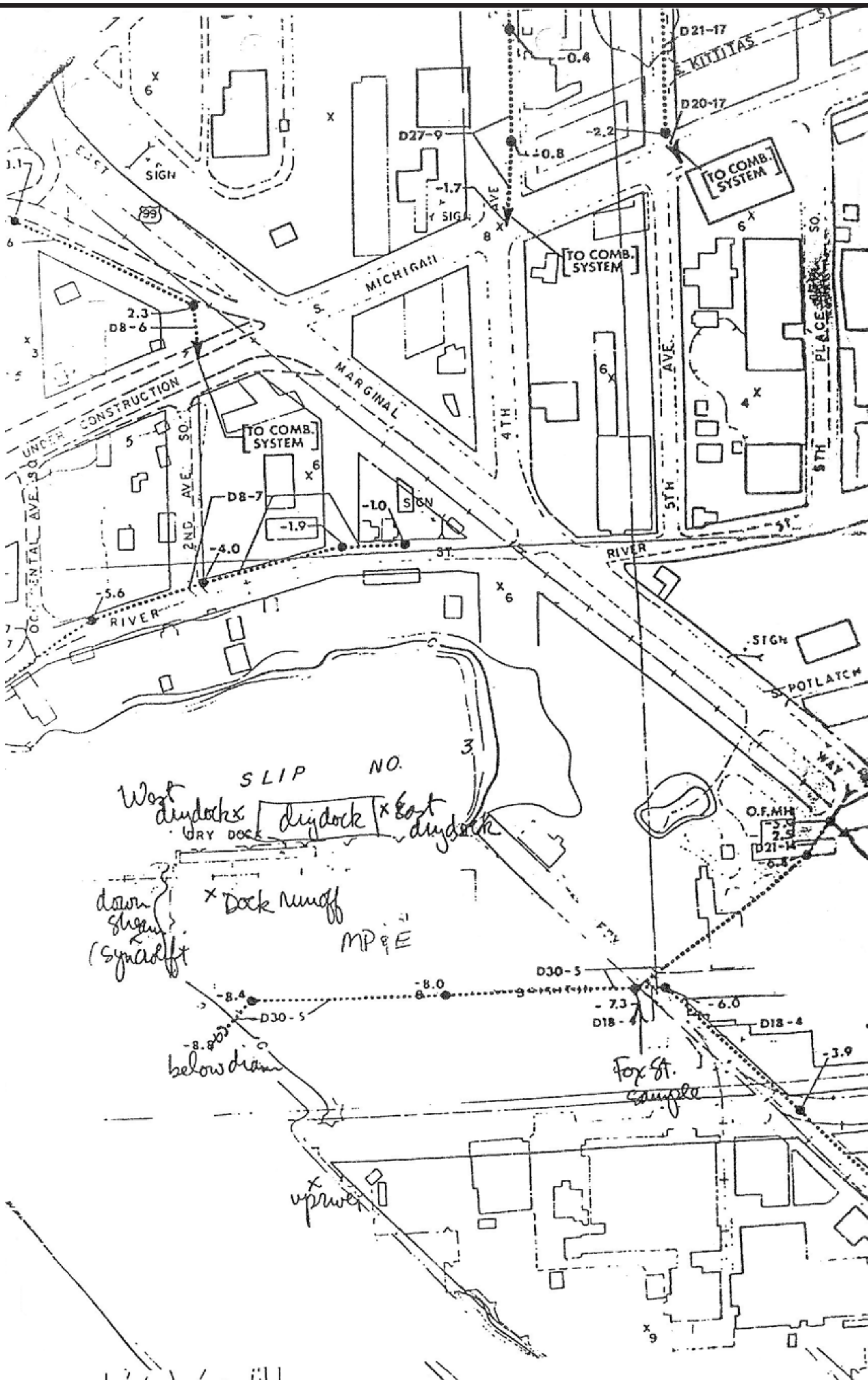
Figure 9
FACILITY MAP - GLACIER MARINE SERVICES
(IN OPERATION AS MARINE POWER & EQUIPMENT)

Base Map Reference: Washington State Department of Ecology, 1989.

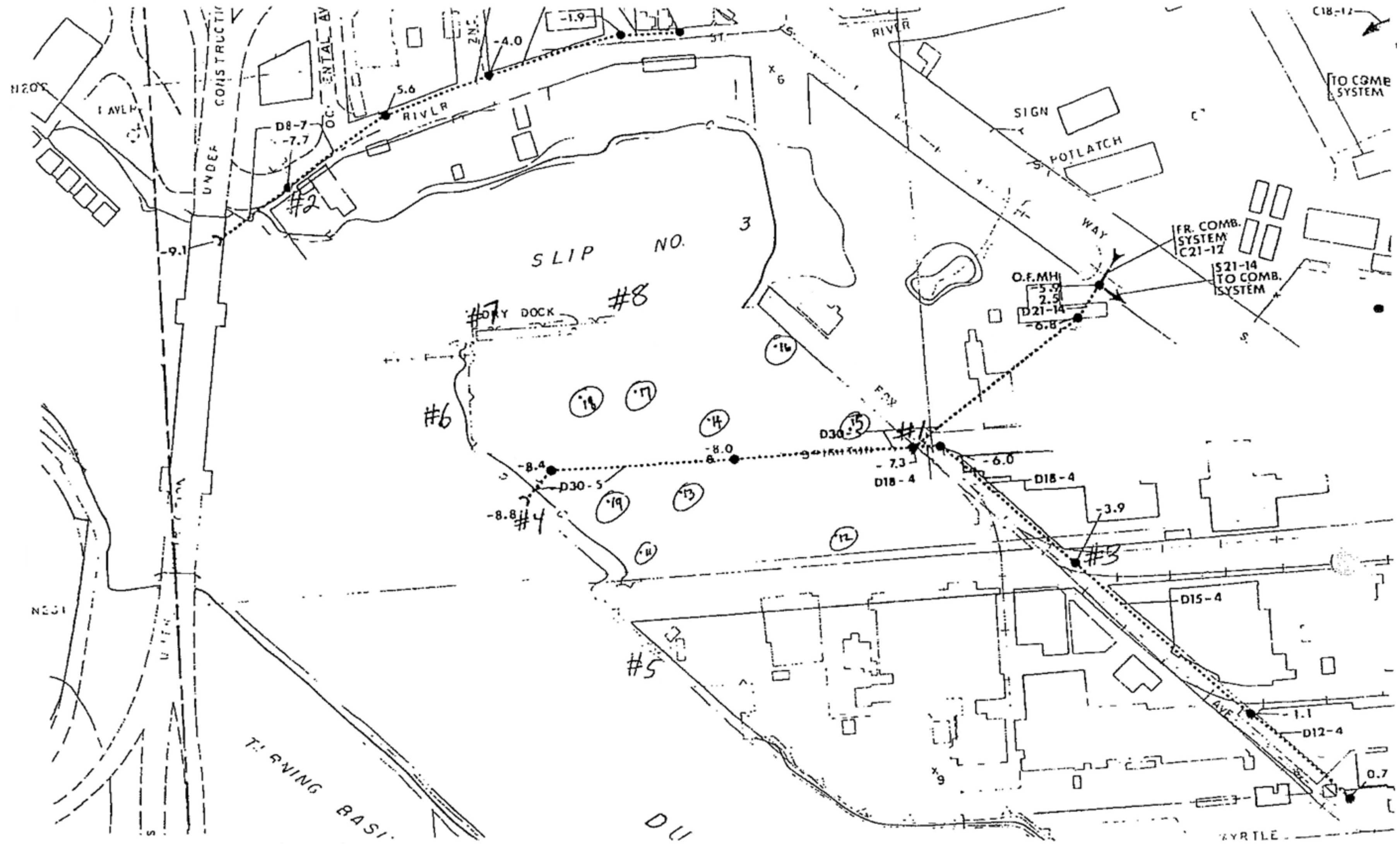
Date: 5-21-08

Drawn by: AES

10:002330WD1403\fig 9



ecology and environment, inc. International Specialists in the Environment, Seattle, Washington	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington	Figure 10 FOX STREET/SLIP 3 SAMPLING LOCATIONS - GLACIER MARINE SERVICES (IN OPERATION AS MARINE POWER & EQUIPMENT)		
	Base Map Reference: Hubbard 1984.	Date: 5-21-08	Drawn by: AES	10:002330WD1403\fig 10



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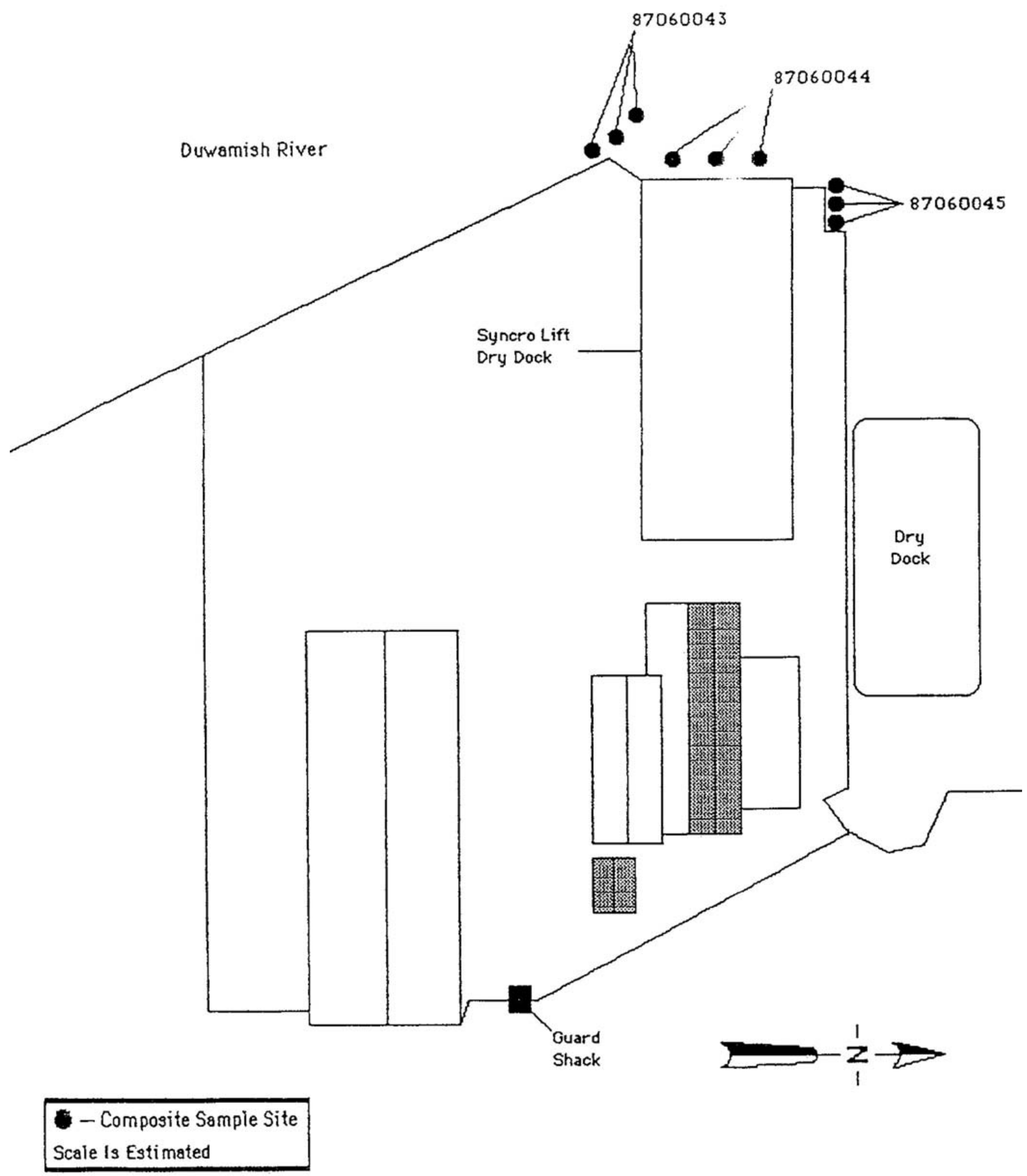
Seattle, Washington

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 11
STORM DRAIN AND SEDIMENT SAMPLING LOCATIONS - GLACIER MARINE SERVICES
(IN OPERATION AS MARINE POWER & EQUIPMENT)

Base Map Reference: Sample 1986.

Date:	Drawn by:	
5/22/08	AES	10:002330WD1403\fig11



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Seattle, Washington

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

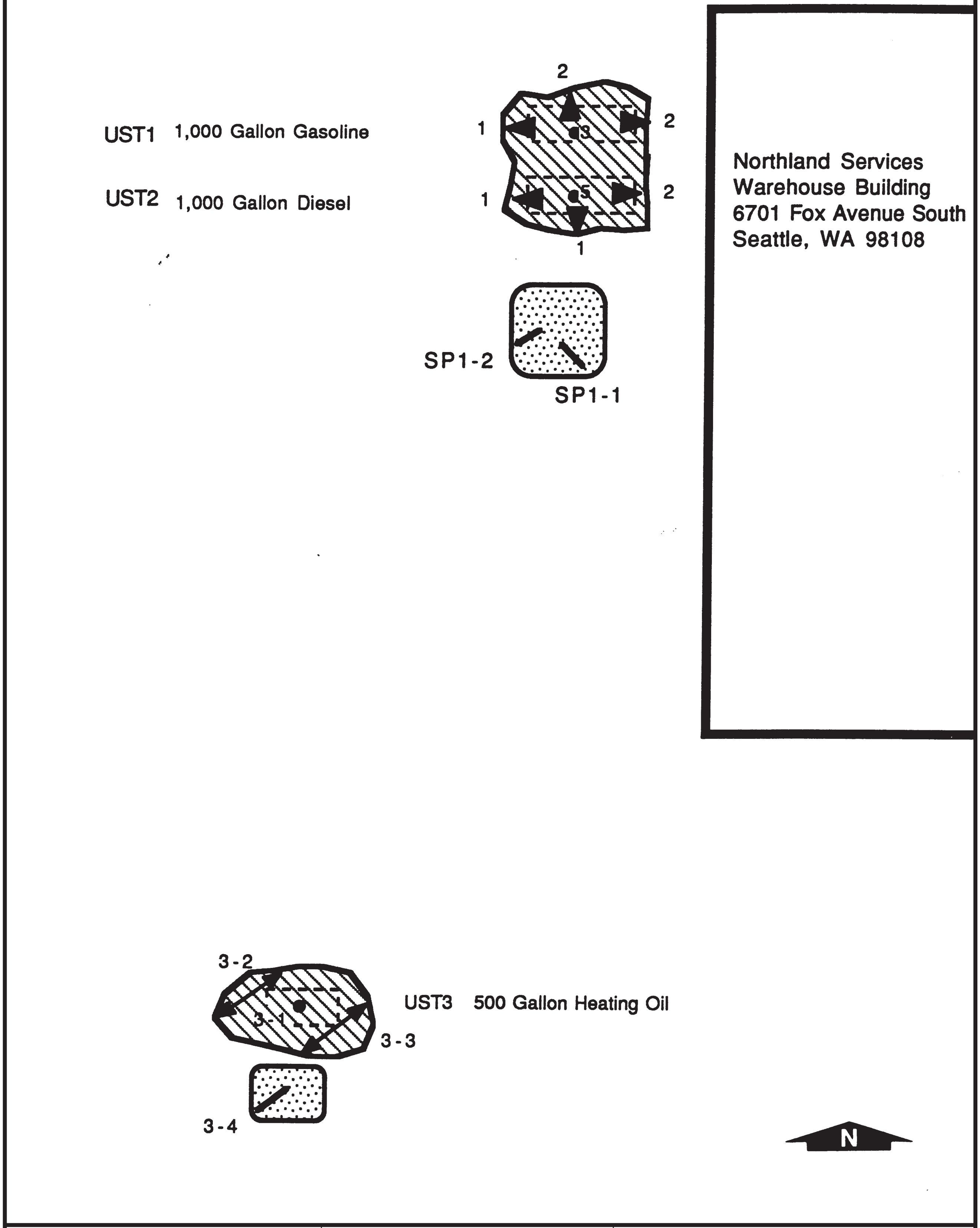
Figure 12

EPA DIVE SURVEY AND SEDIMENT SAMPLING LOCATIONS - GLACIER MARINE SERVICES
(IN OPERATION AS MARINE POWER & EQUIPMENT)

Base Map Reference: Matta 1987.

Date:	Drawn by:	
5-22-08	AES	10:002330WD1403\fig 12

Base Map Reference:
James P Hurley Co. Environmental Risk Management Consultants



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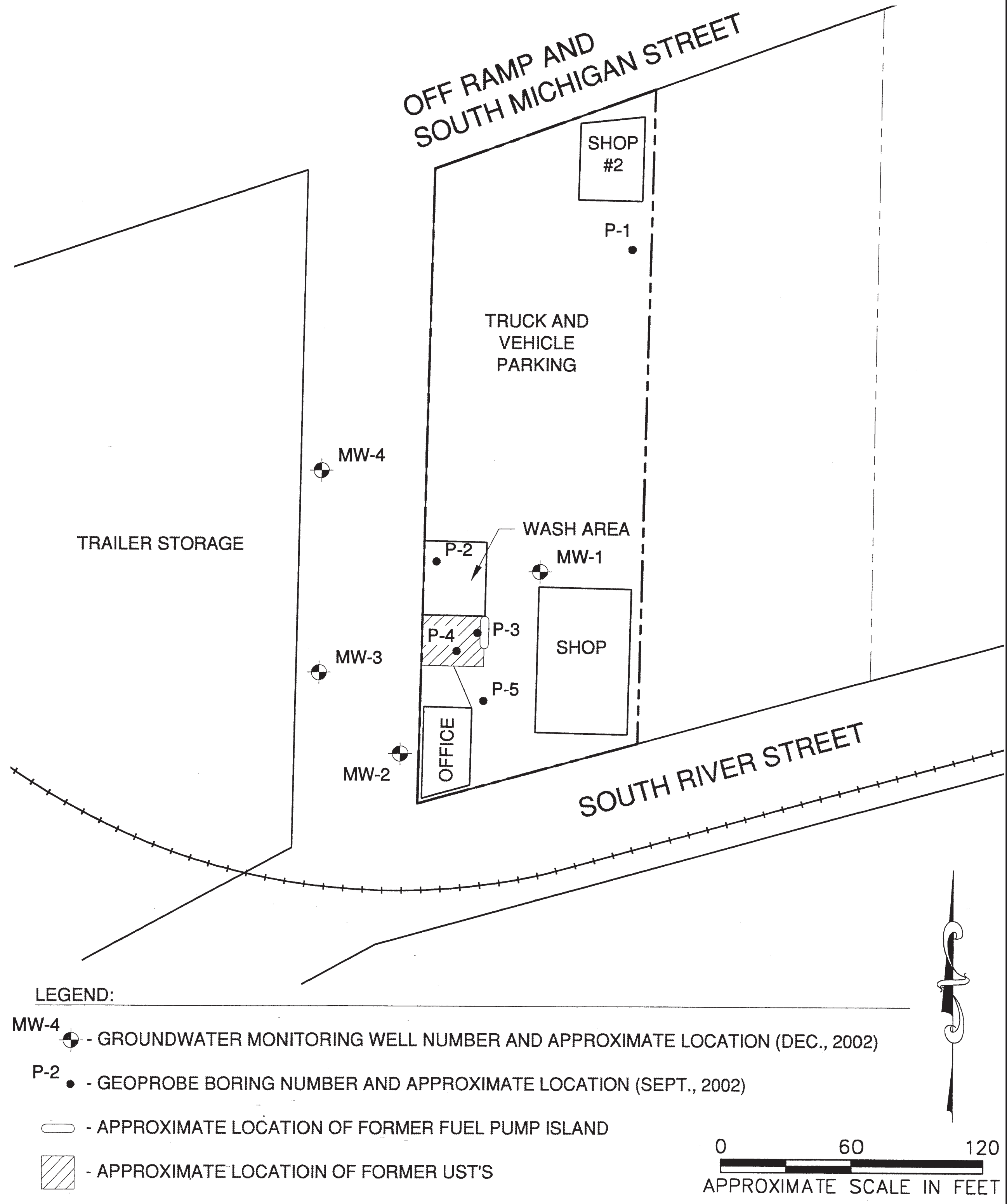
Seattle, Washington

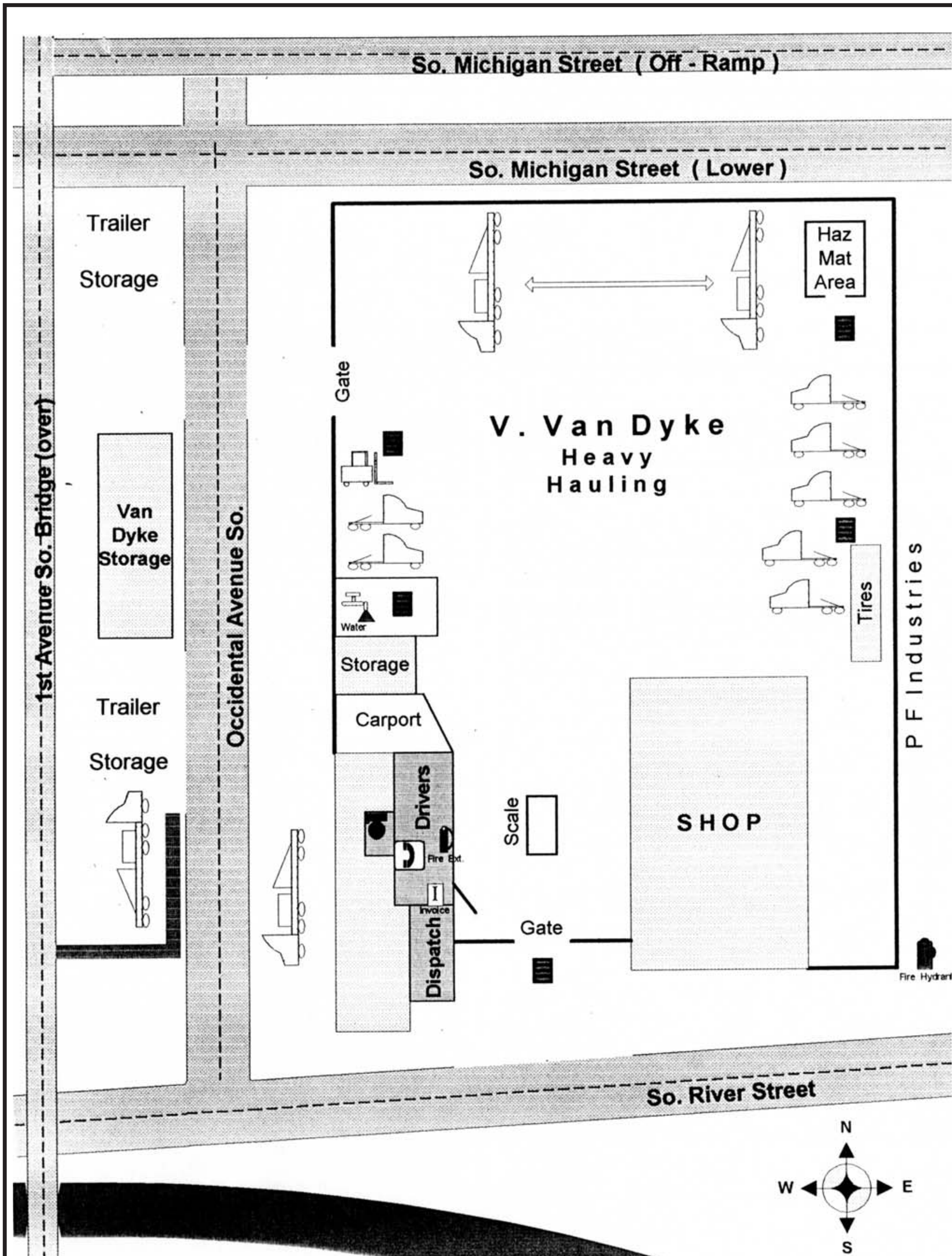
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 13
UST REMOVAL MAP -
GLACIER MARINE SERVICES
(IN OPERATION AS NORTHLAND SERVICES)

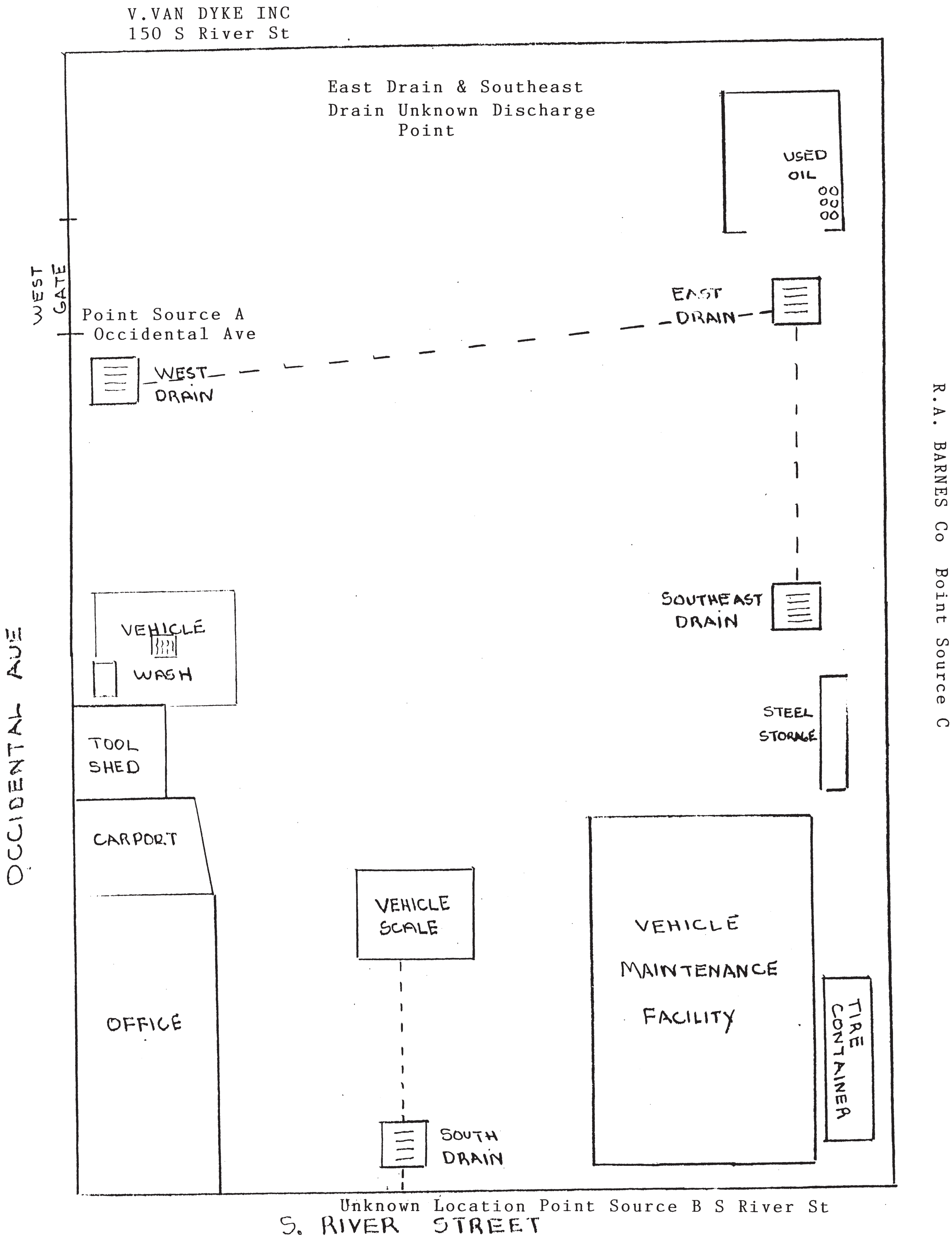
Date:	Drawn by:	
5-21-08	AES	10:002330WD1403\fig 13



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington	Figure 14 FACILITY MAP AND GROUNDWATER MONITORING WELL LOCATIONS - V. VAN DYKE
	Base Map Reference: LSI Adapt 2003.	Date: 5-21-08 / Drawn by: AES / 10:002330WD1403\fig 14



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington	Figure 15 FACILITY MAP - V. VAN DYKE		
	Base Map Reference: V. Van Dyke, Inc., 1993.	Date: 5-21-08	Drawn by: AES	10:002330WD1403\fig 15



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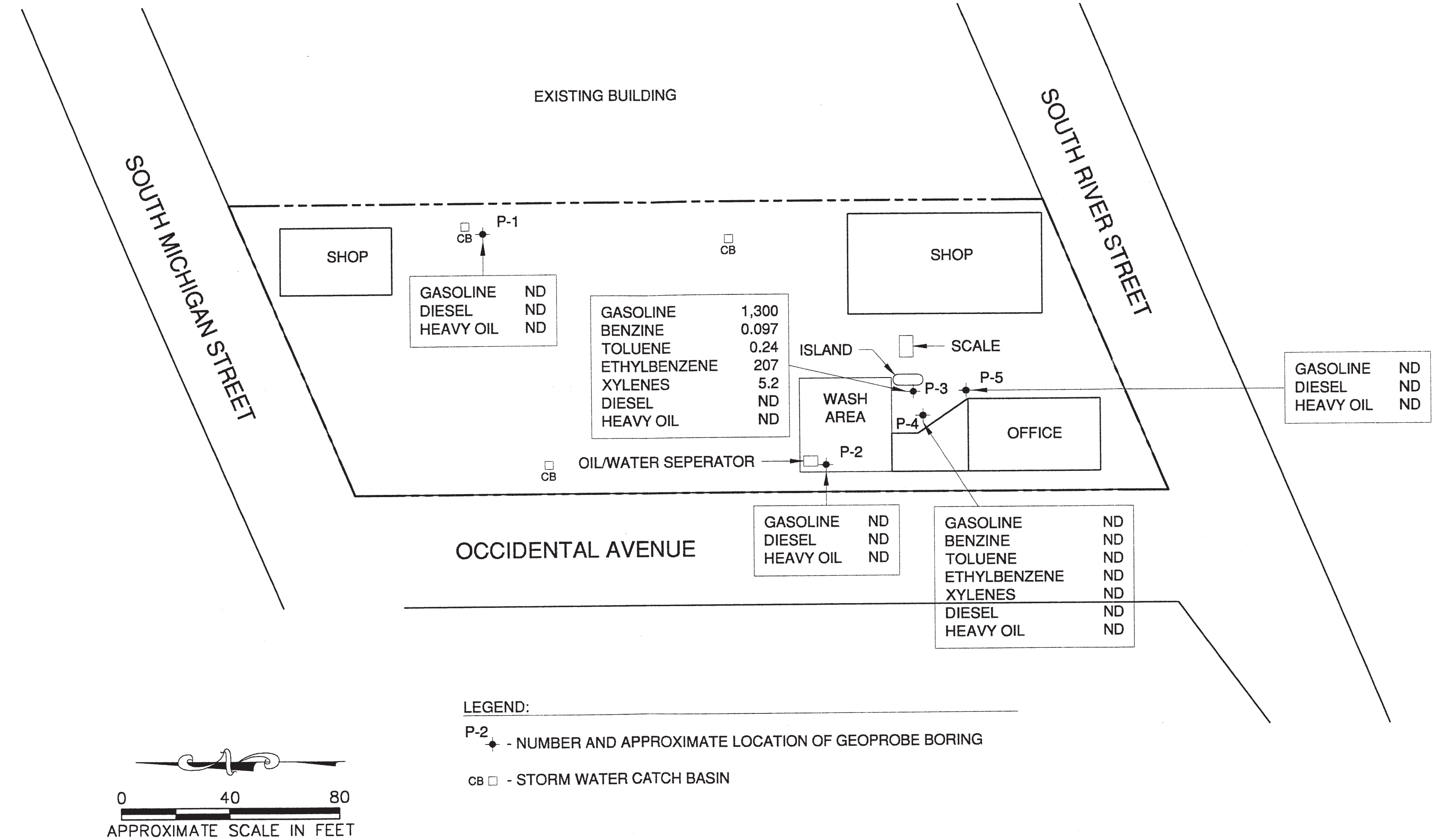
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 16

FACILITY STORM DRAIN LOCATIONS -
V. VAN DYKE

Base Map Reference:
V. Van Dyke, Inc., 1993.

Date: 5-21-08 | Drawn by: AES | 10:002330WD1403\fig 16



LEGEND:

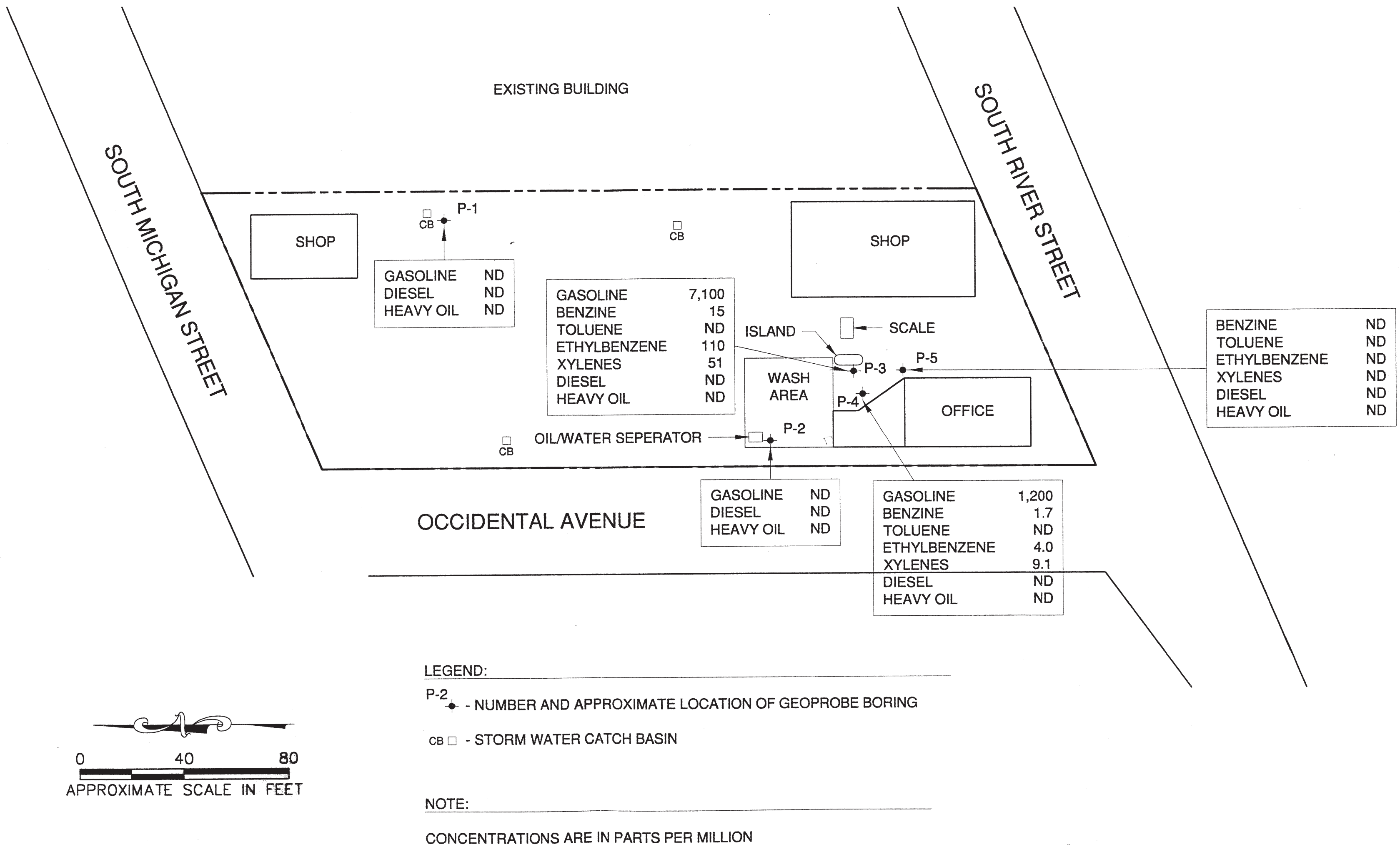
P-2 - NUMBER AND APPROXIMATE LOCATION OF GEOPROBE BORING

CB □ - STORM WATER CATCH BASIN

NOTE:

CONCENTRATIONS ARE IN PARTS PER MILLION

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	**Base Map Reference:** LSI Adapt 2002.	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington	Figure 17 PHASE II SITE ASSESSMENT SOIL SAMPLING RESULTS - V. VAN DYKE Date: 5/21/08 · Drawn by: AES · 10:002330WD1403\fig17



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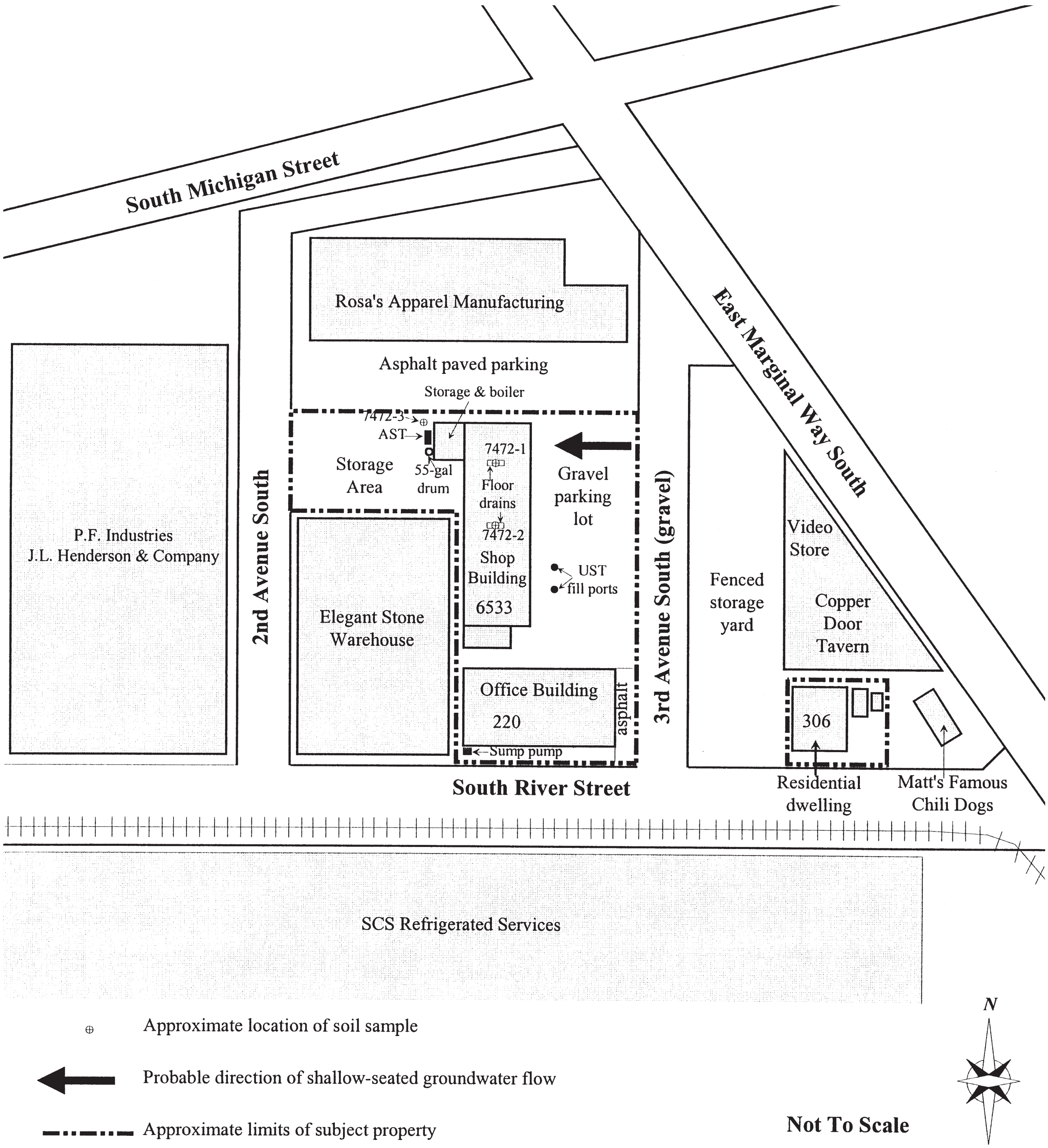
Base Map Reference: LSI Adapt 2002.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

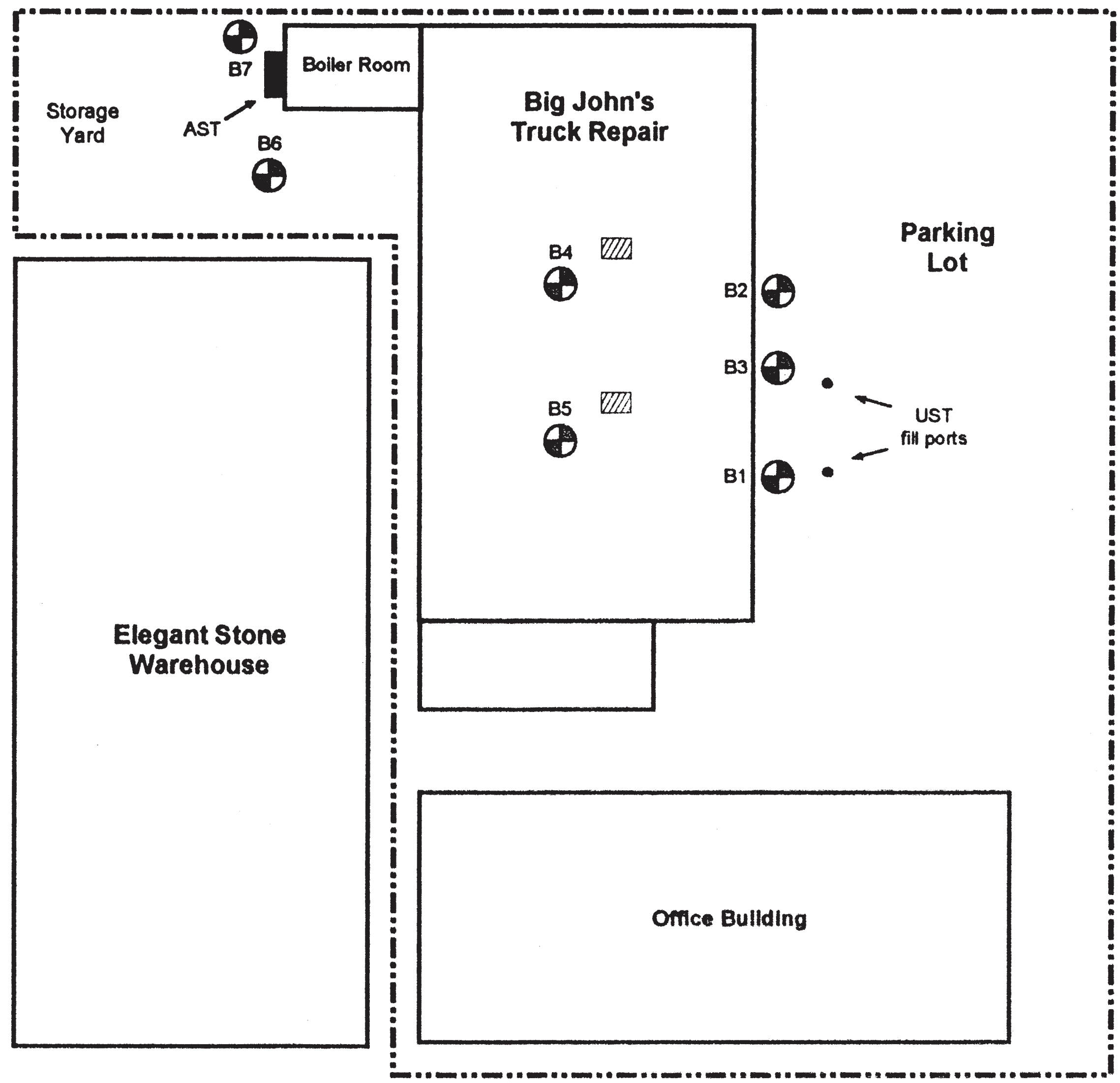
Figure 18

PHASE II SITE ASSESSMENT GROUNDWATER SAMPLING RESULTS - V. VAN DYKE

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig18



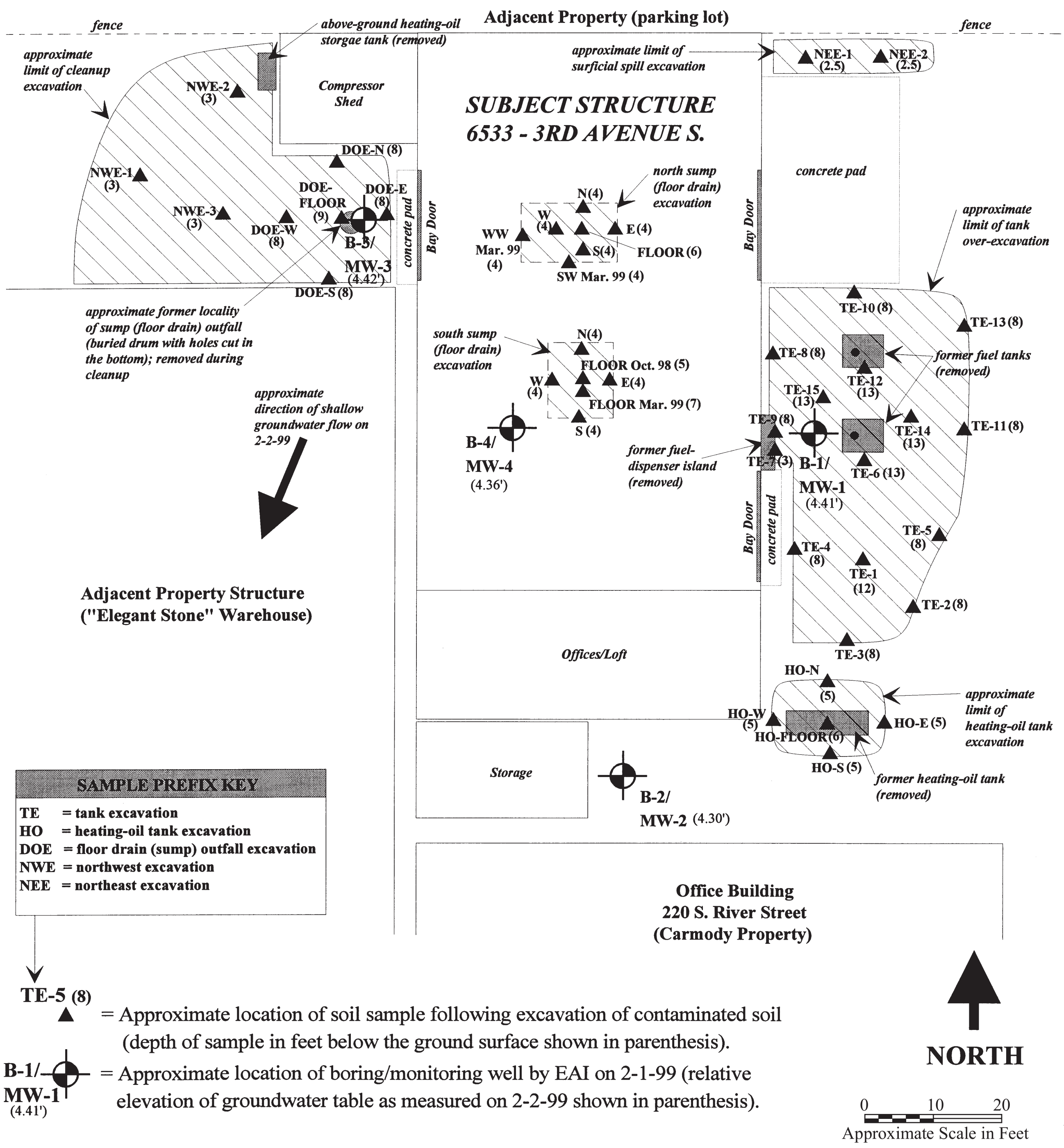
ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington	Figure 19 FACILITY AND PHASE I SITE EXPLORATION MAP - RIVERSIDE INDUSTRIAL PARK (IN OPERATION AS BIG JOHN'S TRUCK REPAIR)	
	Base Map Reference: Environmental Associates, Inc. 1999.	Date: 5-21-08	Drawn by: AES — 10:002330WD1403\fig 19



Legend: Approximate Location of Test Borings.
Approximate Location of Floor Drains.

Probable Direction of Shallow-Seated Groundwater.

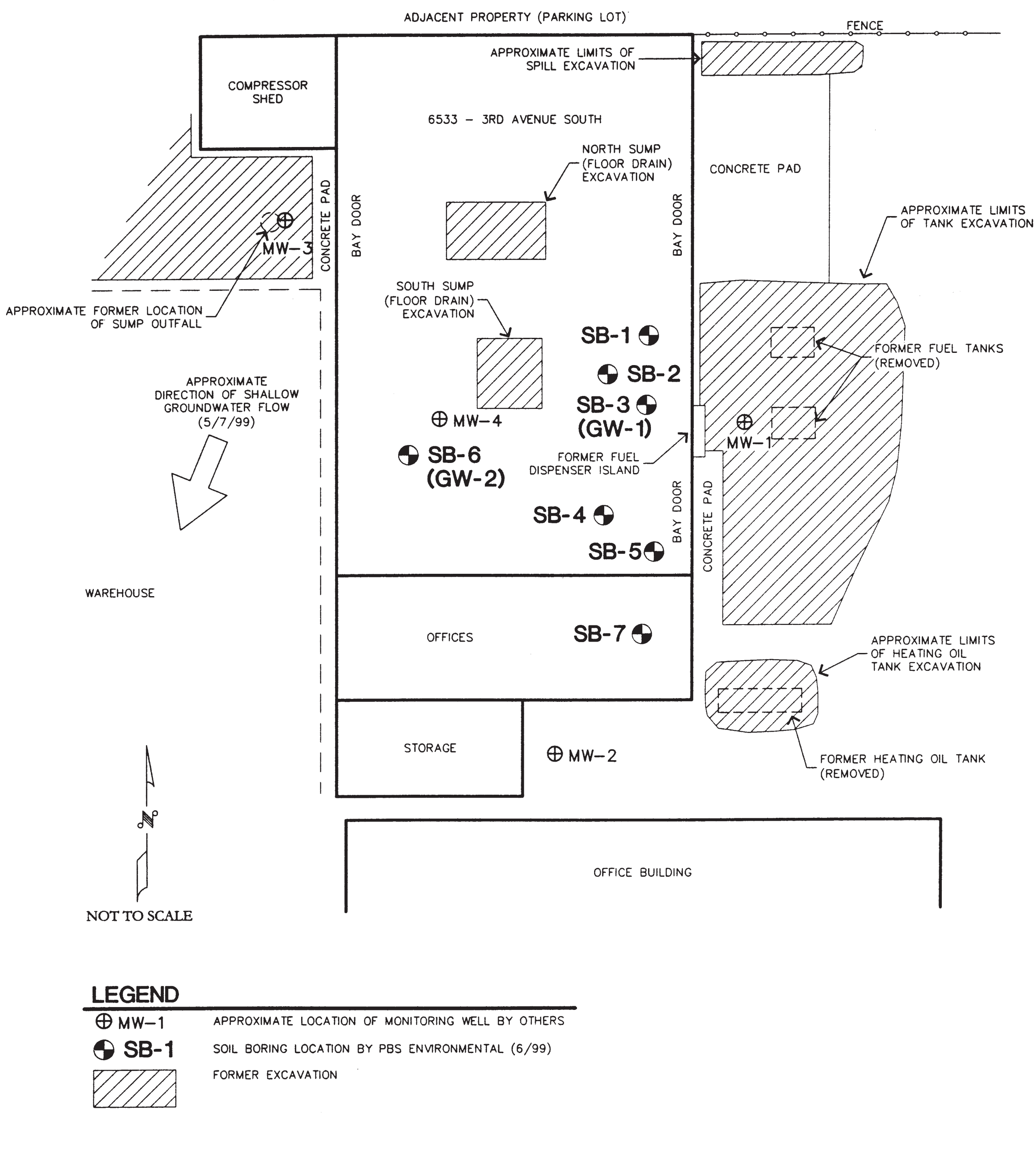
ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington	Figure 20 1998 PHASE II SUBSURFACE EXPLORATION MAP - RIVERSIDE INDUSTRIAL PARK (IN OPERATION AS BIG JOHN'S TRUCK REPAIR)
	Base Map Reference: Geotech Consultants 1998.	Date: 5-21-08 / Drawn by: AES / 10:002330WD1403\fig 20



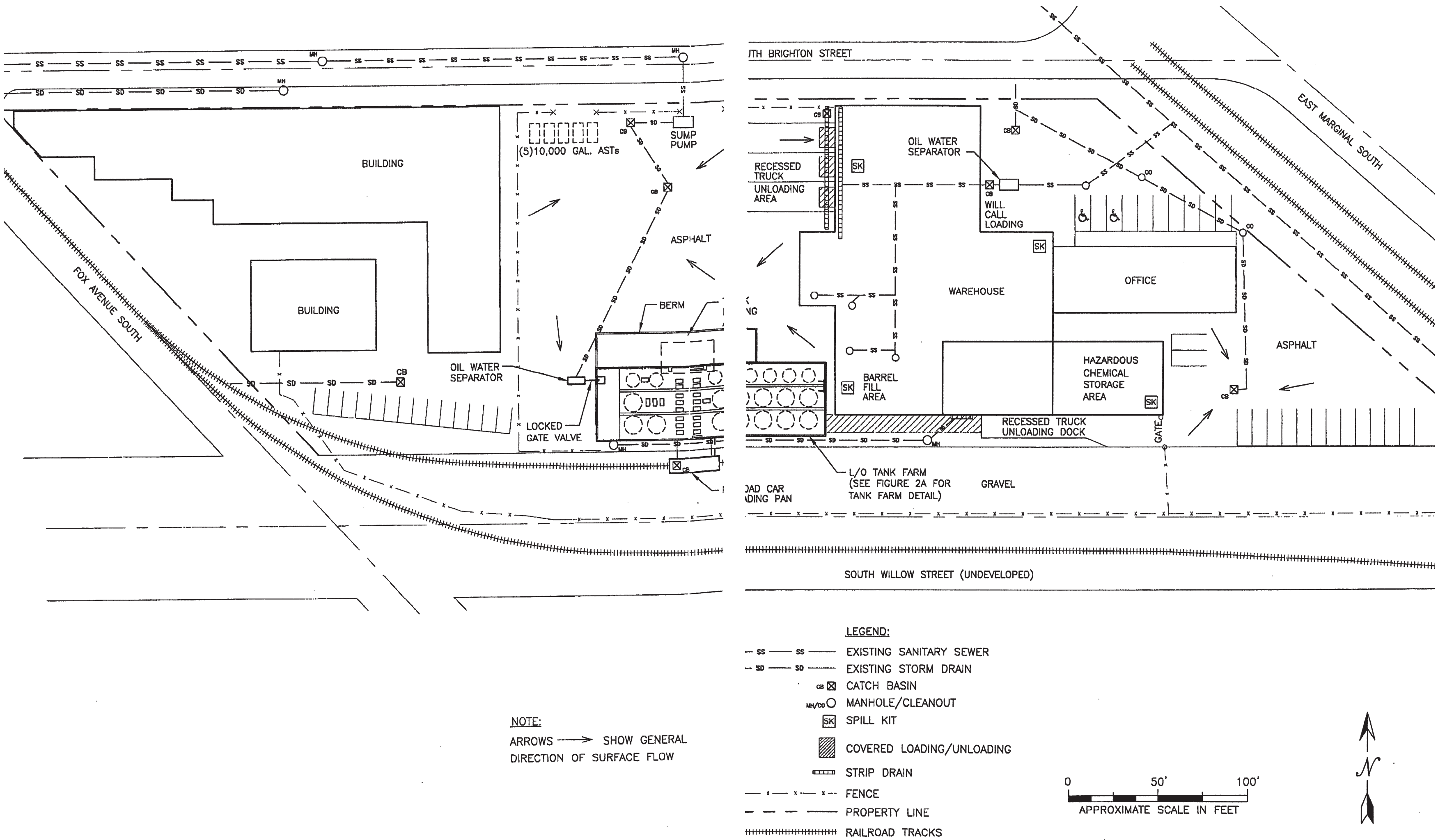
TE-5 (8) ▲ = Approximate location of soil sample following excavation of contaminated soil (depth of sample in feet below the ground surface shown in parenthesis).

B-1/ MW-1 (4.41') = Approximate location of boring/monitoring well by EAI on 2-1-99 (relative elevation of groundwater table as measured on 2-2-99 shown in parenthesis).

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington	Figure 21 TANK REMOVAL AND SAMPLING LOCATIONS - RIVERSIDE INDUSTRIAL PARK (IN OPERATION AS BIG JOHN'S TRUCK REPAIR)
	Base Map Reference: Environmental Associates, Inc. 1999.	Date: 5-21-08 / Drawn by: AES / 10:002330WD1403\fig 21



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington	Figure 22 1999 PHASE II SUBSURFACE EXPLORATION MAP - RIVERSIDE INDUSTRIAL PARK (IN OPERATION AS BIG JOHN'S TRUCK REPAIR)
	Base Map Reference: PBS Environmental 1999.	Date: 5-21-08 / Drawn by: AES / 10:002330WD1403\fig 22



ecology and environment, inc.
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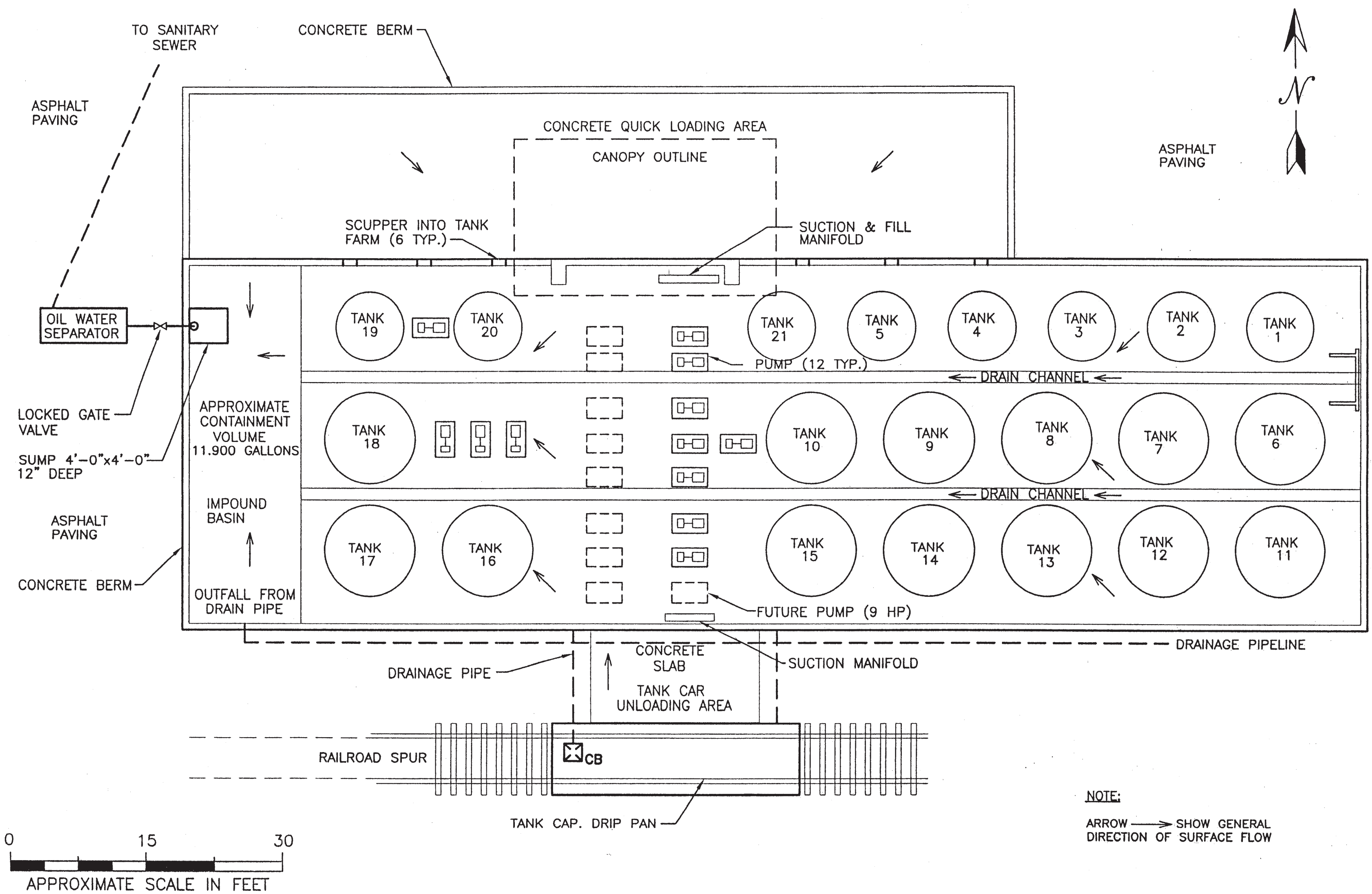
Base Map Reference: EMR Incorporated

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 23

FACILITY MAP AND STORM DRAIN SYSTEM - SHULTZ DISTRIBUTING

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig23



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Seattle, Washington

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

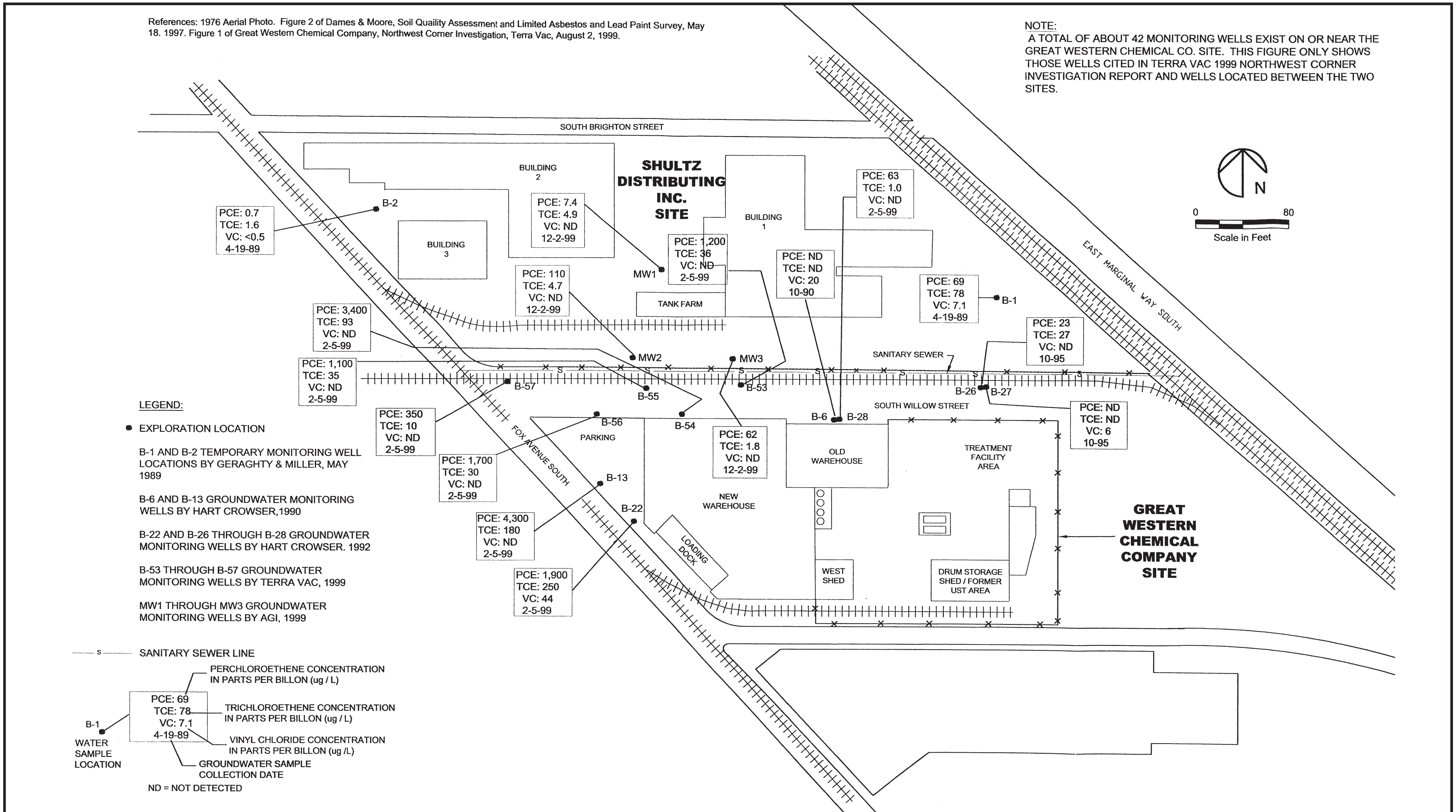
Figure 24
STORM DRAIN SYSTEM AND TANK LOCATIONS - SHULTZ DISTRIBUTING

Base Map Reference: EMR Incorporated

Date: 5/21/08

Drawn by: AES

10:002330WD1403\fig24



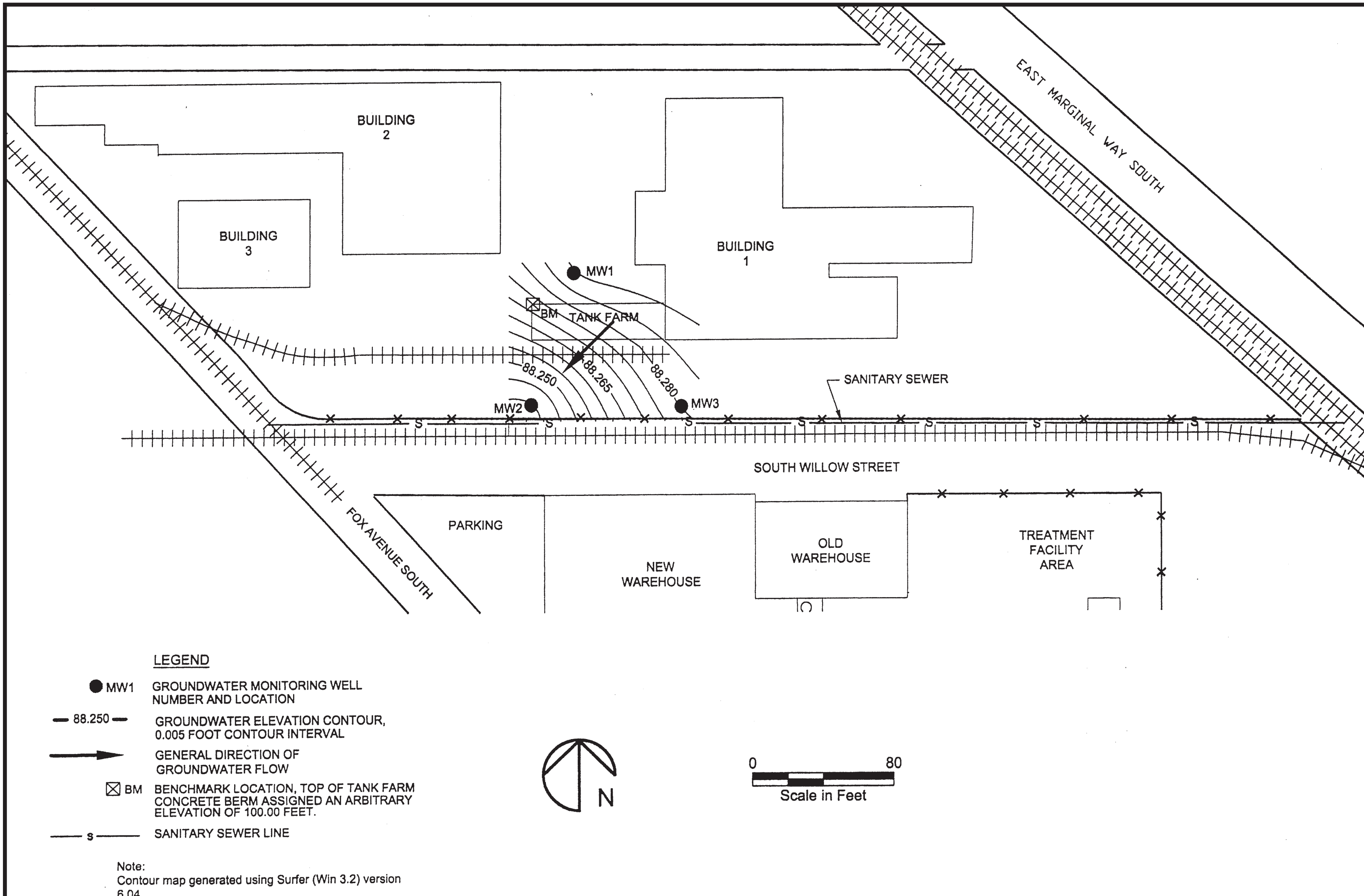
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Base Map Reference: AGI Technologies, 1999.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 25
GROUNDWATER CHEMICAL CONCENTRATION MAP - SHULTZ DISTRIBUTING

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig25



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LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

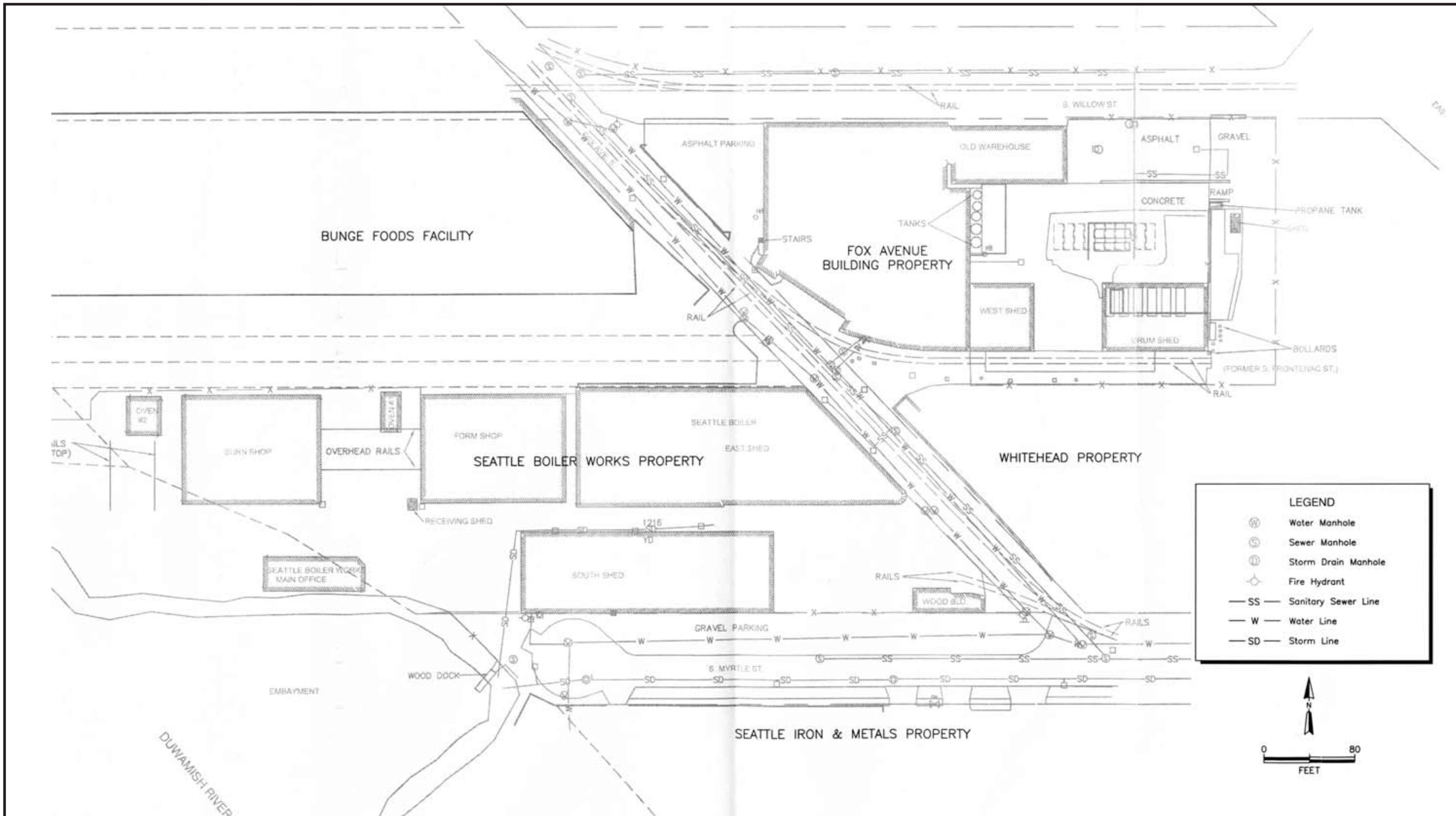
Figure 26
GROUNDWATER ELEVATION CONTOUR MAP
(DECEMBER 1999) - SHULTZ DISTRIBUTING

Base Map Reference: AGI Technologies, 1999.

Date: 5/21/08

Drawn by: AES

10:002330WD1403\fig26



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Seattle, Washington

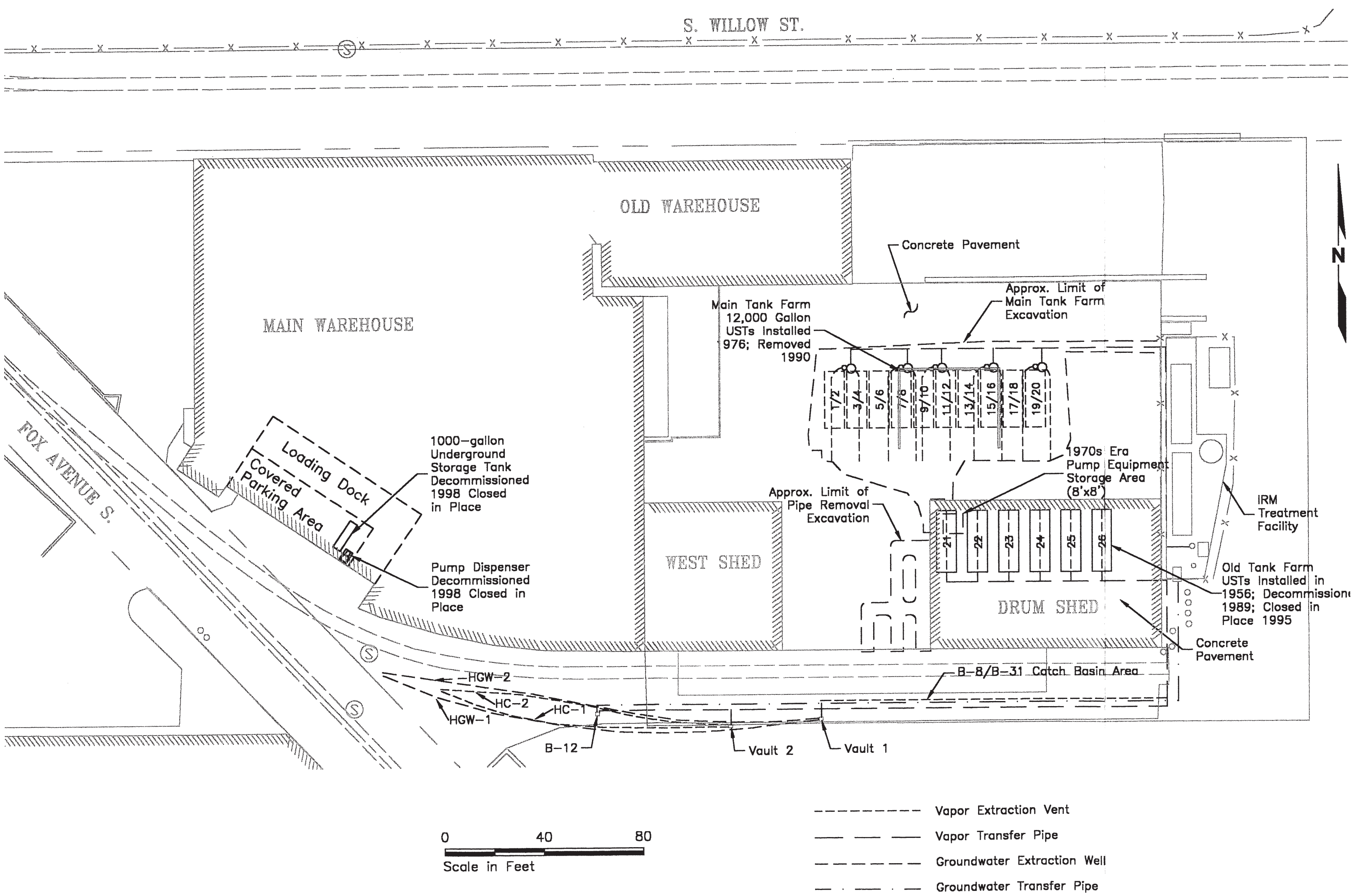
Base Map Reference:
Environmental Resources Management (ERM), 2003.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

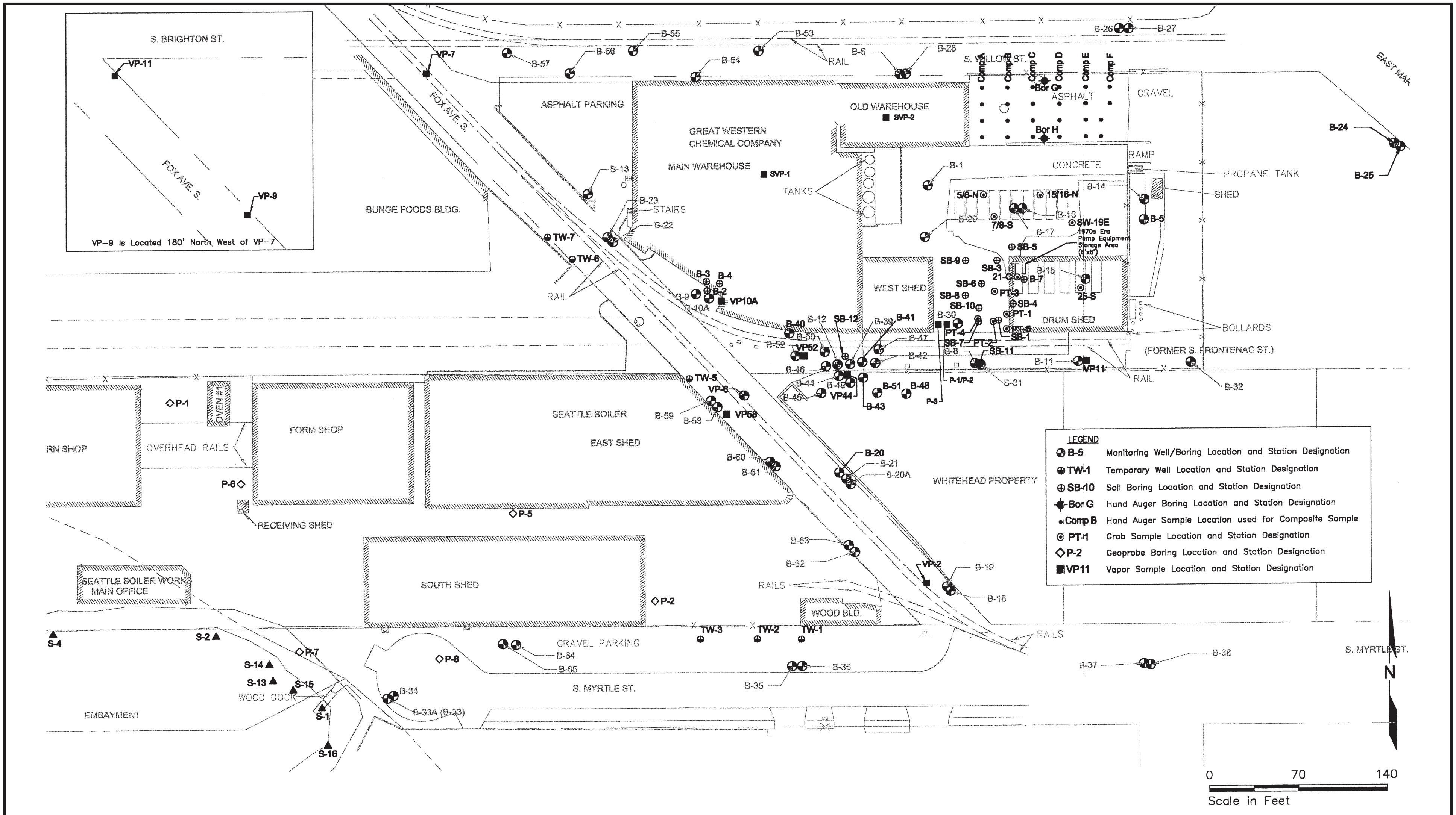
Figure 27

FACILITY MAP - CASCADE COLUMBIA DISTRIBUTION

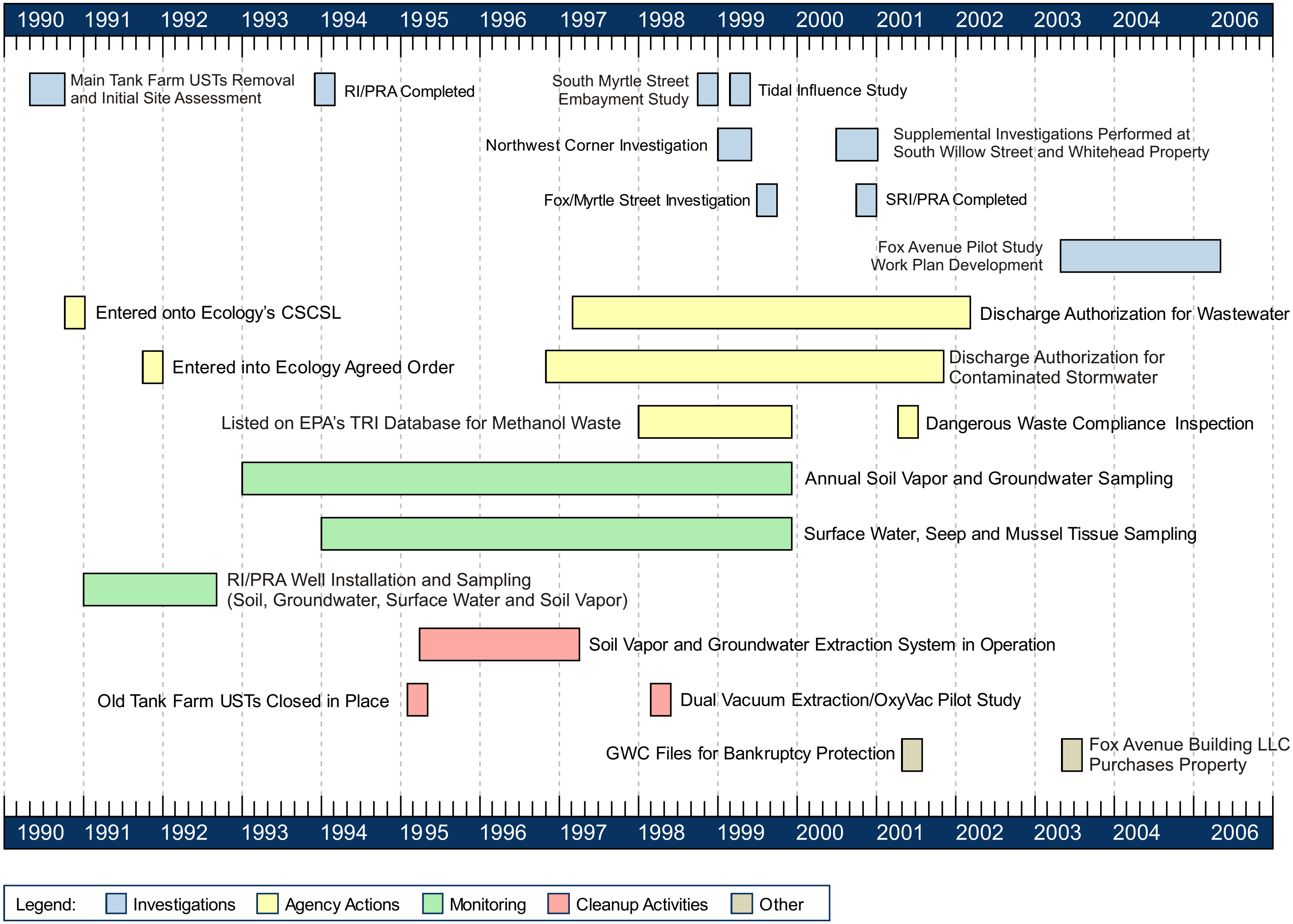
Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig27



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	**Base Map Reference:** Floyd & Snider Inc. 2000.	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington	Figure 28 INTERIM REMEDIAL MEASURES - CASCADE COLUMBIA DISTRIBUTION (IN OPERATION AS GREAT WESTERN CHEMICAL) Date: 5/21/08 — Drawn by: AES — 10:002330WD1403\fig28



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	**Base Map Reference:** Floyd & Snider Inc. 2000.	LOWER DUWAMISH WATERWAY RM 2.0-2.3 EAST Seattle, Washington	Figure 29 SOIL SAMPLING, GROUNDWATER MONITORING WELL AND SOIL VAPOR SAMPLING LOCATIONS - CASCADE COLUMBIA DISTRIBUTION (IN OPERATION AS GREAT WESTERN CHEMICAL)
			Date: 5/21/08 — Drawn by: AES — 10:002330WD1403\fig29



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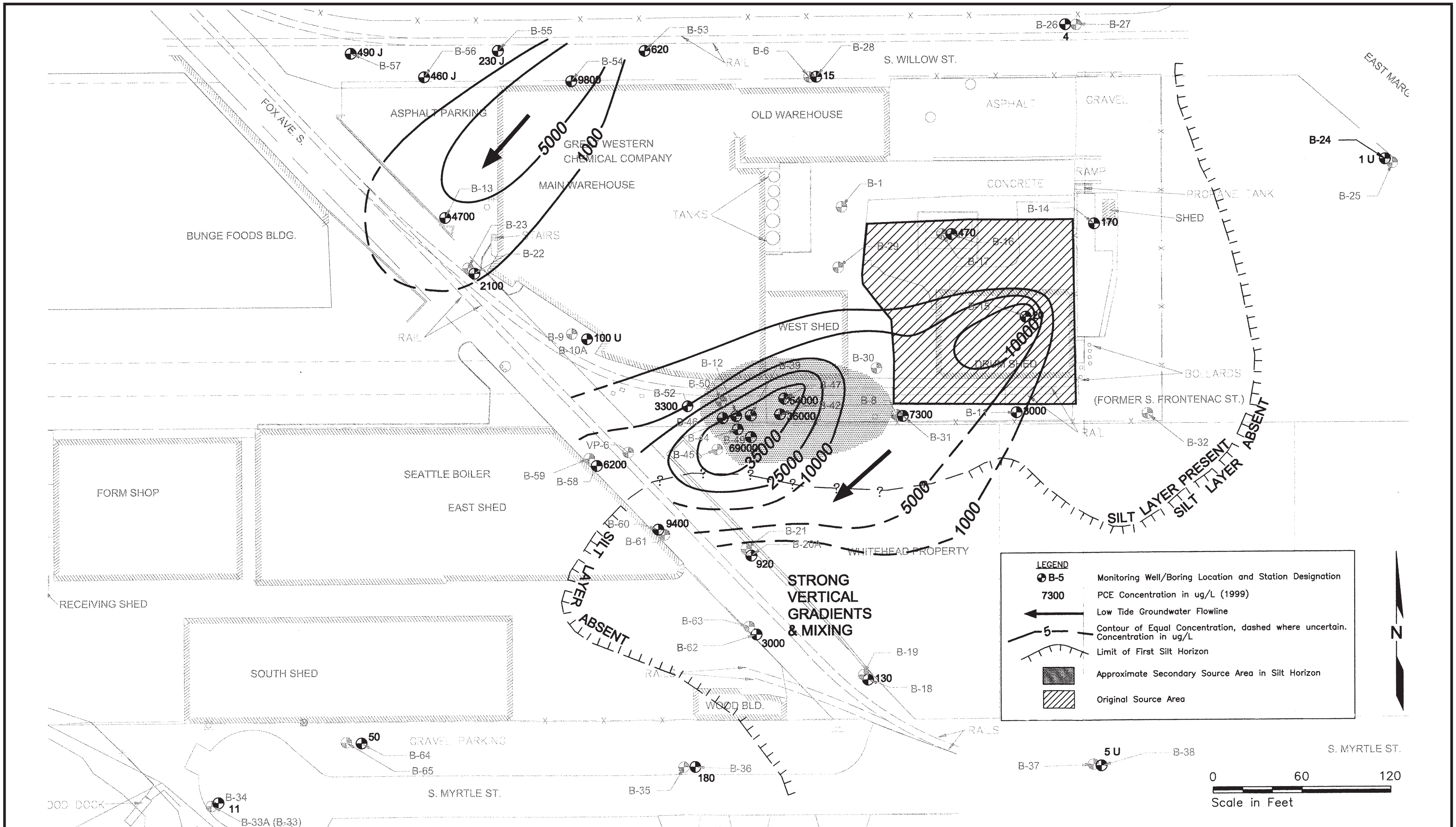
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 30
TIMELINE - CASCADE COLUMBIA DISTRIBUTION PROPERTY

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig30



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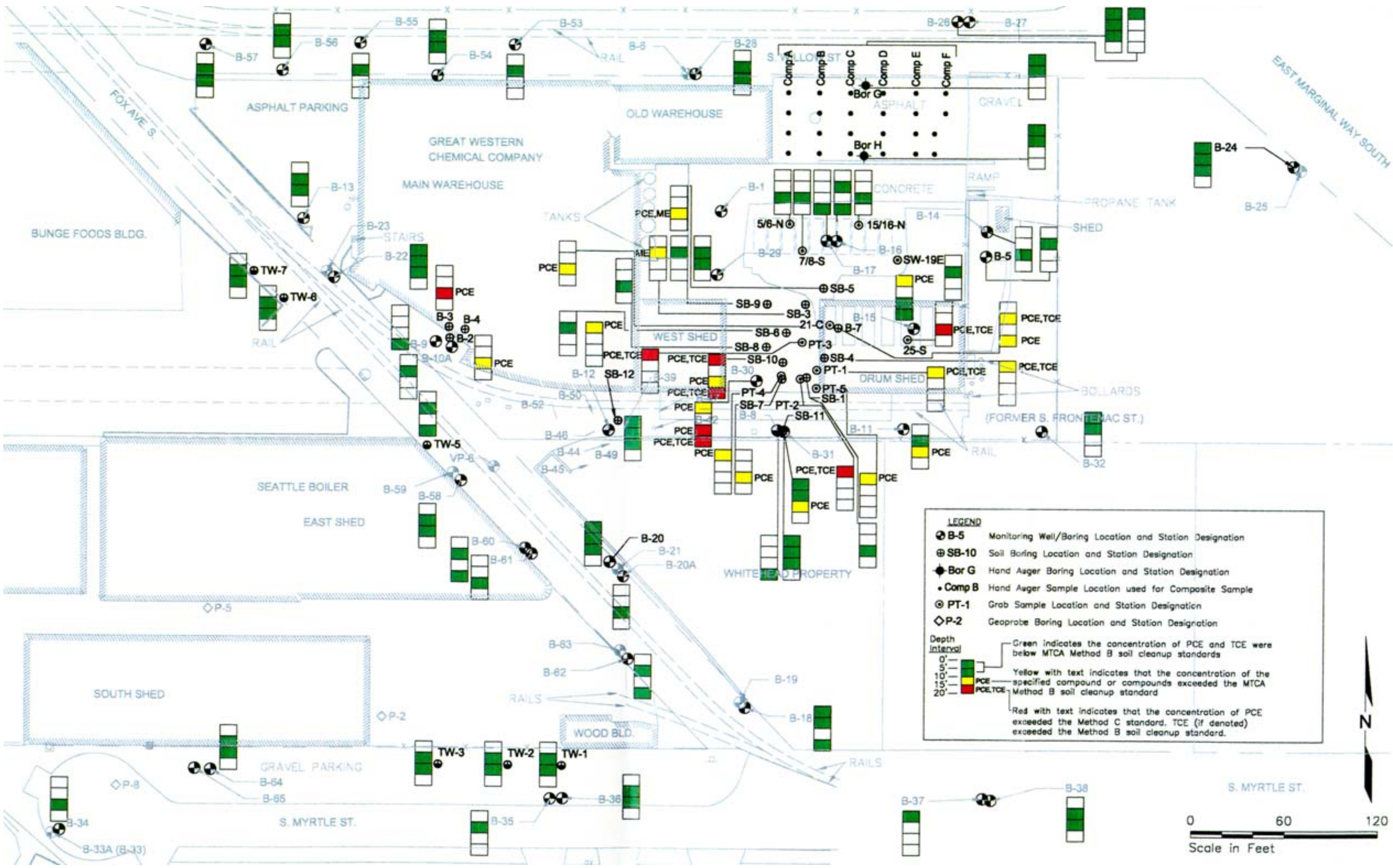
Base Map Reference: Floyd & Snider Inc. 2000.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 31
PCE IN 1st WBZ (1999 SAMPLING EVENT) - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig31



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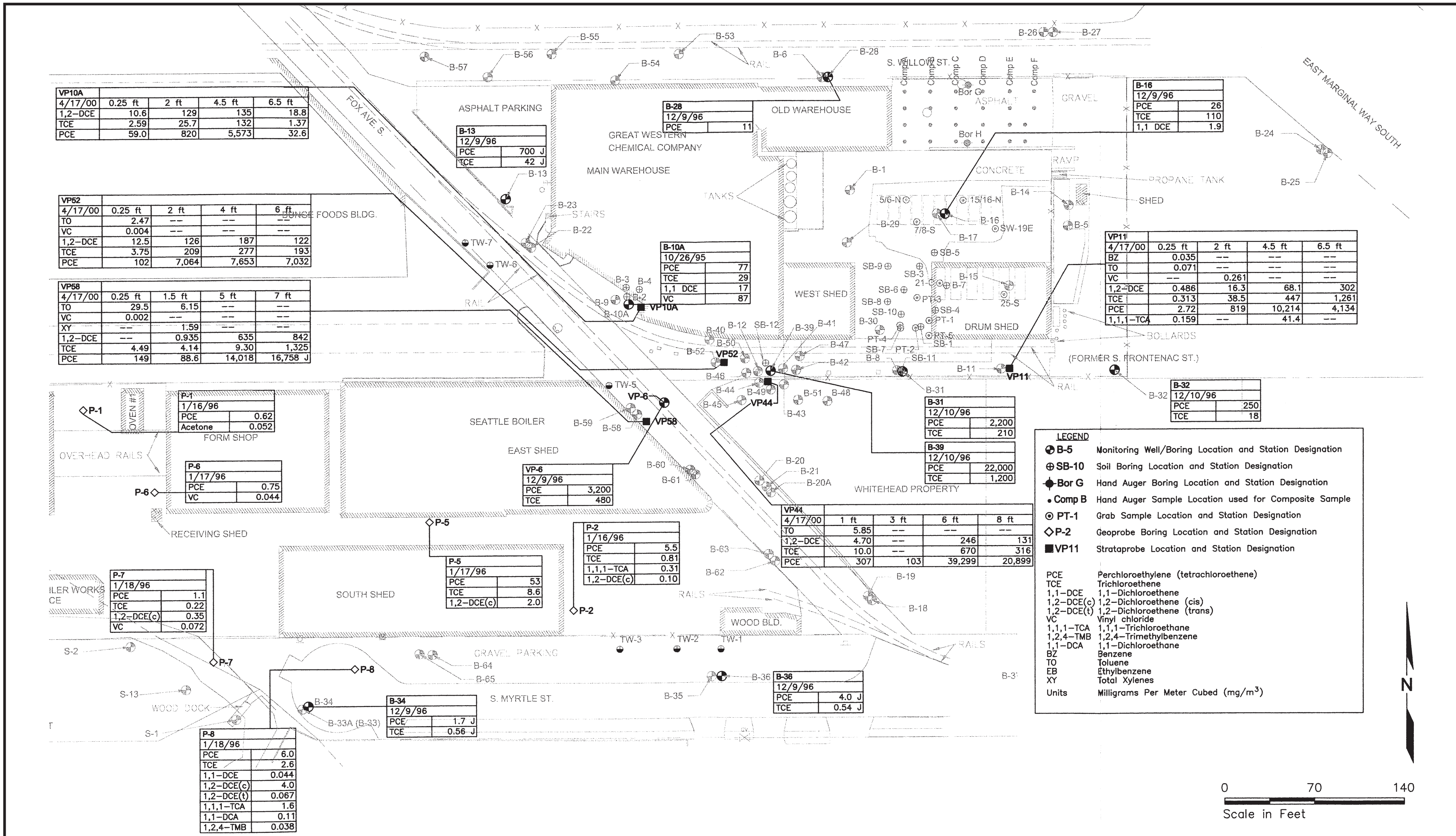
Base Map Reference: Floyd & Snider Inc. 2000.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 32
PCE, TCE, AND METHYLENE CHLORIDE RESULTS FOR SOIL - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig32



VP10A				
4/17/00	0.25 ft	2 ft	4.5 ft	6.5 ft
1,2–DCE	10.6	129	135	18.8
TCE	2.59	25.7	132	1.37
PCE	59.0	820	5,573	32.6

VP52				
4/17/00	0.25 ft	2 ft	4 ft	6 ft
TO	2.47	––	––	––
VC	0.004	––	––	––
1,2–DCE	12.5	126	187	122
TCE	3.75	209	277	193
PCE	102	7,064	7,653	7,032

VP58				
4/17/00	0.25 ft	1.5 ft	5 ft	7 ft
TO	29.5	6.15	––	––
VC	0.002	––	––	––
XY	––	1.59	––	––
1,2–DCE	––	0.935	635	842
TCE	4.49	4.14	9.30	1,325
PCE	149	88.6	14,018	16,758 J

B-13	
12/9/96	
PCE	700 J
TCE	42 J

B-28	
12/9/96	
PCE	11

B-16	
12/9/96	
PCE	26
TCE	110
1,1 DCE	1.9

B-10A	
10/26/95	
PCE	77
TCE	29
1,1 DCE	17
VC	87

VP11				
4/17/00	0.25 ft	2 ft	4.5 ft	6.5 ft
BZ	0.035	––	––	––
TO	0.071	––	––	––
VC	––	0.261	––	––
1,2–DCE	0.486	16.3	68.1	302
TCE	0.313	38.5	447	1,261
PCE	2.72	819	10,214	4,134
1,1,1–TCA	0.159	––	41.4	––

B-32	
12/10/96	
PCE	250
TCE	18

P-1	
1/16/96	
PCE	0.62
Acetone	0.052

P-6	
1/17/96	
PCE	0.75
VC	0.044

VP-6	
12/9/96	
PCE	3,200
TCE	480

B-31	
12/10/96	
PCE	2,200
TCE	210

B-39	
12/10/96	
PCE	22,000
TCE	1,200

VP44				
4/17/00	1 ft	3 ft	6 ft	8 ft
TO	5.85	––	––	––
1,2–DCE	4.70	––	246	131
TCE	10.0	––	670	316
PCE	307	103	39,299	20,899

P-2	
1/16/96	
PCE	5.5
TCE	0.81
1,1,1–TCA	0.31
1,2–DCE(c)	0.10

P-5	
1/17/96	
PCE	53
TCE	8.6
1,2–DCE(c)	2.0

P-7	
1/18/96	
PCE	1.1
TCE	0.22
1,2–DCE(c)	0.35
VC	0.072

B-34	
12/9/96	
PCE	1.7 J
TCE	0.56 J

B-36	
12/9/96	
PCE	4.0 J
TCE	0.54 J

P-8	
1/18/96	
PCE	6.0
TCE	2.6
1,1–DCE	0.044
1,2–DCE(c)	4.0
1,2–DCE(t)	0.067
1,1,1–TCA	1.6
1,1–DCA	0.11
1,2,4–TMB	0.038

LEGEND

B-5	Monitoring Well/Boring Location and Station Designation
SB-10	Soil Boring Location and Station Designation
Bor G	Hand Auger Boring Location and Station Designation
Comp B	Hand Auger Sample Location used for Composite Sample
PT-1	Grab Sample Location and Station Designation
P-2	Geoprobe Boring Location and Station Designation
VP11	Strataprobe Location and Station Designation
PCE	Perchloroethylene (tetrachloroethene)
TCE	Trichloroethene
1,1–DCE	1,1–Dichloroethene
1,2–DCE(c)	1,2–Dichloroethene (cis)
1,2–DCE(t)	1,2–Dichloroethene (trans)
VC	Vinyl chloride
1,1,1–TCA	1,1,1–Trichloroethane
1,2,4–TMB	1,2,4–Trimethylbenzene
1,1–DCA	1,1–Dichloroethane
BZ	Benzene
TO	Toluene
EB	Ethylbenzene
XY	Total Xylenes
Units	Milligrams Per Meter Cubed (mg/m^3)

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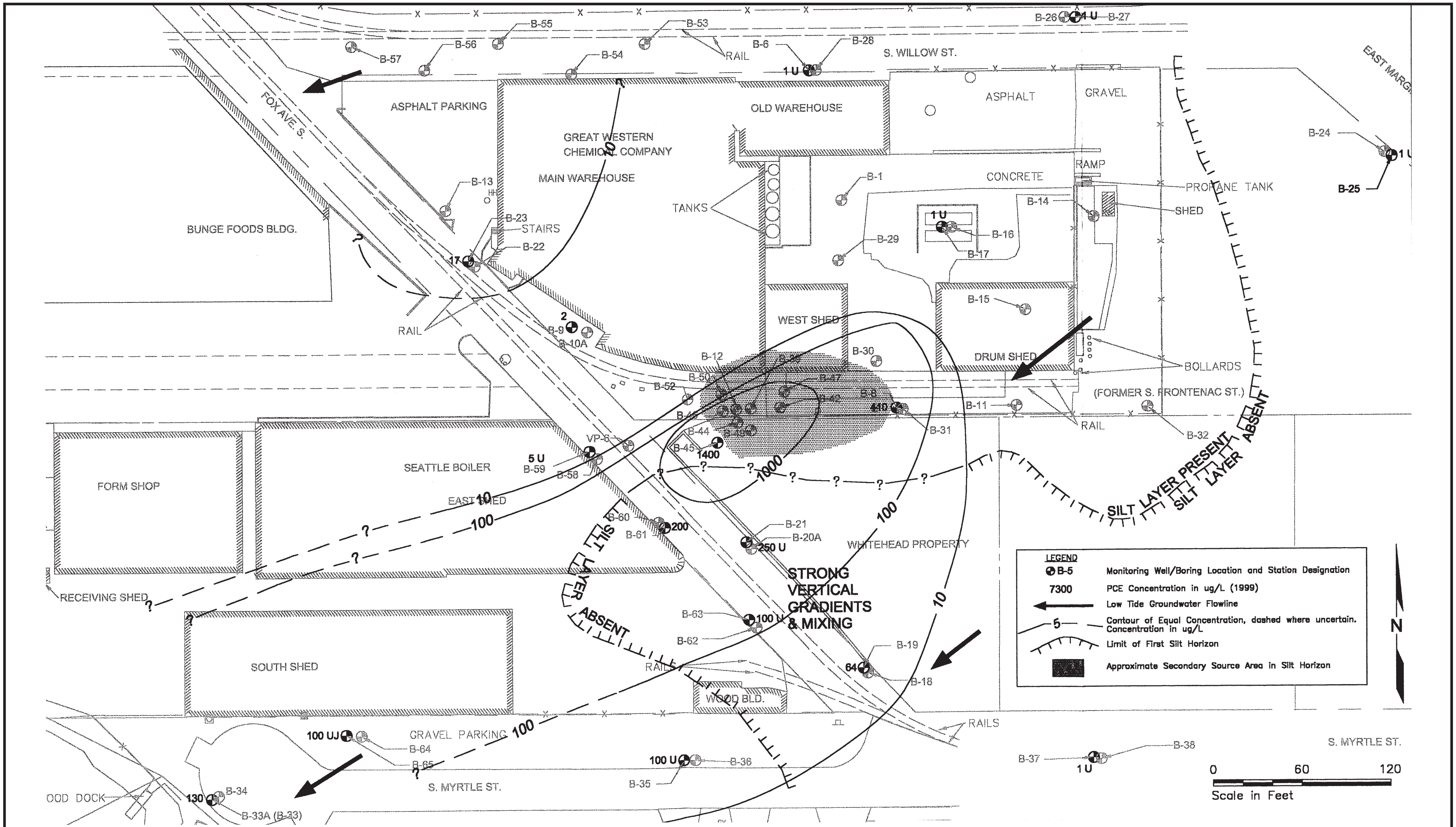
Base Map Reference: Floyd & Snider Inc. 2000.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 33
SOIL VAPOR RESULTS - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig33



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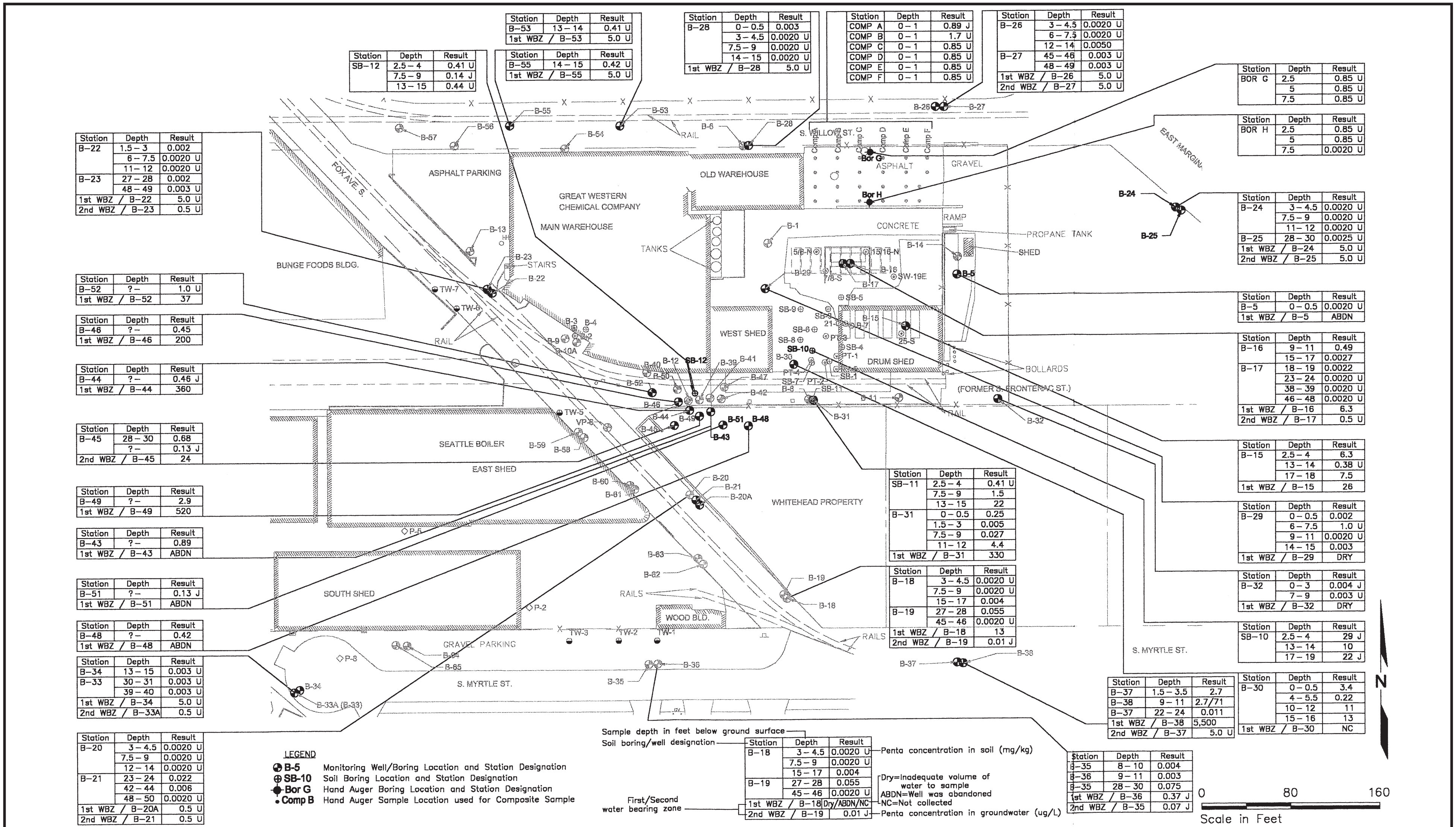
Base Map Reference: Floyd & Snider Inc. 2000.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 34
PCE IN 2nd WBZ (1999 SAMPLING EVENT) - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig34



Station	Depth	Result
B-53	13-14	0.41 U
1st WBZ / B-53		5.0 U

Station	Depth	Result
B-55	14-15	0.42 U
1st WBZ / B-55		5.0 U

Station	Depth	Result
SB-12	2.5-4	0.41 U
	7.5-9	0.14 J
	13-15	0.44 U

Station	Depth	Result
B-28	0-0.5	0.003
	3-4.5	0.0020 U
	7.5-9	0.0020 U
	14-15	0.0020 U
1st WBZ / B-28		5.0 U

Station	Depth	Result
COMP A	0-1	0.89 J
COMP B	0-1	1.7 U
COMP C	0-1	0.85 U
COMP D	0-1	0.85 U
COMP E	0-1	0.85 U
COMP F	0-1	0.85 U

Station	Depth	Result
B-26	3-4.5	0.0020 U
	6-7.5	0.0020 U
	12-14	0.0050
B-27	45-46	0.003 U
	48-49	0.003 U
1st WBZ / B-26		5.0 U
2nd WBZ / B-27		5.0 U

Station	Depth	Result
BOR G	2.5	0.85 U
	5	0.85 U
	7.5	0.85 U

Station	Depth	Result
BOR H	2.5	0.85 U
	5	0.85 U
	7.5	0.0020 U

Station	Depth	Result
B-22	1.5-3	0.002
	6-7.5	0.0020 U
	11-12	0.0020 U
B-23	27-28	0.002
	48-49	0.003 U
1st WBZ / B-22		5.0 U
2nd WBZ / B-23		0.5 U

Station	Depth	Result
B-24	3-4.5	0.0020 U
	7.5-9	0.0020 U
	11-12	0.0020 U
B-25	28-30	0.0025 U
1st WBZ / B-24		5.0 U
2nd WBZ / B-25		5.0 U

Station	Depth	Result
B-52	?-	1.0 U
1st WBZ / B-52		37

Station	Depth	Result
B-46	?-	0.45
1st WBZ / B-46		200

Station	Depth	Result
B-5	0-0.5	0.0020 U
1st WBZ / B-5		ABDN

Station	Depth	Result
B-44	?-	0.46 J
1st WBZ / B-44		360

Station	Depth	Result
B-16	9-11	0.49
	15-17	0.0027
B-17	18-19	0.0022
	23-24	0.0020 U
	38-39	0.0020 U
	46-48	0.0020 U
1st WBZ / B-16		6.3
2nd WBZ / B-17		0.5 U

Station	Depth	Result
B-45	28-30	0.68
	?-	0.13 J
2nd WBZ / B-45		24

Station	Depth	Result
B-15	2.5-4	6.3
	13-14	0.38 U
	17-18	7.5
1st WBZ / B-15		26

Station	Depth	Result
SB-11	2.5-4	0.41 U
	7.5-9	1.5
	13-15	22
B-31	0-0.5	0.25
	1.5-3	0.005
	7.5-9	0.027
	11-12	4.4
1st WBZ / B-31		330

Station	Depth	Result
B-49	?-	2.9
1st WBZ / B-49		520

Station	Depth	Result
B-29	0-0.5	0.002
	6-7.5	1.0 U
	9-11	0.0020 U
	14-15	0.003
1st WBZ / B-29		DRY

Station	Depth	Result
B-43	?-	0.89
1st WBZ / B-43		ABDN

Station	Depth	Result
B-18	3-4.5	0.0020 U
	7.5-9	0.0020 U
	15-17	0.004
B-19	27-28	0.055
	45-46	0.0020 U
1st WBZ / B-18		13
2nd WBZ / B-19		0.01 J

Station	Depth	Result
B-32	0-3	0.004 J
	7-9	0.003 U
1st WBZ / B-32		DRY

Station	Depth	Result
B-51	?-	0.13 J
1st WBZ / B-51		ABDN

Station	Depth	Result
B-48	?-	0.42
1st WBZ / B-48		ABDN

Station	Depth	Result
SB-10	2.5-4	29 J
	13-14	10
	17-19	22 J

Station	Depth	Result
B-34	13-15	0.003 U
B-33	30-31	0.003 U
	39-40	0.003 U
1st WBZ / B-34		5.0 U
2nd WBZ / B-33A		0.5 U

Station	Depth	Result
B-37	1.5-3.5	2.7
B-38	9-11	2.7/71
B-37	22-24	0.011
1st WBZ / B-38		5,500
2nd WBZ / B-37		5.0 U

Station	Depth	Result
B-30	0-0.5	3.4
	4-5.5	0.22
	10-12	11
	15-16	13
1st WBZ / B-30		NC

Station	Depth	Result
B-20	3-4.5	0.0020 U
	7.5-9	0.0020 U
	12-14	0.0020 U
B-21	23-24	0.022
	42-44	0.006
	48-50	0.0020 U
1st WBZ / B-20A		0.5 U
2nd WBZ / B-21		0.5 U

Station	Depth	Result
B-35	8-10	0.004
B-36	9-11	0.003
B-35	28-30	0.075
1st WBZ / B-36		0.37 J
2nd WBZ / B-35		0.07 J

Sample depth in feet below ground surface
Soil boring/well designation

Station	Depth	Result
B-18	3-4.5	0.0020 U
	7.5-9	0.0020 U
	15-17	0.004
B-19	27-28	0.055
	45-46	0.0020 U
1st WBZ / B-18		Dry/ABDN/NC
2nd WBZ / B-19		0.01 J

Penta concentration in soil (mg/kg)
Dry=Inadequate volume of water to sample
ABDN=Well was abandoned
NC=Not collected
Penta concentration in groundwater (ug/L)
First/Second water bearing zone

LEGEND

- B-5 Monitoring Well/Boring Location and Station Designation
- SB-10 Soil Boring Location and Station Designation
- Bor G Hand Auger Boring Location and Station Designation
- Comp B Hand Auger Sample Location used for Composite Sample

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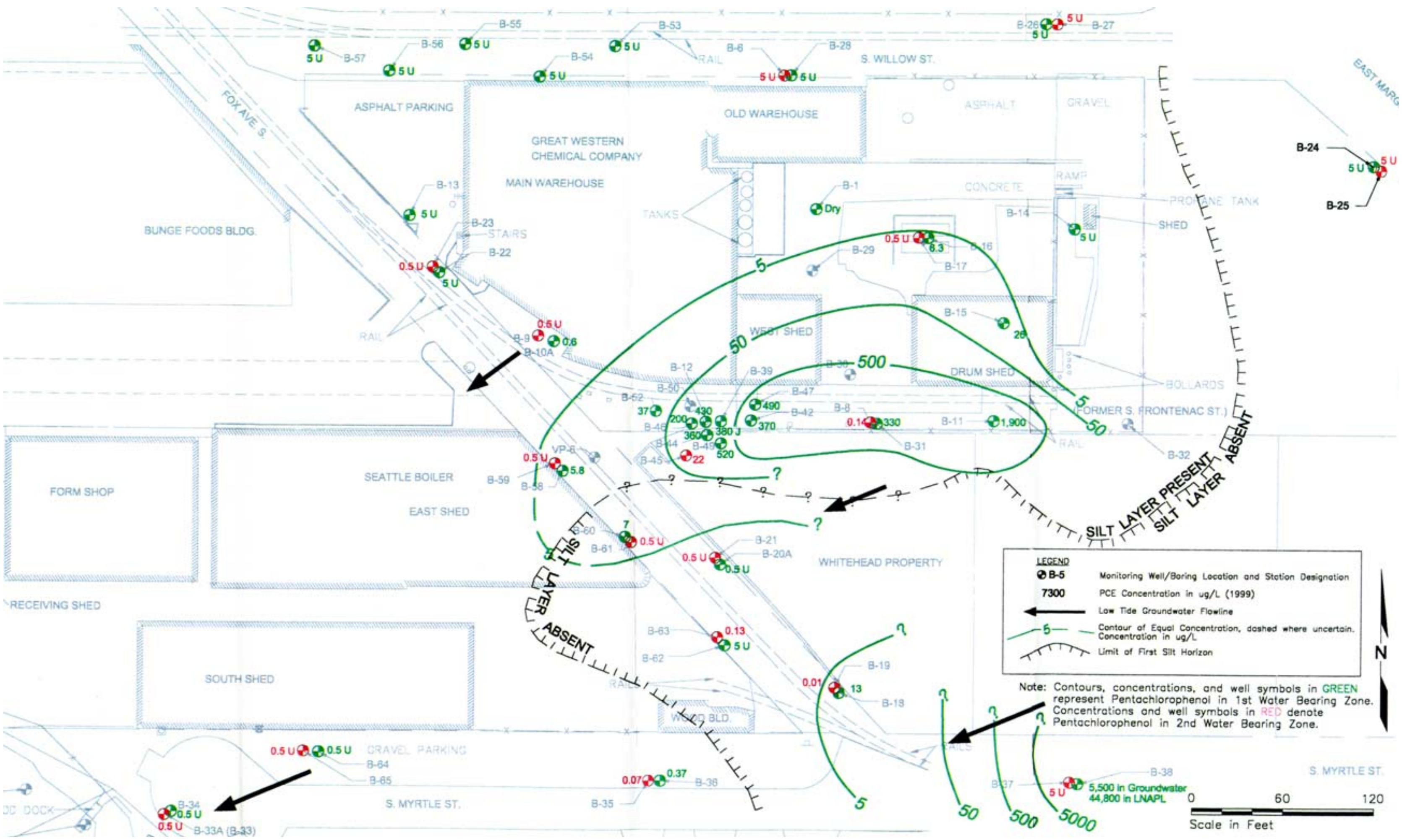
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 35
PENTA RESULTS FOR SOIL - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig35



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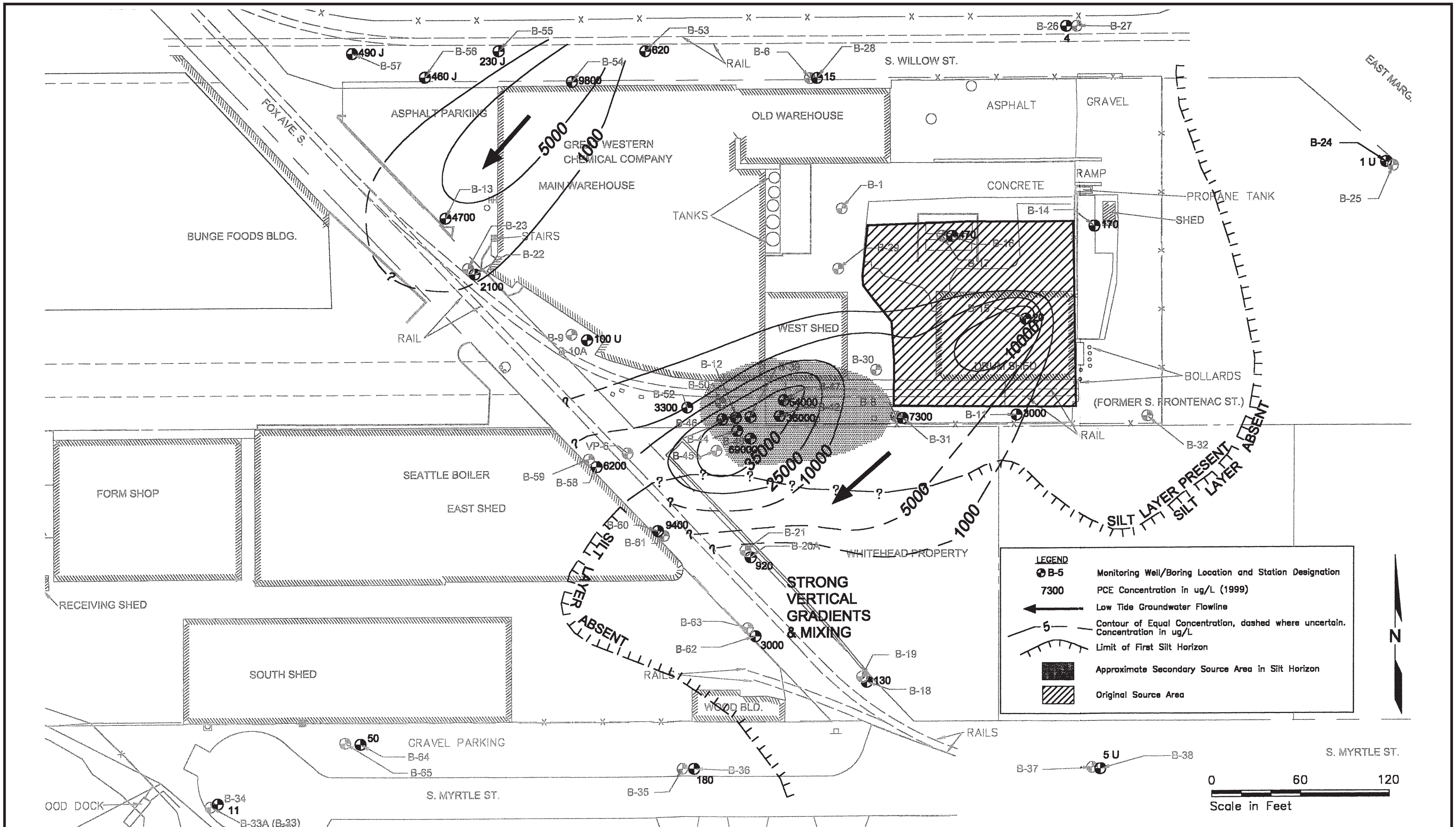
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 36
PENTA IN 1st AND 2nd WBZ (1999 SAMPLING EVENT) -
CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig36



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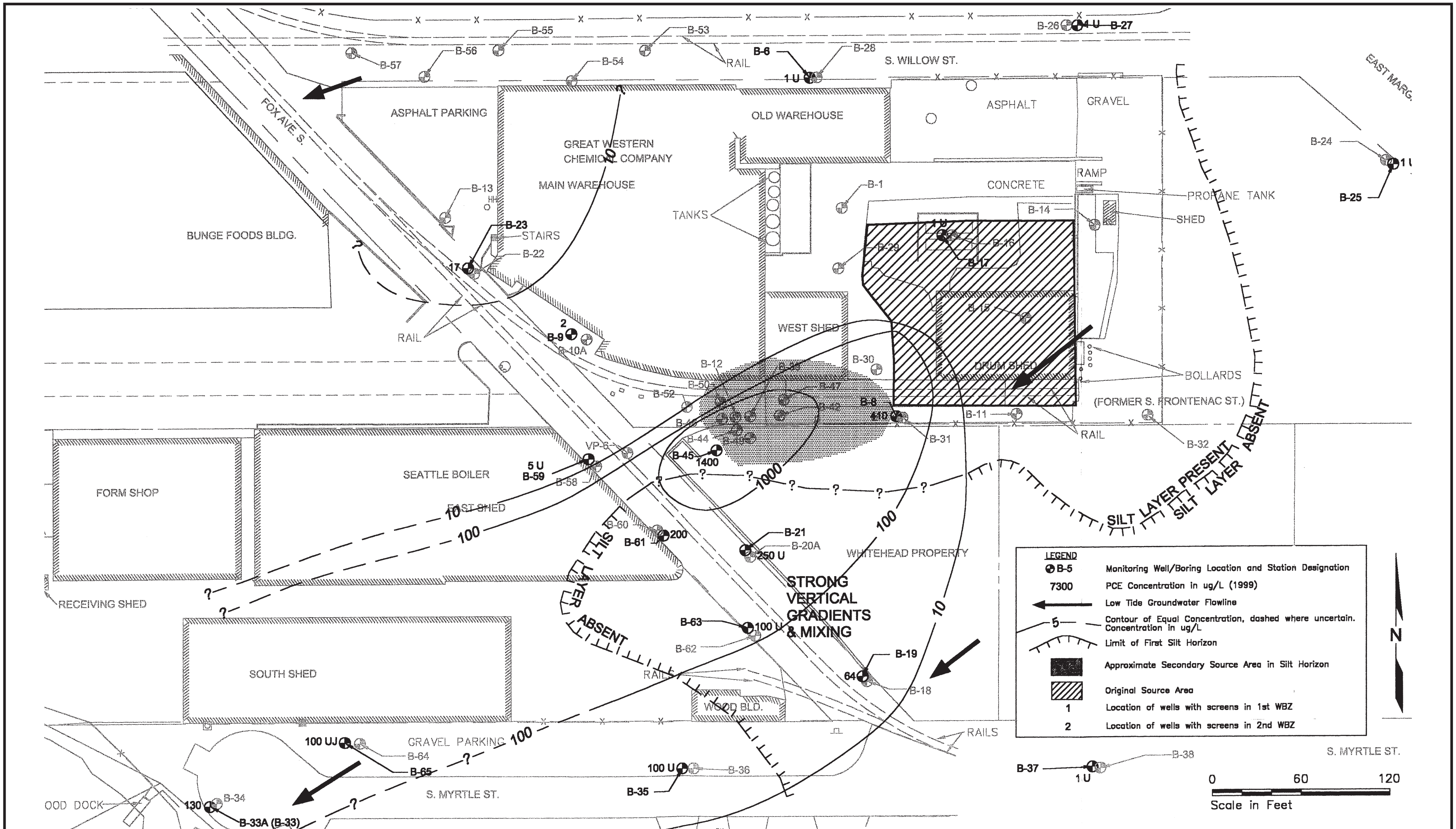
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 37
PCE IN 1st WBZ (1999 SAMPLING EVENT) - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig37



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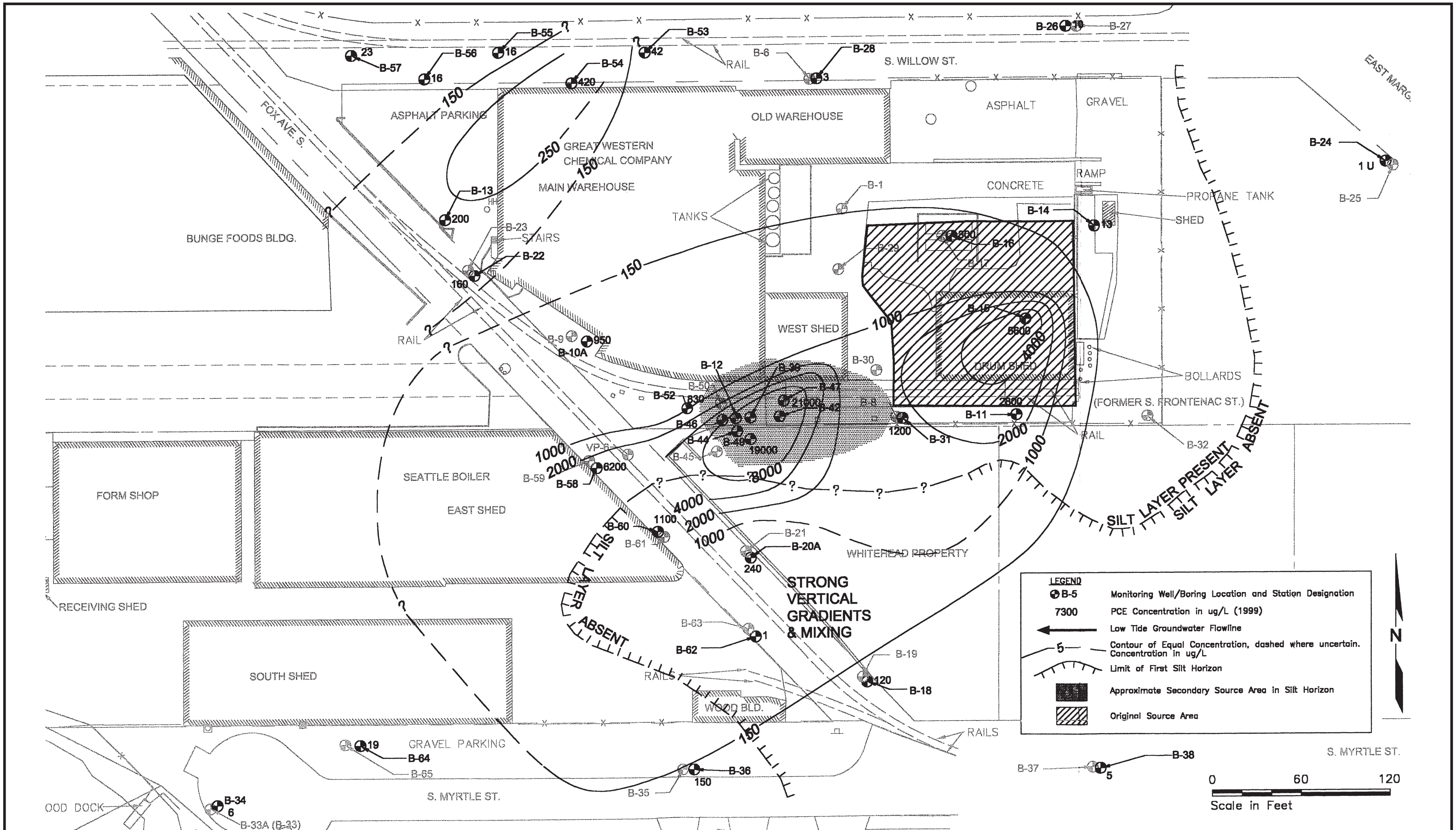
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 38
PCE IN 2nd WBZ (1999 SAMPLING EVENT) - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig38



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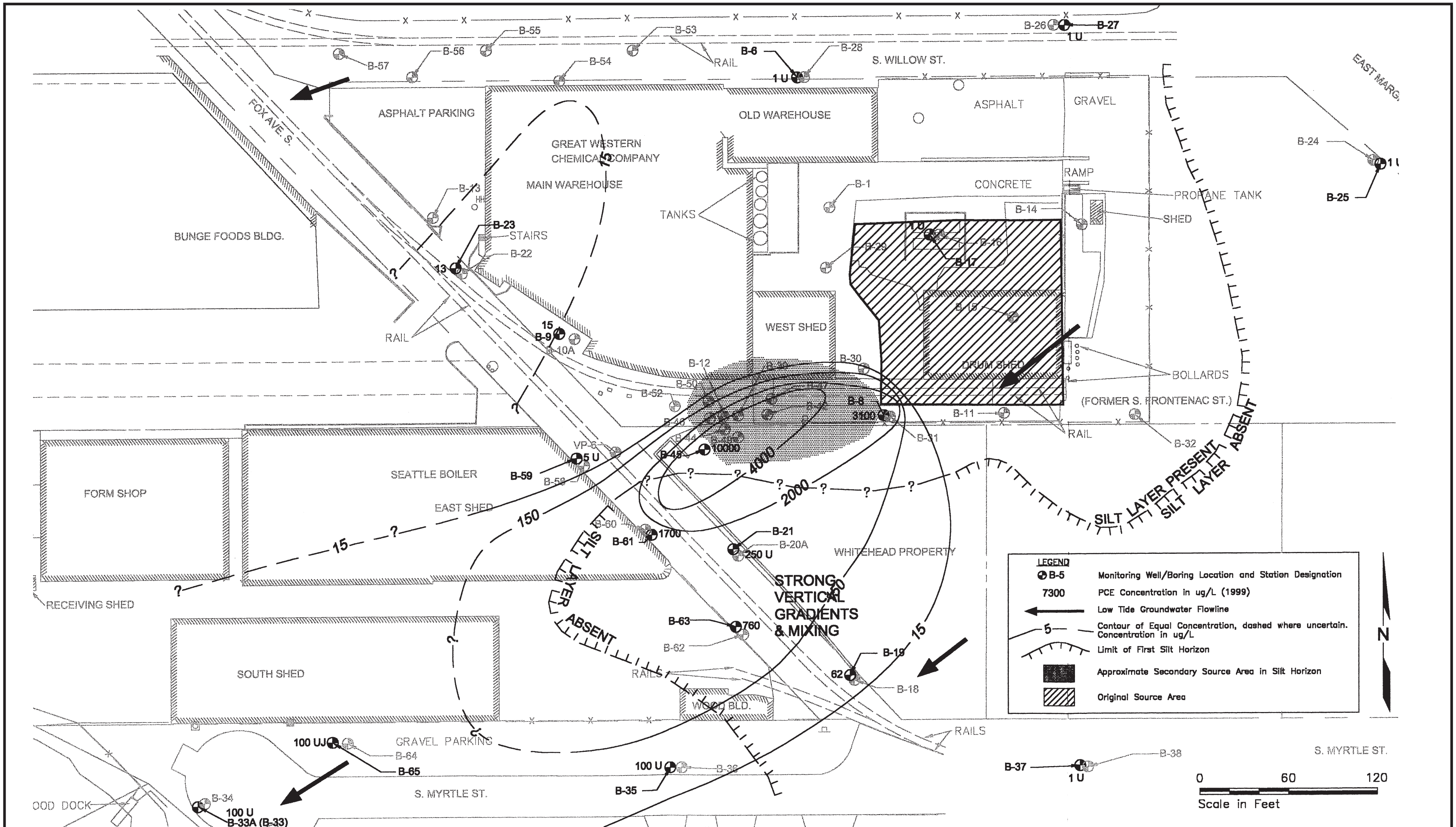
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 39

TCE IN 1st WBZ (1999 SAMPLING EVENT) - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig39



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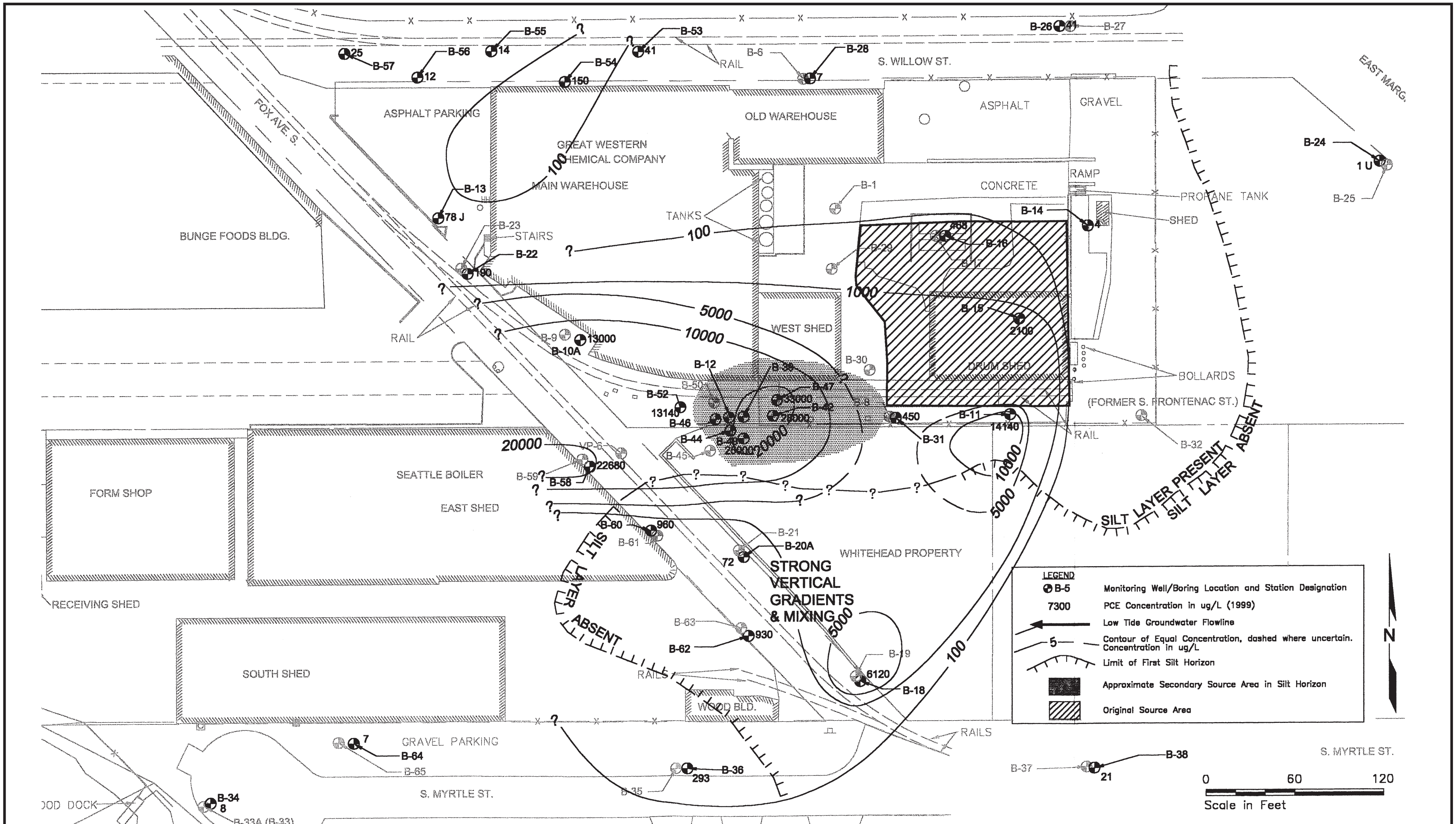
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 40
TCE IN 2nd WBZ (1999 SAMPLING EVENT) - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig40



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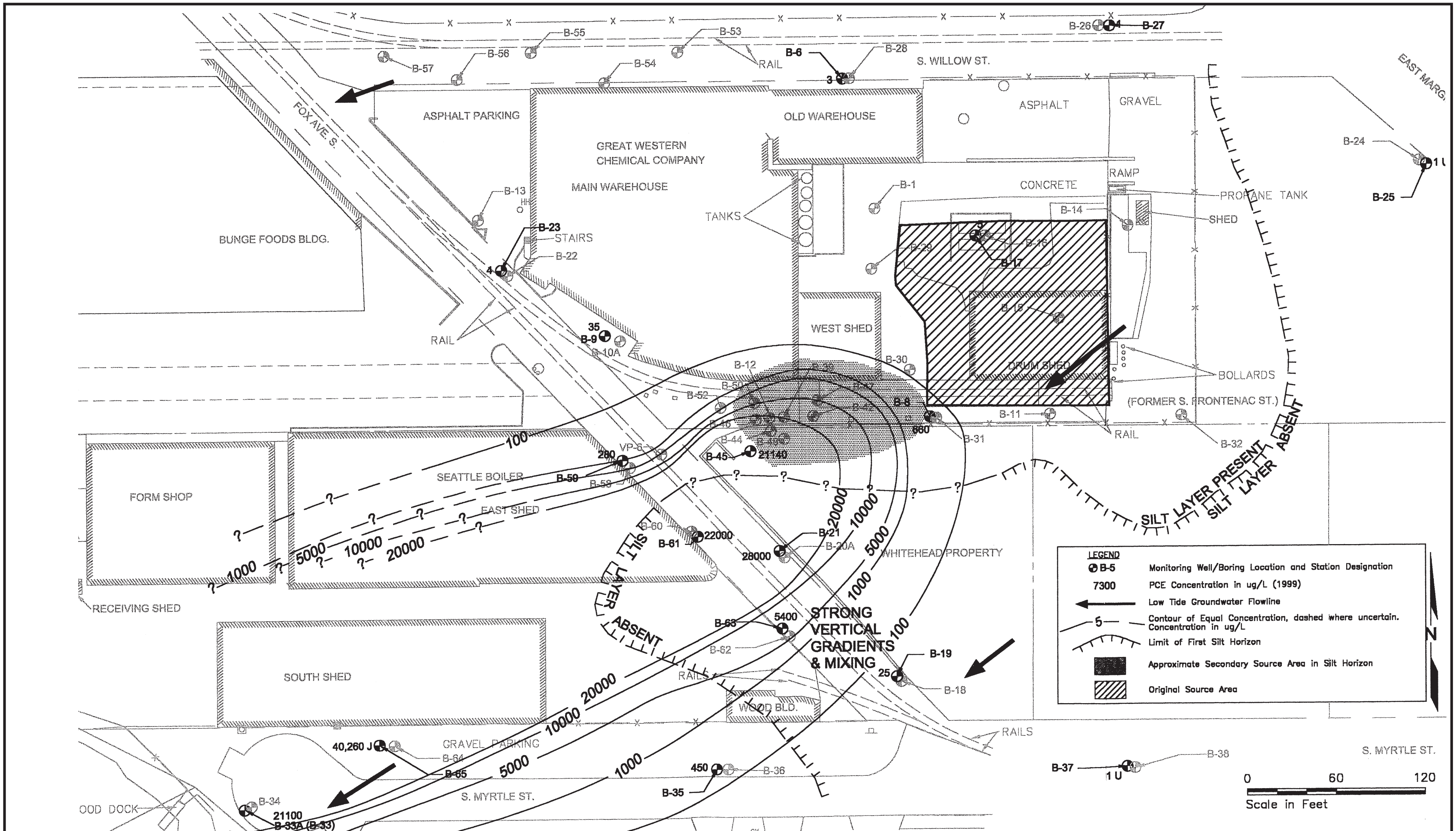
			Date: 5/21/08 — Drawn by: AES — 10:002330WD1403\fig41



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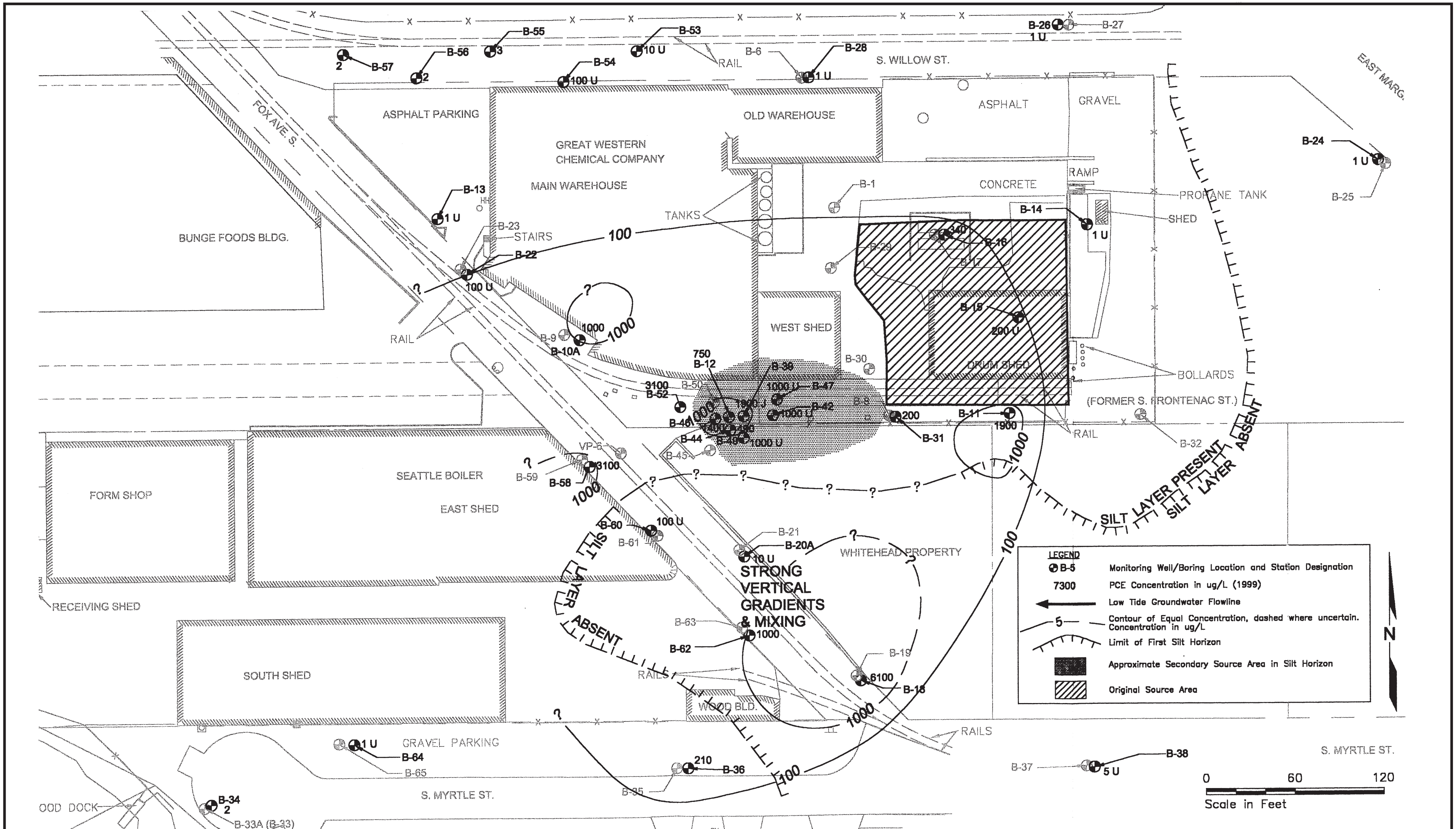
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 42
1,2-DCE IN 2nd WBZ (1999 SAMPLING EVENT) -
CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig42



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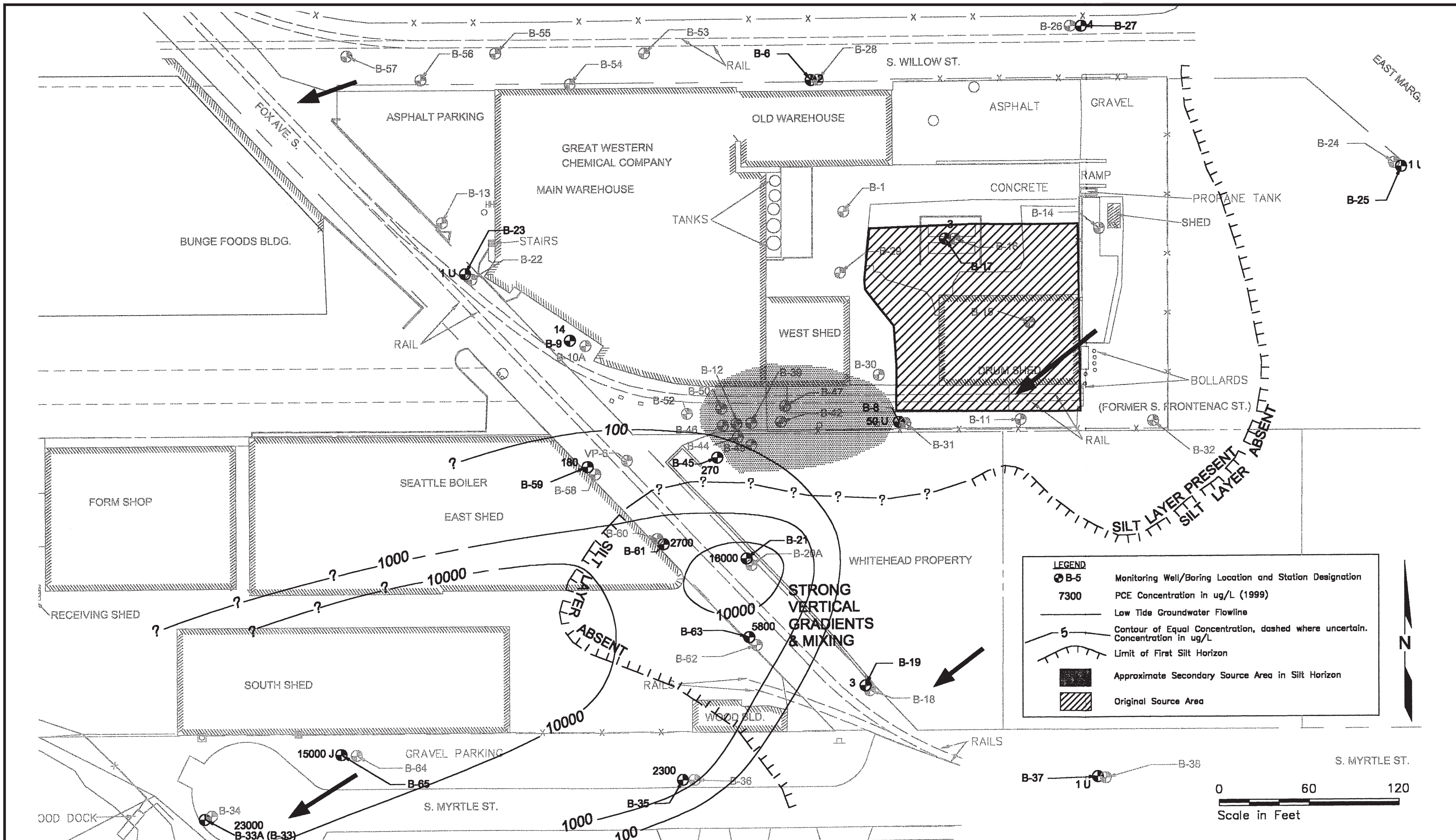
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 43
VC IN 1st WBZ (1999 SAMPLING EVENT) - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig43



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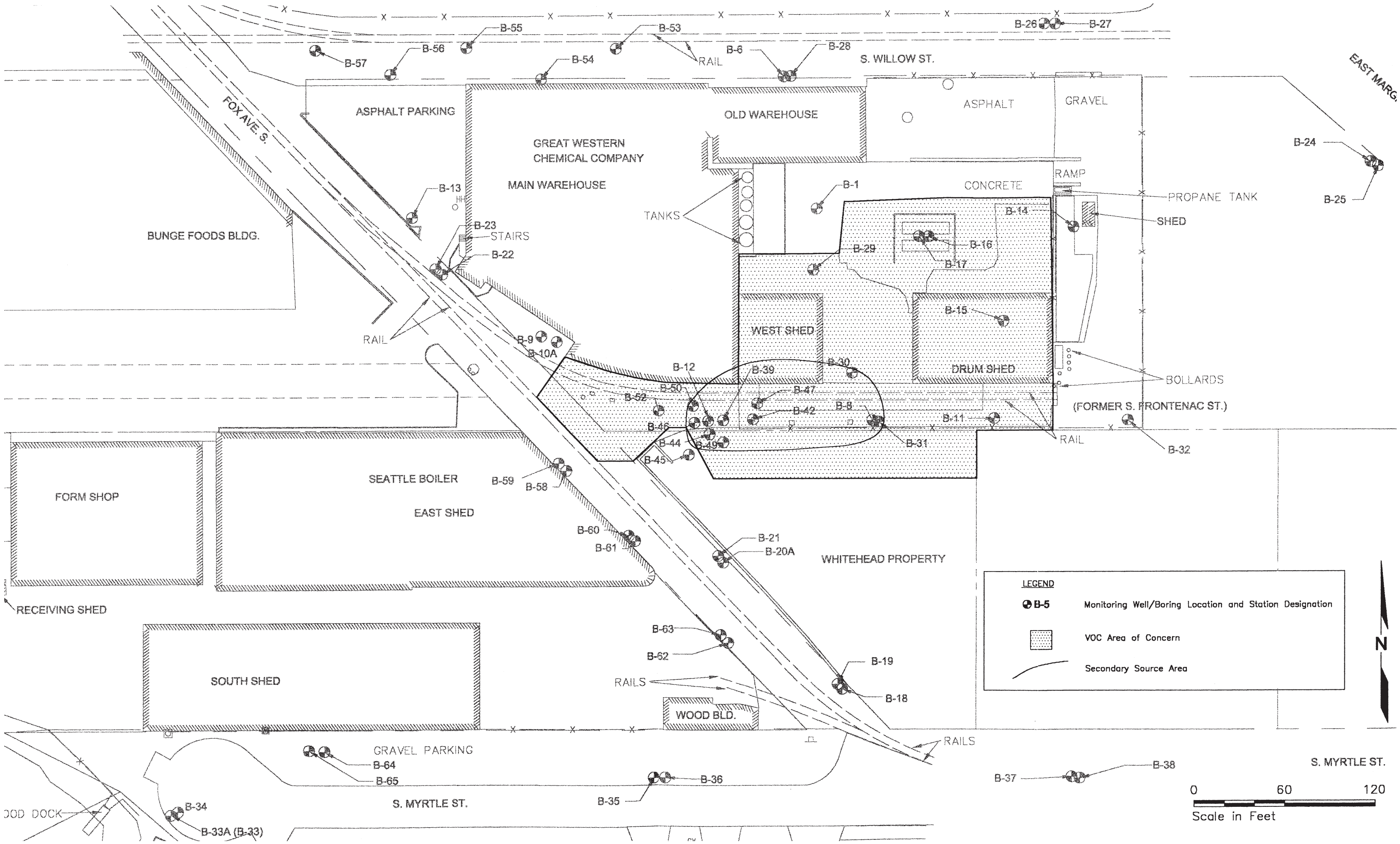
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 44
VC IN 2nd WBZ (1999 SAMPLING EVENT) - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig44



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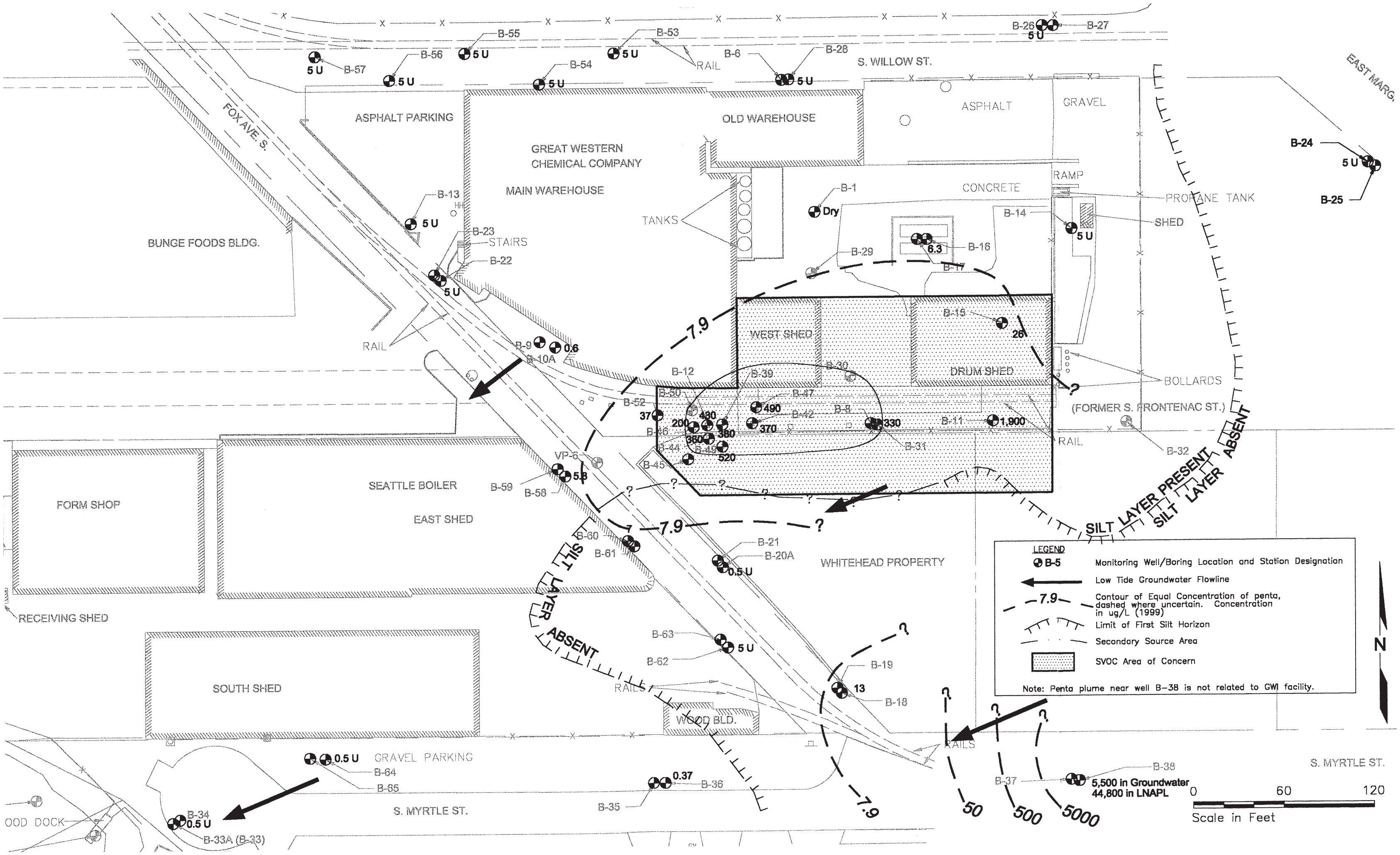
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 45
VOC AREA OF CONCERN - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig45



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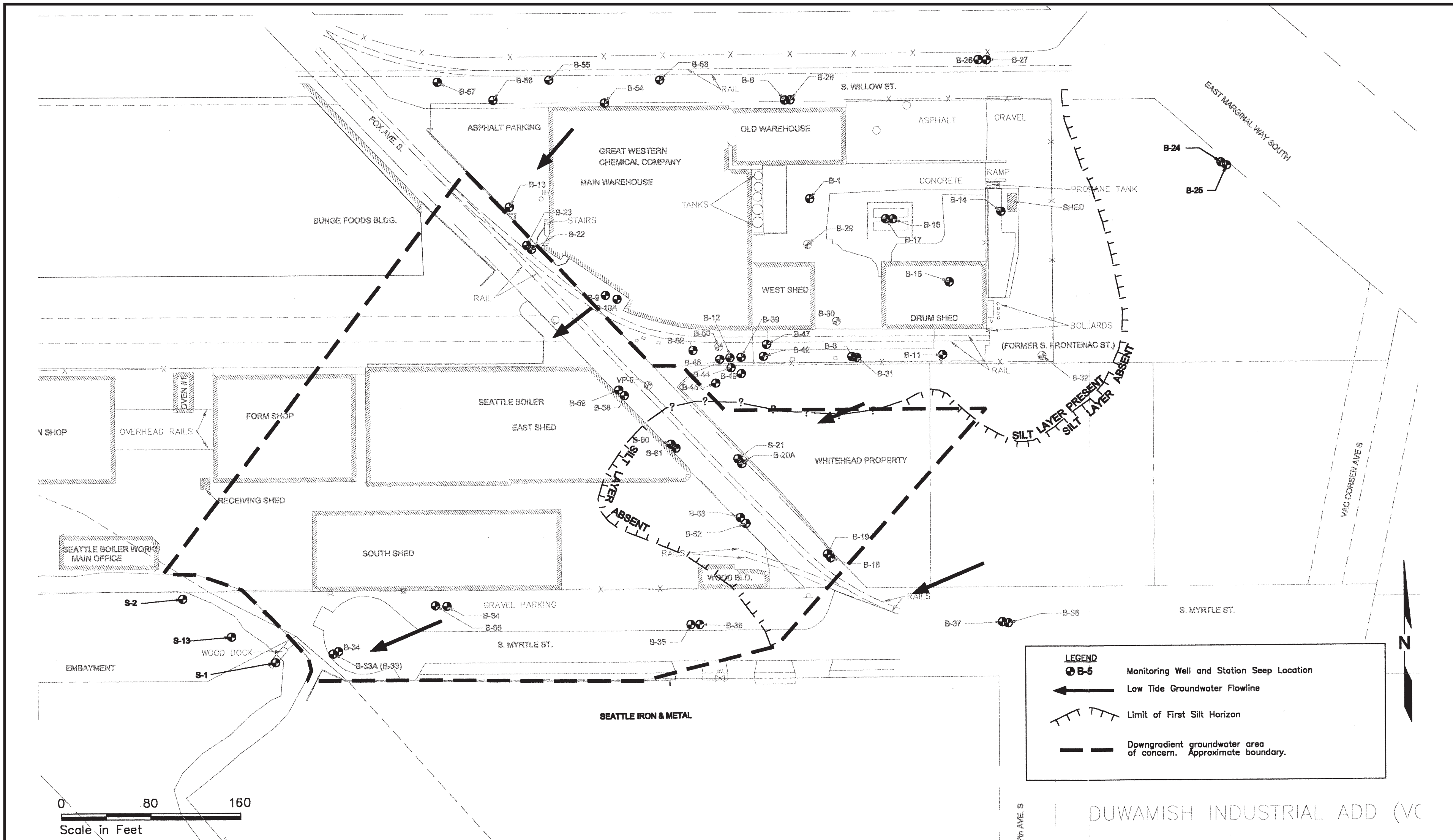
Base Map Reference: Floyd & Snider Inc. 2000.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 46
SVOC AREA OF CONCERN - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig46



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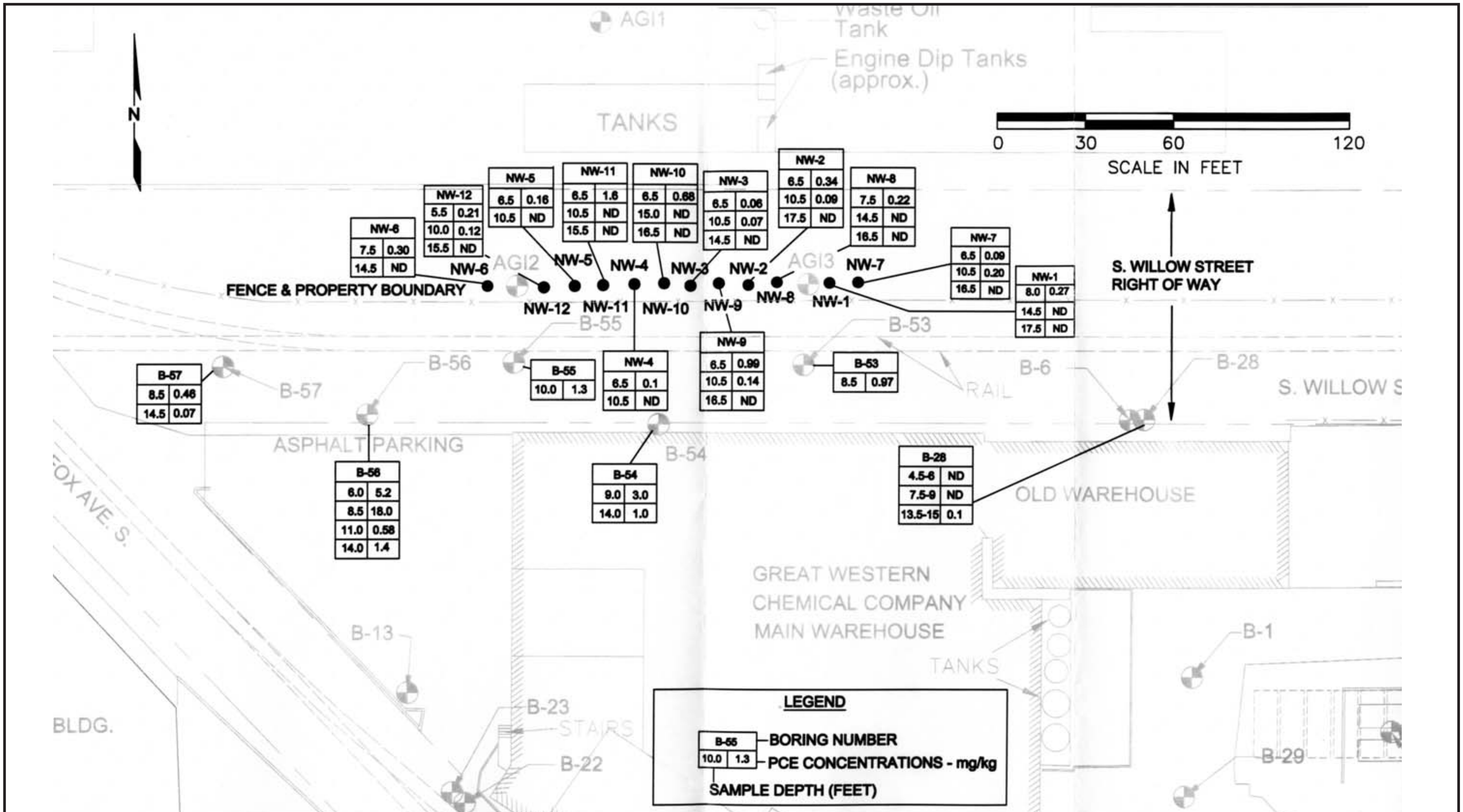
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 47
EXTENT OF DOWNGRADIENT AREA OF CONCERN IN 2nd WBZ - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig47



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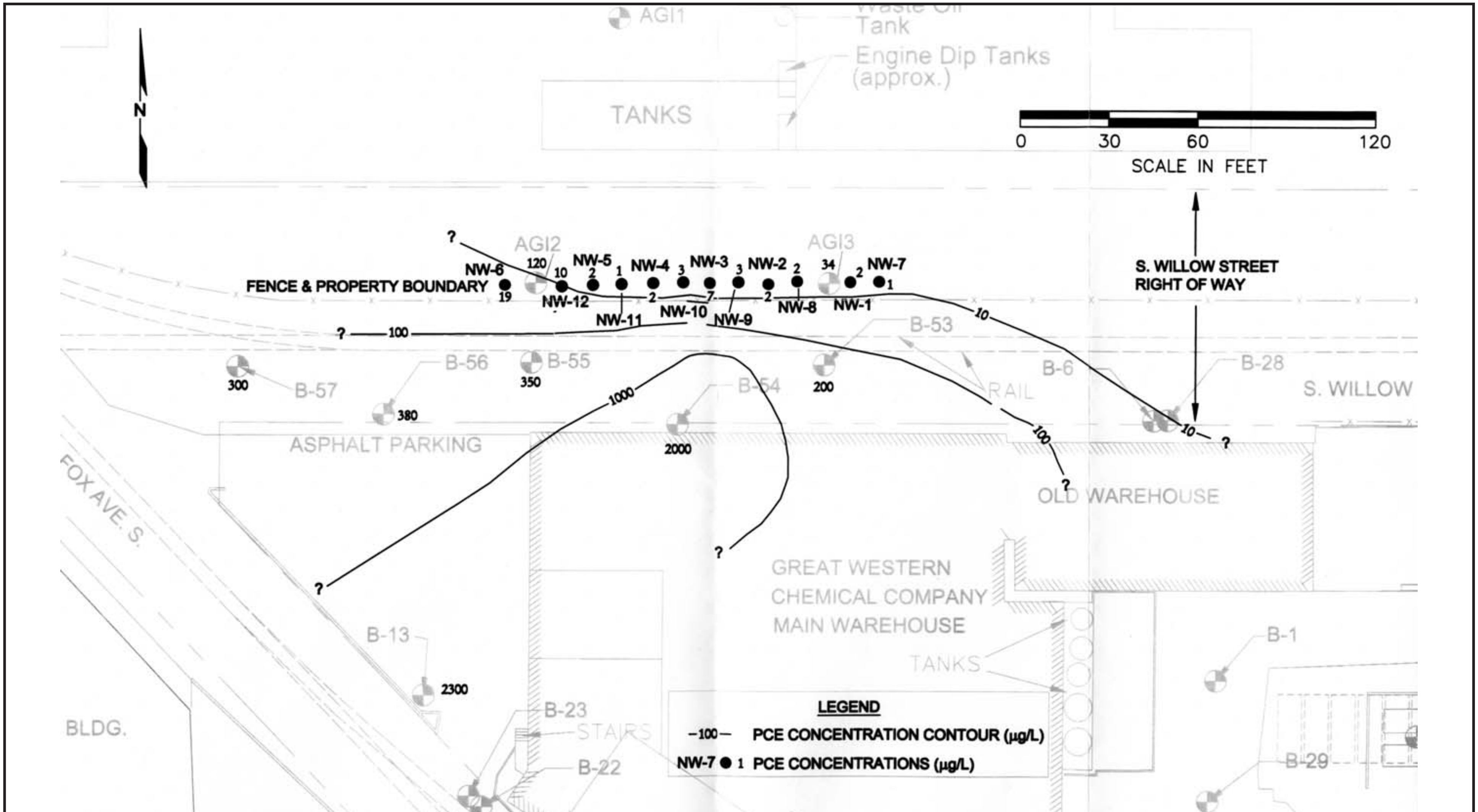
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 48
PCE IN SOIL IN SOUTH WILLOW STREET ROW - CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig48



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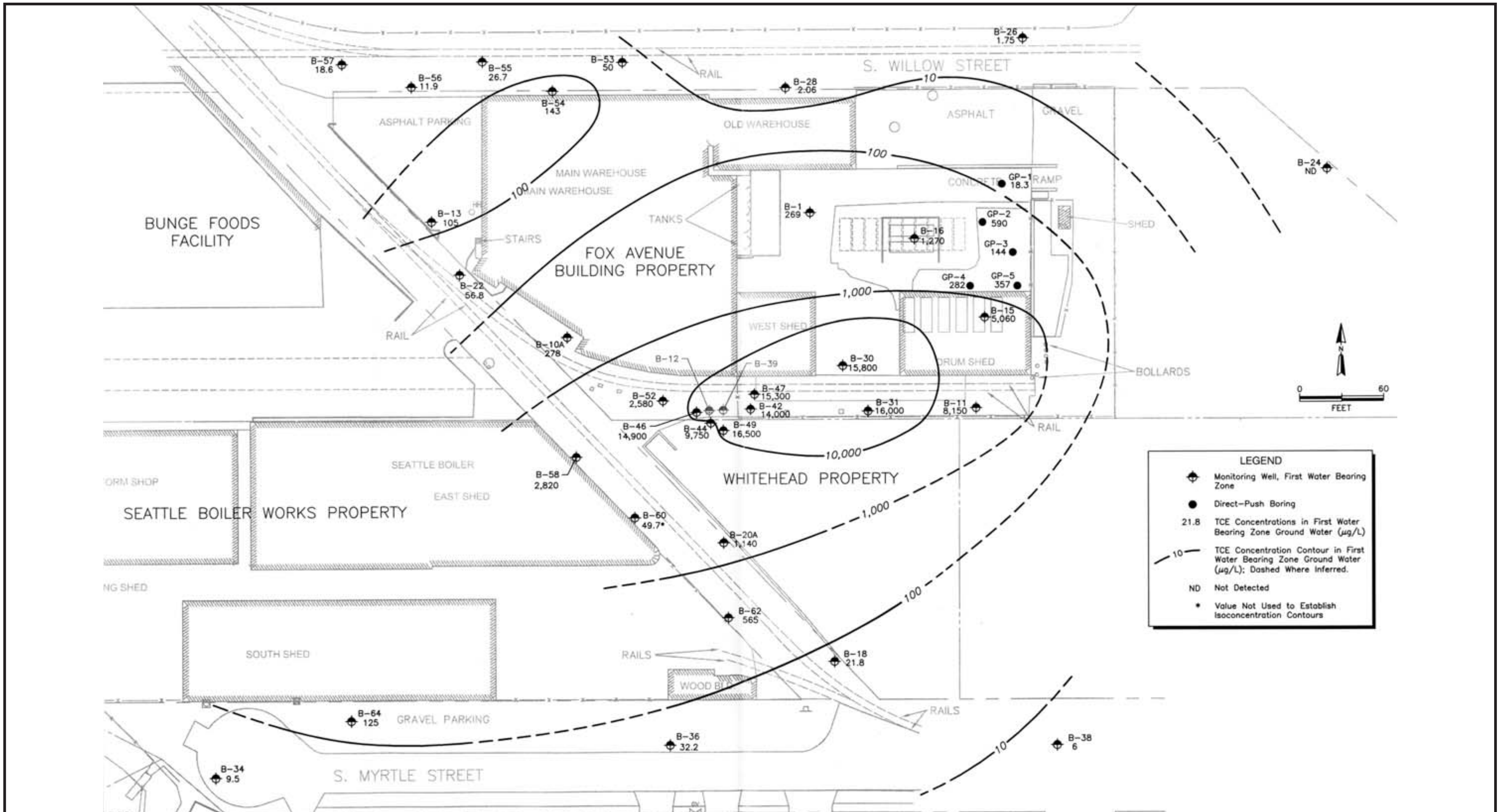
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 49
PCE IN GROUNDWATER IN SOUTH WILLOW STREET ROW -
CASCADE COLUMBIA DISTRIBUTION
(IN OPERATION AS GREAT WESTERN CHEMICAL)

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig49



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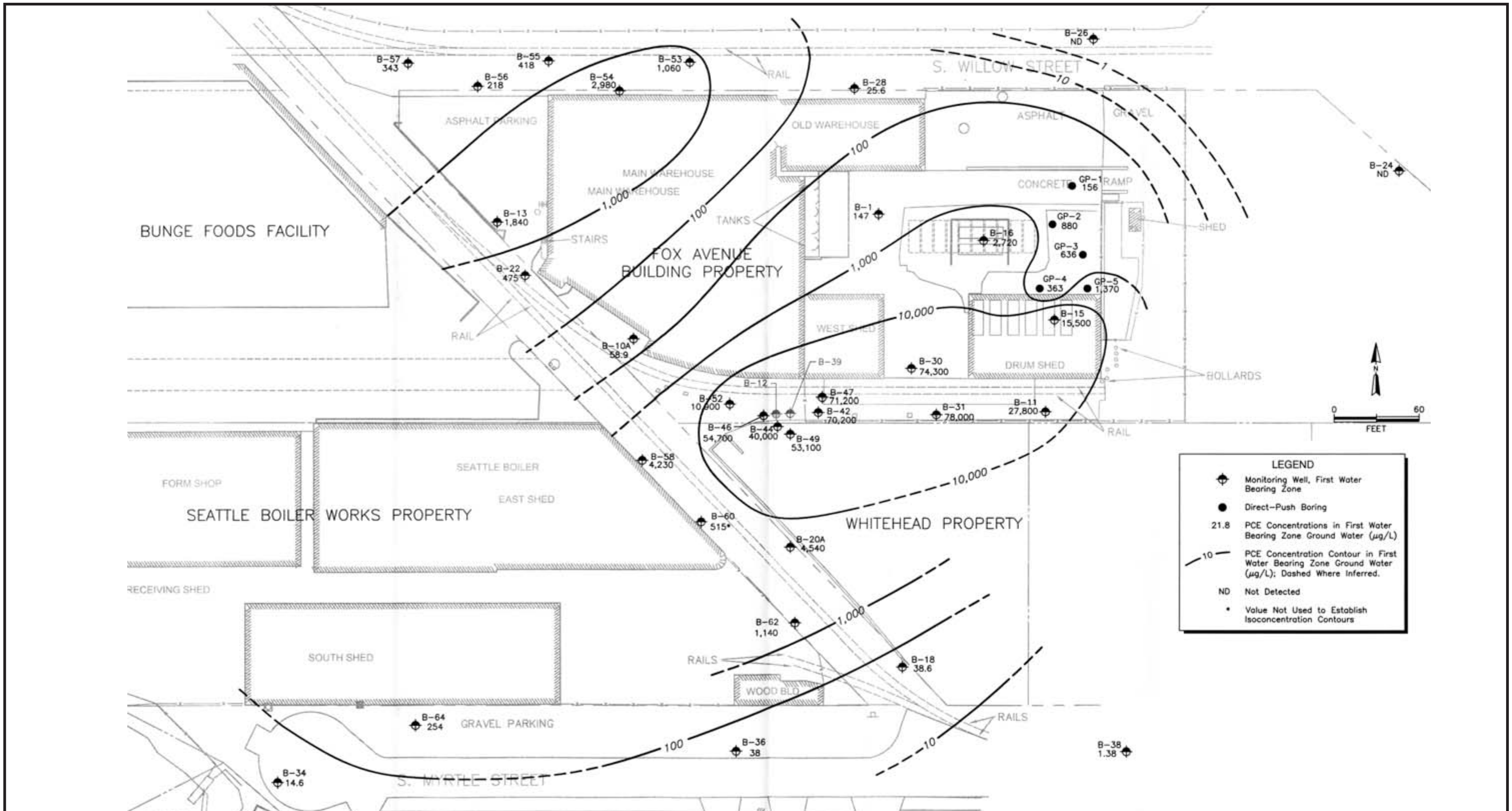

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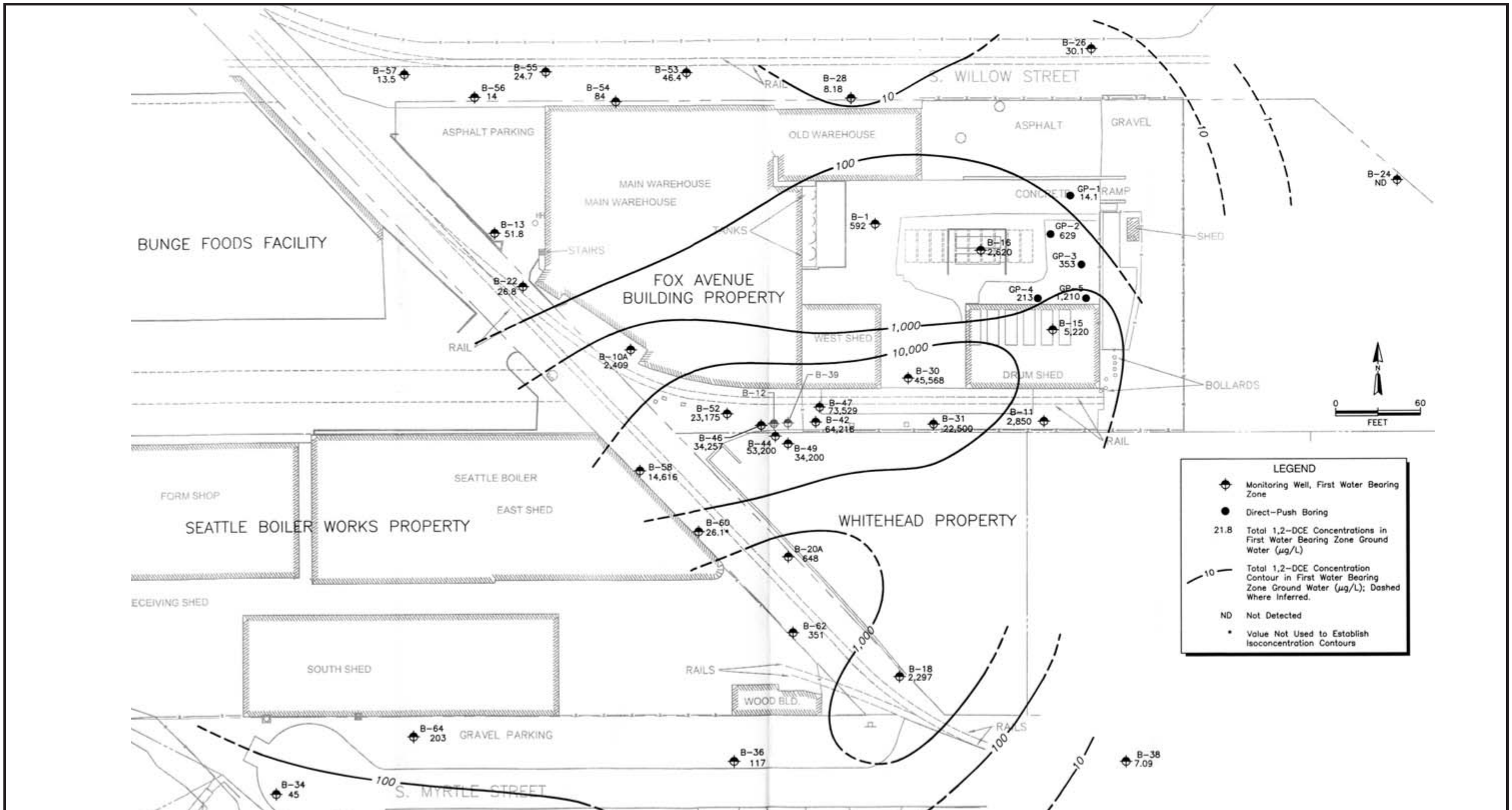
Environmental Resources Management (ERM), 2003.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 51
PCE IN 1st WBZ GROUNDWATER (FOX AVENUE PILOT STUDY) - CASCADE COLUMBIA DISTRIBUTION

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig51



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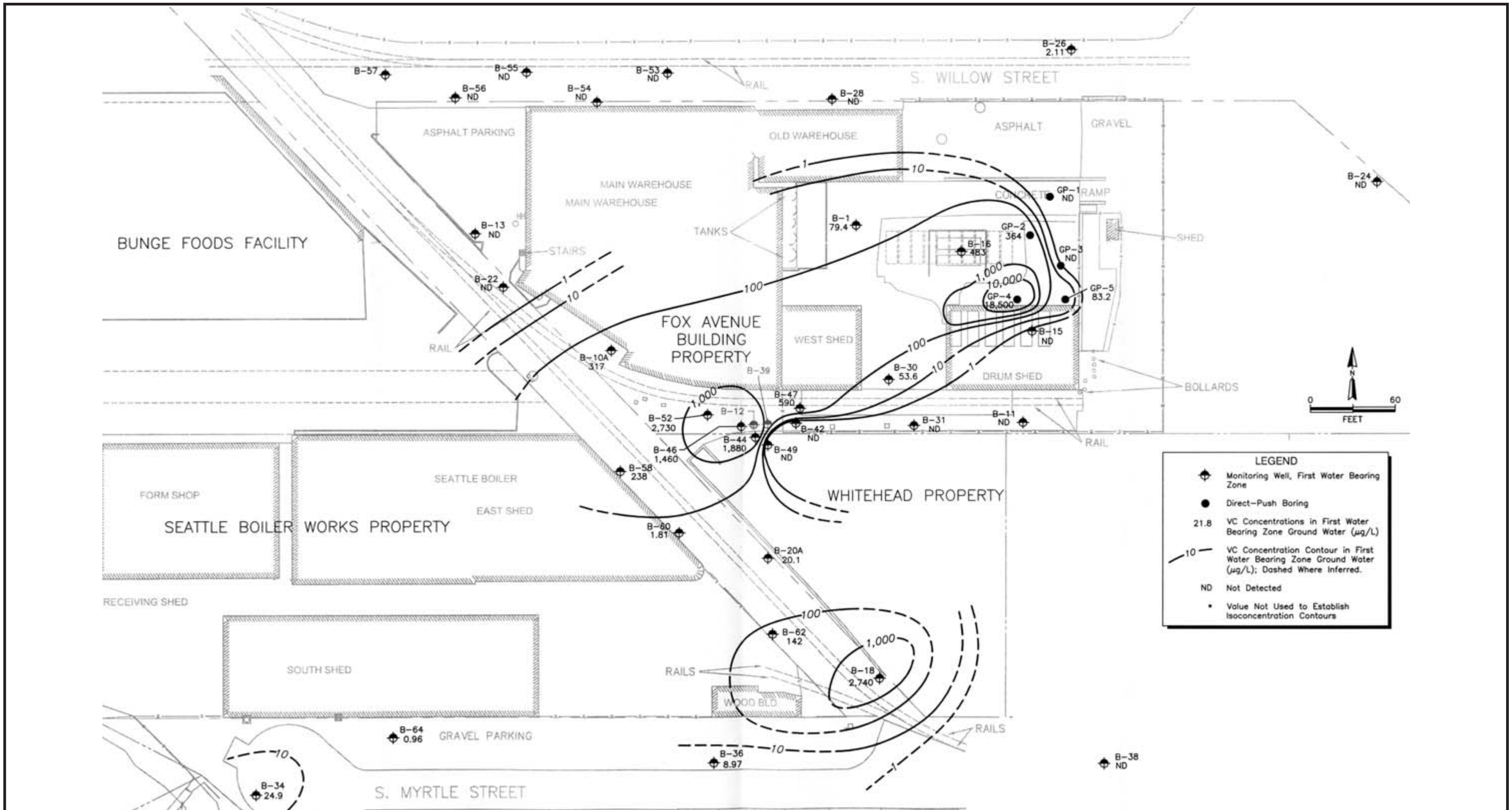
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 52
1,2-DCE IN 1st WBZ GROUNDWATER (FOX AVENUE PILOT STUDY) - CASCADE COLUMBIA DISTRIBUTION

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig52



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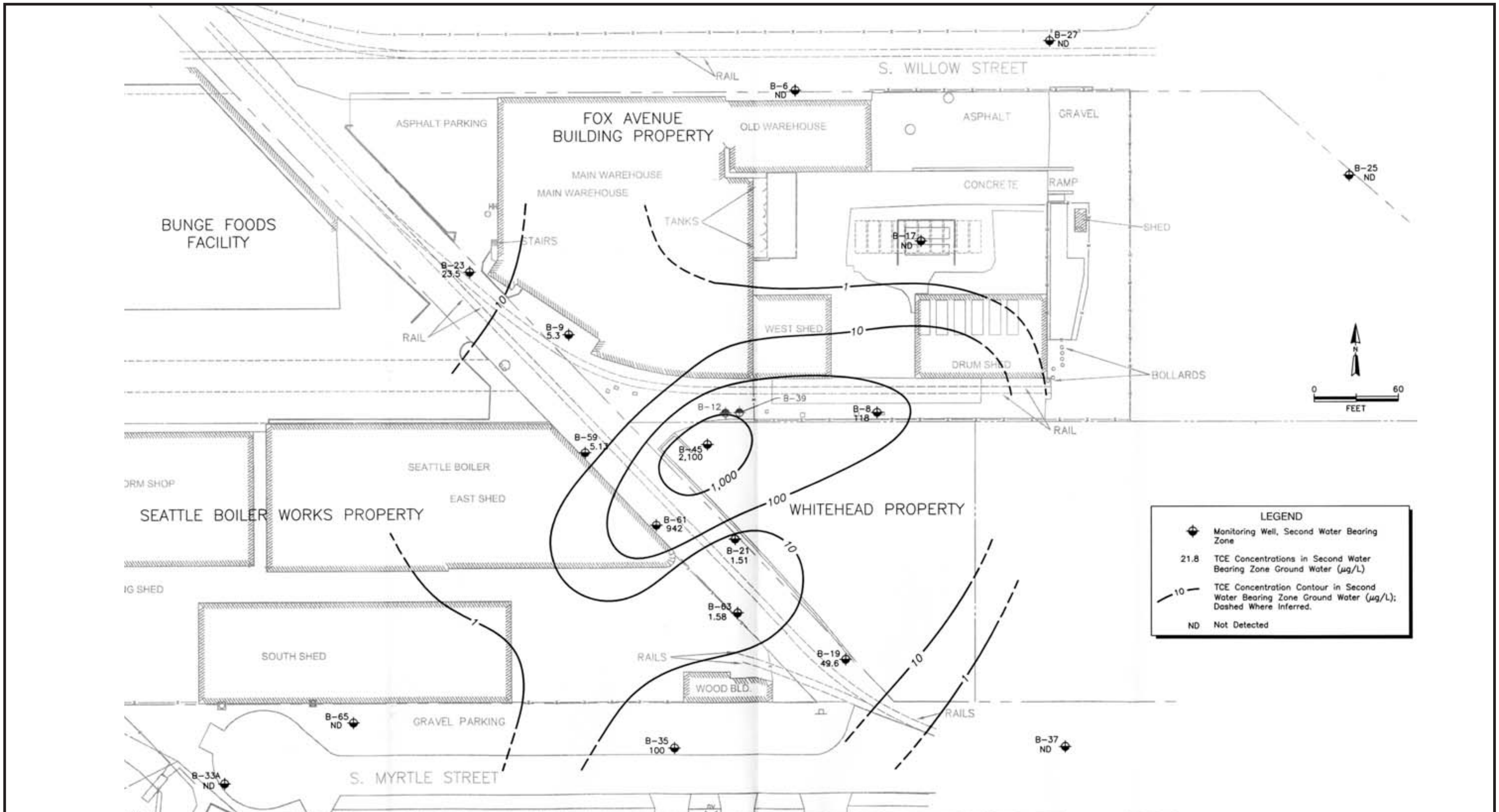
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 53
VC IN 1st WBZ GROUNDWATER (FOX AVENUE PILOT STUDY) - CASCADE COLUMBIA DISTRIBUTION

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig53



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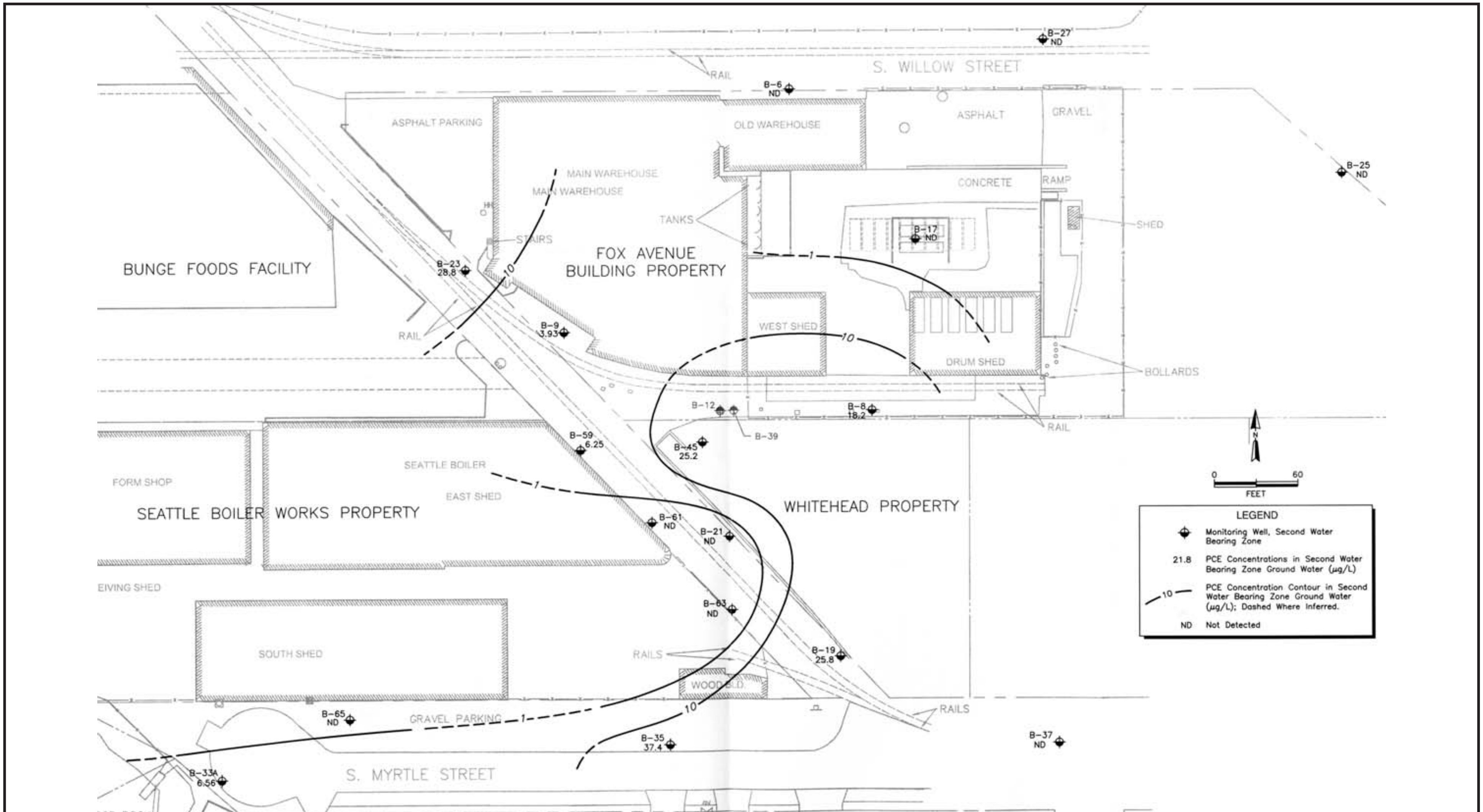
Environmental Resources Management (ERM), 2003.

LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 54
TCE IN 2nd WBZ GROUNDWATER (FOX AVENUE PILOT STUDY) - CASCADE COLUMBIA DISTRIBUTION

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig54



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Base Map Reference:
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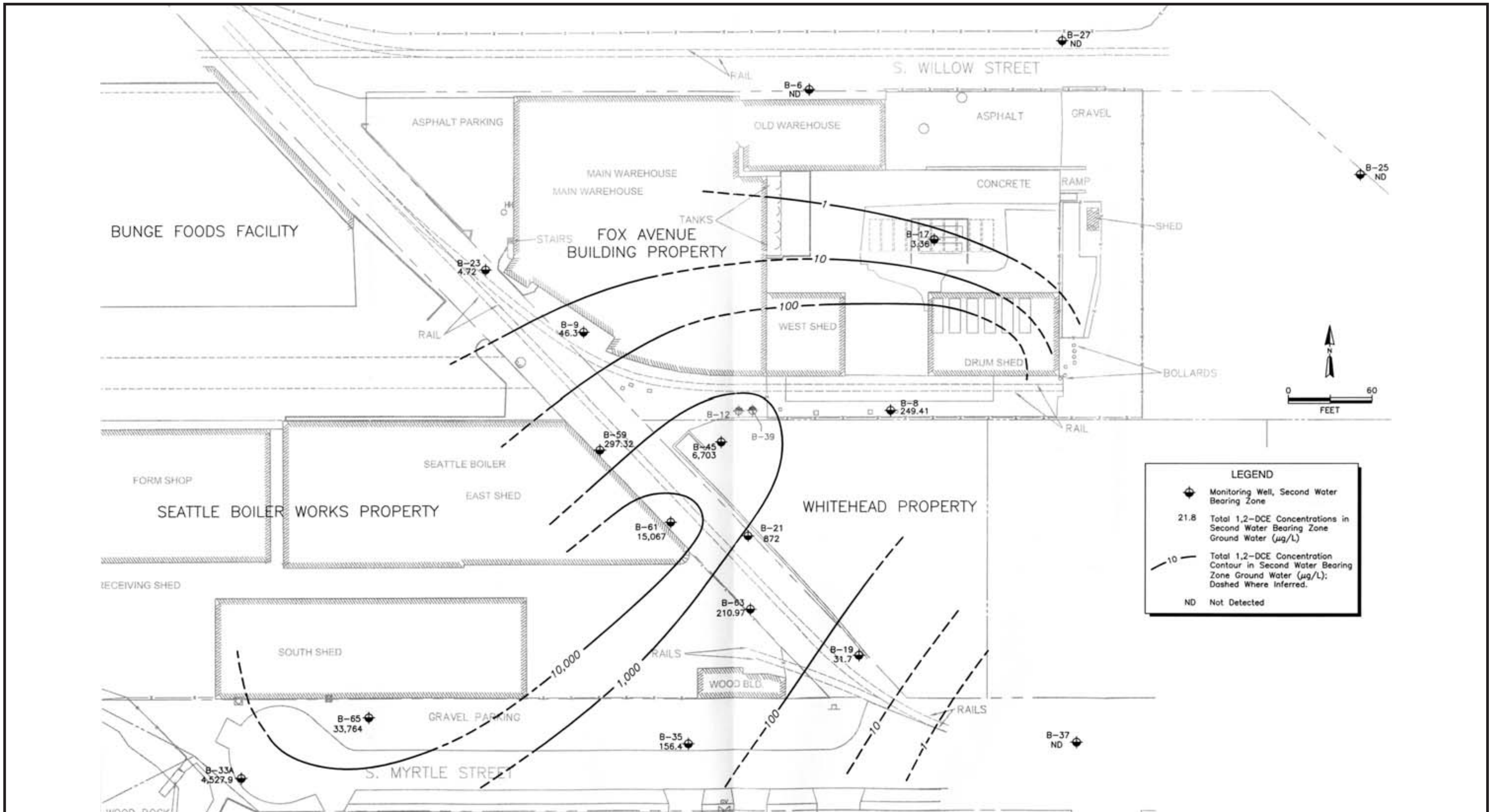
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 55
PCE IN 2nd WBZ GROUNDWATER (FOX AVENUE PILOT STUDY) - CASCADE COLUMBIA DISTRIBUTION

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig55



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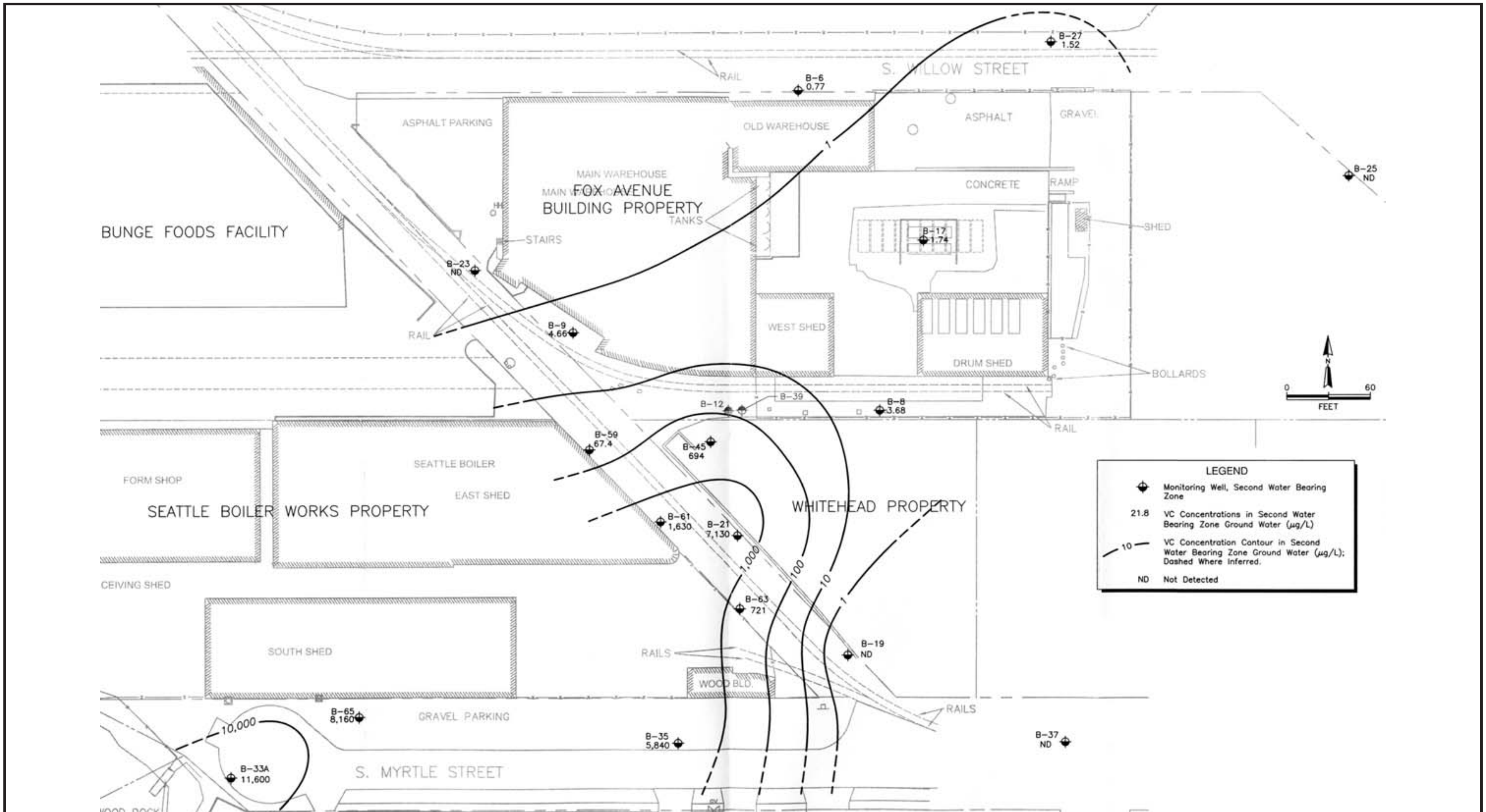
LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 56
1,2-DCE IN 2nd WBZ GROUNDWATER (FOX AVENUE PILOT STUDY) - CASCADE COLUMBIA DISTRIBUTION

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig56



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LOWER DUWAMISH WATERWAY
RM 2.0-2.3 EAST
Seattle, Washington

Figure 57
VC IN 2nd WBZ GROUNDWATER (FOX AVENUE PILOT STUDY) - CASCADE COLUMBIA DISTRIBUTION

Date:	Drawn by:	
5/21/08	AES	10:002330WD1403\fig57

Appendix A

RM 2.0-2.3 East Sediment Sampling Data

Table A-1
Contaminants Detected in Surface Sediment
RM 2.0-2.3 East

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR111	2.1	EPA SI	8/19/1998	1,2,3,4,6,7,8-HpCDD	0.00041	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	1,2,3,4,6,7,8-HpCDD	0.00026	mg/kg dw		1.3						
DR111	2.1	EPA SI	8/19/1998	1,2,3,4,6,7,8-HpCDF	0.000054	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	1,2,3,4,6,7,8-HpCDF	0.000025	mg/kg dw		1.3						
DR111	2.1	EPA SI	8/19/1998	1,2,3,4,7,8,9-HpCDF	0.0000051	mg/kg dw	J	2.26						
DR111	2.1	EPA SI	8/19/1998	1,2,3,4,7,8-HxCDF	0.0000061	mg/kg dw	J	2.26						
DR111	2.1	EPA SI	8/19/1998	1,2,3,6,7,8-HxCDD	0.000016	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	1,2,3,6,7,8-HxCDD	0.0000086	mg/kg dw		1.3						
DR111	2.1	EPA SI	8/19/1998	1,2,3,7,8,9-HxCDD	0.0000091	mg/kg dw	J	2.26						
DR115	2.3	EPA SI	9/14/1998	1,2,3,7,8,9-HxCDD	0.0000069	mg/kg dw	J	1.3						
B6b	2.2	LDWRI-Benthic	9/18/2004	1-Methylnaphthalene	0.0057	mg/kg dw		2.96						
DR111	2.1	EPA SI	8/19/1998	2,3,7,8-TCDF	0.0000023	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	2,3,7,8-TCDF	0.00000099	mg/kg dw	J	1.3						
B6b	2.2	LDWRI-Benthic	9/18/2004	2,4'-DDT	0.0084	mg/kg dw	JN	2.96						
B6b	2.2	LDWRI-Benthic	9/18/2004	2-Methylnaphthalene	0.0081	mg/kg dw		2.96	0.27	38	64	mg/kg OC	0.0071	0.0042
DR112	2.1	EPA SI	8/19/1998	2-Methylnaphthalene	0.02	mg/kg dw		2.64	0.76	38	64	mg/kg OC	0.02	0.012
DR114	2.3	EPA SI	8/19/1998	2-Methylnaphthalene	0.02	mg/kg dw		2.51	0.8	38	64	mg/kg OC	0.021	0.013
DR148	2.1	EPA SI	8/18/1998	2-Methylnaphthalene	20	ug/kg dw		4.51		670	1400	ug/kg dw	0.03	0.014
B6b	2.2	LDWRI-Benthic	9/18/2004	4,4'-DDD	0.002	mg/kg dw	JN	2.96						
DR111	2.1	EPA SI	8/19/1998	4,4'-DDD	0.067	mg/kg dw	J	2.26						
DR111	2.1	EPA SI	8/19/1998	4,4'-DDE	0.005	mg/kg dw		2.26						
B6b	2.2	LDWRI-Benthic	9/18/2004	4,4'-DDT	0.012	mg/kg dw	JN	2.96						
DR111	2.1	EPA SI	8/19/1998	4,4'-DDT	0.003	mg/kg dw		2.26						
B6b	2.2	LDWRI-Benthic	9/18/2004	4-Methylphenol	6.2	ug/kg dw	J	2.96		670	670	ug/kg dw	0.0093	0.0093
B6b	2.2	LDWRI-Benthic	9/18/2004	Acenaphthene	0.012	mg/kg dw		2.96	0.41	16	57	mg/kg OC	0.026	0.0072
DR107	2.1	EPA SI	8/19/1998	Acenaphthene	0.02	mg/kg dw		2.5	0.8	16	57	mg/kg OC	0.05	0.014
DR109	2.1	EPA SI	9/1/1998	Acenaphthene	0.02	mg/kg dw		2.35	0.85	16	57	mg/kg OC	0.053	0.015
DR110	2.1	EPA SI	8/19/1998	Acenaphthene	0.08	mg/kg dw		2.67	3	16	57	mg/kg OC	0.19	0.053
DR111	2.1	EPA SI	8/19/1998	Acenaphthene	0.03	mg/kg dw		2.26	1.3	16	57	mg/kg OC	0.081	0.023
DR112	2.1	EPA SI	8/19/1998	Acenaphthene	0.05	mg/kg dw		2.64	1.9	16	57	mg/kg OC	0.12	0.033
DR114	2.3	EPA SI	8/19/1998	Acenaphthene	0.02	mg/kg dw		2.51	0.8	16	57	mg/kg OC	0.05	0.014
DR115	2.3	EPA SI	9/14/1998	Acenaphthene	0.03	mg/kg dw		1.3	2.3	16	57	mg/kg OC	0.14	0.04
DR148	2.1	EPA SI	8/18/1998	Acenaphthene	20	ug/kg dw		4.51		500	730	ug/kg dw	0.04	0.027
DR149	2.3	EPA SI	8/19/1998	Acenaphthene	0.09	mg/kg dw		2.01	4.5	16	57	mg/kg OC	0.28	0.079
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Acenaphthene	0.034	mg/kg dw	J	2.57	1.3	16	57	mg/kg OC	0.081	0.023
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Acenaphthene	0.033	mg/kg dw		2.08	1.6	16	57	mg/kg OC	0.1	0.028
B6b	2.2	LDWRI-Benthic	9/18/2004	Acenaphthylene	0.019	mg/kg dw		2.96	0.64	66	66	mg/kg OC	0.0097	0.0097
DR112	2.1	EPA SI	8/19/1998	Acenaphthylene	0.03	mg/kg dw		2.64	1.1	66	66	mg/kg OC	0.017	0.017
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Acenaphthylene	0.045	mg/kg dw		2.08	2.2	66	66	mg/kg OC	0.033	0.033
B6b	2.2	LDWRI-Benthic	9/18/2004	alpha-Chlordane	0.00024	mg/kg dw	JN	2.96						
DR105	2	EPA SI	8/19/1998	Aluminum	19500	mg/kg dw		2.07						
DR107	2.1	EPA SI	8/19/1998	Aluminum	18600	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Aluminum	19800	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Aluminum	26400	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Aluminum	19300	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Aluminum	18000	mg/kg dw		2.26						
DR112	2.1	EPA SI	8/19/1998	Aluminum	19400	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Aluminum	19100	mg/kg dw		2.51						
DR115	2.3	EPA SI	9/14/1998	Aluminum	18100	mg/kg dw		1.3						

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR148	2.1	EPA SI	8/18/1998	Aluminum	20400	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Aluminum	18800	mg/kg dw		2.01						
B6b	2.2	LDWRI-Benthic	9/18/2004	Aniline	0.013	mg/kg dw	J	2.96						
B6b	2.2	LDWRI-Benthic	9/18/2004	Anthracene	0.073	mg/kg dw		2.96	2.5	220	1200	mg/kg OC	0.011	0.0021
DR105	2	EPA SI	8/19/1998	Anthracene	0.04	mg/kg dw		2.07	1.9	220	1200	mg/kg OC	0.0086	0.0016
DR107	2.1	EPA SI	8/19/1998	Anthracene	0.18	mg/kg dw		2.5	7.2	220	1200	mg/kg OC	0.033	0.006
DR108	2.1	EPA SI	8/19/1998	Anthracene	0.1	mg/kg dw		2.33	4.3	220	1200	mg/kg OC	0.02	0.0036
DR109	2.1	EPA SI	9/1/1998	Anthracene	0.08	mg/kg dw		2.35	3.4	220	1200	mg/kg OC	0.015	0.0028
DR110	2.1	EPA SI	8/19/1998	Anthracene	0.14	mg/kg dw		2.67	5.2	220	1200	mg/kg OC	0.024	0.0043
DR111	2.1	EPA SI	8/19/1998	Anthracene	0.08	mg/kg dw		2.26	3.5	220	1200	mg/kg OC	0.016	0.0029
DR112	2.1	EPA SI	8/19/1998	Anthracene	0.32	mg/kg dw		2.64	12	220	1200	mg/kg OC	0.055	0.01
DR114	2.3	EPA SI	8/19/1998	Anthracene	0.4	mg/kg dw		2.51	16	220	1200	mg/kg OC	0.073	0.013
DR115	2.3	EPA SI	9/14/1998	Anthracene	0.1	mg/kg dw		1.3	7.7	220	1200	mg/kg OC	0.035	0.0064
DR148	2.1	EPA SI	8/18/1998	Anthracene	30	ug/kg dw		4.51		960	4400	ug/kg dw	0.031	0.0068
DR149	2.3	EPA SI	8/19/1998	Anthracene	0.22	mg/kg dw		2.01	11	220	1200	mg/kg OC	0.05	0.0092
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Anthracene	0.036	mg/kg dw	J	0.972	3.7	220	1200	mg/kg OC	0.017	0.0031
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Anthracene	0.29	mg/kg dw		2.57	11	220	1200	mg/kg OC	0.05	0.0092
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Anthracene	0.12	mg/kg dw		2.43	4.9	220	1200	mg/kg OC	0.022	0.0041
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Anthracene	0.21	mg/kg dw		2.08	10	220	1200	mg/kg OC	0.045	0.0083
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Anthracene	0.059	mg/kg dw	J	2.55	2.3	220	1200	mg/kg OC	0.01	0.0019
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Anthracene	0.043	mg/kg dw		2.47	1.7	220	1200	mg/kg OC	0.0077	0.0014
B6b	2.2	LDWRI-Benthic	9/18/2004	Antimony	0.72	mg/kg dw	J	2.96						
DR108	2.1	EPA SI	8/19/1998	Antimony	6	mg/kg dw	J	2.33						
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Antimony	0.6	mg/kg dw	J	1.46						
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Antimony	3	mg/kg dw		2.08						
B6b	2.2	LDWRI-Benthic	9/18/2004	Arsenic	13.6	mg/kg dw	J	2.96		57	93	mg/kg dw	0.24	0.15
DR105	2	EPA SI	8/19/1998	Arsenic	9.1	mg/kg dw		2.07		57	93	mg/kg dw	0.16	0.098
DR107	2.1	EPA SI	8/19/1998	Arsenic	23.1	mg/kg dw		2.5		57	93	mg/kg dw	0.41	0.25
DR108	2.1	EPA SI	8/19/1998	Arsenic	21.4	mg/kg dw		2.33		57	93	mg/kg dw	0.38	0.23
DR109	2.1	EPA SI	9/1/1998	Arsenic	14.3	mg/kg dw		2.35		57	93	mg/kg dw	0.25	0.15
DR110	2.1	EPA SI	8/19/1998	Arsenic	13.9	mg/kg dw		2.67		57	93	mg/kg dw	0.24	0.15
DR111	2.1	EPA SI	8/19/1998	Arsenic	16.5	mg/kg dw		2.26		57	93	mg/kg dw	0.29	0.18
DR112	2.1	EPA SI	8/19/1998	Arsenic	11.8	mg/kg dw		2.64		57	93	mg/kg dw	0.21	0.13
DR114	2.3	EPA SI	8/19/1998	Arsenic	13.2	mg/kg dw		2.51		57	93	mg/kg dw	0.23	0.14
DR115	2.3	EPA SI	9/14/1998	Arsenic	8.2	mg/kg dw		1.3		57	93	mg/kg dw	0.14	0.088
DR148	2.1	EPA SI	8/18/1998	Arsenic	12.4	mg/kg dw		4.51		57	93	mg/kg dw	0.22	0.13
DR149	2.3	EPA SI	8/19/1998	Arsenic	10.8	mg/kg dw		2.01		57	93	mg/kg dw	0.19	0.12
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Arsenic	8.4	mg/kg dw		0.972		57	93	mg/kg dw	0.15	0.09
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Arsenic	8.9	mg/kg dw		1.59		57	93	mg/kg dw	0.16	0.096
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Arsenic	23.1	mg/kg dw		2.57		57	93	mg/kg dw	0.41	0.25
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Arsenic	17.5	mg/kg dw		2.43		57	93	mg/kg dw	0.31	0.19
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Arsenic	47.3	mg/kg dw		1.46		57	93	mg/kg dw	0.83	0.51
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Arsenic	14.5	mg/kg dw		2.17		57	93	mg/kg dw	0.25	0.16
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Arsenic	80.9	mg/kg dw		2.08		57	93	mg/kg dw	1.4	0.87
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Arsenic	14	mg/kg dw		2.55		57	93	mg/kg dw	0.25	0.15
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Arsenic	18.1	mg/kg dw		2.47		57	93	mg/kg dw	0.32	0.19
DR105	2	EPA SI	8/19/1998	Barium	80	mg/kg dw		2.07						
DR107	2.1	EPA SI	8/19/1998	Barium	77	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Barium	78	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Barium	93	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Barium	79	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Barium	78	mg/kg dw		2.26						
DR112	2.1	EPA SI	8/19/1998	Barium	82	mg/kg dw		2.64						

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR114	2.3	EPA SI	8/19/1998	Barium	80	mg/kg dw		2.51						
DR115	2.3	EPA SI	9/14/1998	Barium	77	mg/kg dw		1.3						
DR148	2.1	EPA SI	8/18/1998	Barium	84	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Barium	66	mg/kg dw		2.01						
B6b	2.2	LDWRI-Benthic	9/18/2004	Benzo(a)anthracene	0.17	mg/kg dw		2.96	5.7	110	270	mg/kg OC	0.052	0.021
DR105	2	EPA SI	8/19/1998	Benzo(a)anthracene	0.19	mg/kg dw		2.07	9.2	110	270	mg/kg OC	0.084	0.034
DR107	2.1	EPA SI	8/19/1998	Benzo(a)anthracene	0.45	mg/kg dw		2.5	18	110	270	mg/kg OC	0.16	0.067
DR108	2.1	EPA SI	8/19/1998	Benzo(a)anthracene	0.38	mg/kg dw		2.33	16	110	270	mg/kg OC	0.15	0.059
DR109	2.1	EPA SI	9/1/1998	Benzo(a)anthracene	0.34	mg/kg dw		2.35	14	110	270	mg/kg OC	0.13	0.052
DR110	2.1	EPA SI	8/19/1998	Benzo(a)anthracene	0.46	mg/kg dw		2.67	17	110	270	mg/kg OC	0.15	0.063
DR111	2.1	EPA SI	8/19/1998	Benzo(a)anthracene	0.48	mg/kg dw	J	2.26	21	110	270	mg/kg OC	0.19	0.078
DR112	2.1	EPA SI	8/19/1998	Benzo(a)anthracene	1.1	mg/kg dw		2.64	42	110	270	mg/kg OC	0.38	0.16
DR114	2.3	EPA SI	8/19/1998	Benzo(a)anthracene	0.35	mg/kg dw		2.51	14	110	270	mg/kg OC	0.13	0.052
DR115	2.3	EPA SI	9/14/1998	Benzo(a)anthracene	0.38	mg/kg dw		1.3	29	110	270	mg/kg OC	0.26	0.11
DR148	2.1	EPA SI	8/18/1998	Benzo(a)anthracene	60	ug/kg dw		4.51		1300	1600	ug/kg dw	0.046	0.038
DR149	2.3	EPA SI	8/19/1998	Benzo(a)anthracene	0.6	mg/kg dw		2.01	30	110	270	mg/kg OC	0.27	0.11
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(a)anthracene	0.097	mg/kg dw		0.972	10	110	270	mg/kg OC	0.091	0.037
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(a)anthracene	0.049	mg/kg dw	J	1.59	3.1	110	270	mg/kg OC	0.028	0.011
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(a)anthracene	0.5	mg/kg dw		2.57	19	110	270	mg/kg OC	0.17	0.07
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(a)anthracene	0.39	mg/kg dw		2.43	16	110	270	mg/kg OC	0.15	0.059
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(a)anthracene	0.077	mg/kg dw	J	1.46	5.3	110	270	mg/kg OC	0.048	0.02
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Benzo(a)anthracene	0.068	mg/kg dw		2.17	3.1	110	270	mg/kg OC	0.028	0.011
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Benzo(a)anthracene	0.63	mg/kg dw		2.08	30	110	270	mg/kg OC	0.27	0.11
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(a)anthracene	0.21	mg/kg dw		2.55	8.2	110	270	mg/kg OC	0.075	0.03
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Benzo(a)anthracene	0.16	mg/kg dw		2.47	6.5	110	270	mg/kg OC	0.059	0.024
B6b	2.2	LDWRI-Benthic	9/18/2004	Benzo(a)pyrene	0.16	mg/kg dw		2.96	5.4	99	210	mg/kg OC	0.055	0.026
DR105	2	EPA SI	8/19/1998	Benzo(a)pyrene	0.24	mg/kg dw		2.07	12	99	210	mg/kg OC	0.12	0.057
DR107	2.1	EPA SI	8/19/1998	Benzo(a)pyrene	0.44	mg/kg dw		2.5	18	99	210	mg/kg OC	0.18	0.086
DR108	2.1	EPA SI	8/19/1998	Benzo(a)pyrene	0.41	mg/kg dw		2.33	18	99	210	mg/kg OC	0.18	0.086
DR109	2.1	EPA SI	9/1/1998	Benzo(a)pyrene	0.34	mg/kg dw		2.35	14	99	210	mg/kg OC	0.14	0.067
DR110	2.1	EPA SI	8/19/1998	Benzo(a)pyrene	0.45	mg/kg dw		2.67	17	99	210	mg/kg OC	0.17	0.081
DR111	2.1	EPA SI	8/19/1998	Benzo(a)pyrene	0.46	mg/kg dw	J	2.26	20	99	210	mg/kg OC	0.2	0.095
DR112	2.1	EPA SI	8/19/1998	Benzo(a)pyrene	0.79	mg/kg dw		2.64	30	99	210	mg/kg OC	0.3	0.14
DR114	2.3	EPA SI	8/19/1998	Benzo(a)pyrene	0.28	mg/kg dw		2.51	11	99	210	mg/kg OC	0.11	0.052
DR115	2.3	EPA SI	9/14/1998	Benzo(a)pyrene	0.36	mg/kg dw		1.3	28	99	210	mg/kg OC	0.28	0.13
DR148	2.1	EPA SI	8/18/1998	Benzo(a)pyrene	60	ug/kg dw		4.51		1600	3000	ug/kg dw	0.038	0.02
DR149	2.3	EPA SI	8/19/1998	Benzo(a)pyrene	0.39	mg/kg dw		2.01	19	99	210	mg/kg OC	0.19	0.09
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(a)pyrene	0.097	mg/kg dw		0.972	10	99	210	mg/kg OC	0.1	0.048
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(a)pyrene	0.063	mg/kg dw		1.59	4	99	210	mg/kg OC	0.04	0.019
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(a)pyrene	0.52	mg/kg dw		2.57	20	99	210	mg/kg OC	0.2	0.095
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(a)pyrene	0.52	mg/kg dw		2.43	21	99	210	mg/kg OC	0.21	0.1
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(a)pyrene	0.1	mg/kg dw		1.46	6.8	99	210	mg/kg OC	0.069	0.032
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Benzo(a)pyrene	0.08	mg/kg dw		2.17	3.7	99	210	mg/kg OC	0.037	0.018
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Benzo(a)pyrene	0.64	mg/kg dw		2.08	31	99	210	mg/kg OC	0.31	0.15
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(a)pyrene	0.26	mg/kg dw		2.55	10	99	210	mg/kg OC	0.1	0.048
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Benzo(a)pyrene	0.18	mg/kg dw		2.47	7.3	99	210	mg/kg OC	0.074	0.035
B6b	2.2	LDWRI-Benthic	9/18/2004	Benzo(b)fluoranthene	0.19	mg/kg dw		2.96						
DR105	2	EPA SI	8/19/1998	Benzo(b)fluoranthene	0.27	mg/kg dw		2.07						
DR107	2.1	EPA SI	8/19/1998	Benzo(b)fluoranthene	0.59	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Benzo(b)fluoranthene	0.55	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Benzo(b)fluoranthene	0.46	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Benzo(b)fluoranthene	0.6	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Benzo(b)fluoranthene	0.62	mg/kg dw	J	2.26						

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR112	2.1	EPA SI	8/19/1998	Benzo(b)fluoranthene	1.3	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Benzo(b)fluoranthene	0.33	mg/kg dw		2.51						
DR115	2.3	EPA SI	9/14/1998	Benzo(b)fluoranthene	0.41	mg/kg dw		1.3						
DR148	2.1	EPA SI	8/18/1998	Benzo(b)fluoranthene	0.07	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Benzo(b)fluoranthene	0.48	mg/kg dw		2.01						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(b)fluoranthene	0.11	mg/kg dw		0.972						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(b)fluoranthene	0.1	mg/kg dw		1.59						
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(b)fluoranthene	0.77	mg/kg dw		2.57						
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(b)fluoranthene	0.88	mg/kg dw		2.43						
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(b)fluoranthene	0.13	mg/kg dw		1.46						
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Benzo(b)fluoranthene	0.12	mg/kg dw		2.17						
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Benzo(b)fluoranthene	1.1	mg/kg dw		2.08						
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(b)fluoranthene	0.38	mg/kg dw		2.55						
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Benzo(b)fluoranthene	0.27	mg/kg dw		2.47						
B6b	2.2	LDWRI-Benthic	9/18/2004	Benzo(e)pyrene	0.15	mg/kg dw		2.96						
B6b	2.2	LDWRI-Benthic	9/18/2004	Benzo(g,h,i)perylene	0.1	mg/kg dw		2.96	3.4	31	78	mg/kg OC	0.11	0.044
DR105	2	EPA SI	8/19/1998	Benzo(g,h,i)perylene	0.16	mg/kg dw		2.07	7.7	31	78	mg/kg OC	0.25	0.099
DR107	2.1	EPA SI	8/19/1998	Benzo(g,h,i)perylene	0.22	mg/kg dw		2.5	8.8	31	78	mg/kg OC	0.28	0.11
DR108	2.1	EPA SI	8/19/1998	Benzo(g,h,i)perylene	0.22	mg/kg dw		2.33	9.4	31	78	mg/kg OC	0.3	0.12
DR109	2.1	EPA SI	9/1/1998	Benzo(g,h,i)perylene	0.23	mg/kg dw		2.35	9.8	31	78	mg/kg OC	0.32	0.13
DR110	2.1	EPA SI	8/19/1998	Benzo(g,h,i)perylene	0.21	mg/kg dw		2.67	7.9	31	78	mg/kg OC	0.25	0.1
DR111	2.1	EPA SI	8/19/1998	Benzo(g,h,i)perylene	0.22	mg/kg dw	J	2.26	9.7	31	78	mg/kg OC	0.31	0.12
DR112	2.1	EPA SI	8/19/1998	Benzo(g,h,i)perylene	0.35	mg/kg dw		2.64	13	31	78	mg/kg OC	0.42	0.17
DR114	2.3	EPA SI	8/19/1998	Benzo(g,h,i)perylene	0.14	mg/kg dw		2.51	5.6	31	78	mg/kg OC	0.18	0.072
DR115	2.3	EPA SI	9/14/1998	Benzo(g,h,i)perylene	0.17	mg/kg dw		1.3	13	31	78	mg/kg OC	0.42	0.17
DR148	2.1	EPA SI	8/18/1998	Benzo(g,h,i)perylene	40	ug/kg dw		4.51		670	720	ug/kg dw	0.06	0.056
DR149	2.3	EPA SI	8/19/1998	Benzo(g,h,i)perylene	0.18	mg/kg dw		2.01	9	31	78	mg/kg OC	0.29	0.12
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(g,h,i)perylene	0.068	mg/kg dw		0.972	7	31	78	mg/kg OC	0.23	0.09
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(g,h,i)perylene	0.053	mg/kg dw	J	1.59	3.3	31	78	mg/kg OC	0.11	0.042
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(g,h,i)perylene	0.28	mg/kg dw		2.57	11	31	78	mg/kg OC	0.35	0.14
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(g,h,i)perylene	0.17	mg/kg dw		2.43	7	31	78	mg/kg OC	0.23	0.09
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Benzo(g,h,i)perylene	0.028	mg/kg dw		2.17	1.3	31	78	mg/kg OC	0.042	0.017
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Benzo(g,h,i)perylene	0.16	mg/kg dw		2.08	7.7	31	78	mg/kg OC	0.25	0.099
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(g,h,i)perylene	0.094	mg/kg dw	J	2.55	3.7	31	78	mg/kg OC	0.12	0.047
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Benzo(g,h,i)perylene	0.095	mg/kg dw		2.47	3.8	31	78	mg/kg OC	0.12	0.049
B6b	2.2	LDWRI-Benthic	9/18/2004	Benzo(k)fluoranthene	0.18	mg/kg dw		2.96						
DR105	2	EPA SI	8/19/1998	Benzo(k)fluoranthene	0.22	mg/kg dw		2.07						
DR107	2.1	EPA SI	8/19/1998	Benzo(k)fluoranthene	0.38	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Benzo(k)fluoranthene	0.36	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Benzo(k)fluoranthene	0.33	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Benzo(k)fluoranthene	0.39	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Benzo(k)fluoranthene	0.45	mg/kg dw	J	2.26						
DR112	2.1	EPA SI	8/19/1998	Benzo(k)fluoranthene	0.8	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Benzo(k)fluoranthene	0.32	mg/kg dw		2.51						
DR115	2.3	EPA SI	9/14/1998	Benzo(k)fluoranthene	0.38	mg/kg dw		1.3						
DR148	2.1	EPA SI	8/18/1998	Benzo(k)fluoranthene	0.06	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Benzo(k)fluoranthene	0.43	mg/kg dw		2.01						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(k)fluoranthene	0.099	mg/kg dw		0.972						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(k)fluoranthene	0.059	mg/kg dw	J	1.59						
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzo(k)fluoranthene	0.45	mg/kg dw		2.57						
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(k)fluoranthene	0.41	mg/kg dw		2.43						
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(k)fluoranthene	0.12	mg/kg dw		1.46						
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Benzo(k)fluoranthene	0.07	mg/kg dw		2.17						

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Benzo(k)fluoranthene	0.57	mg/kg dw		2.08						
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzo(k)fluoranthene	0.24	mg/kg dw		2.55						
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Benzo(k)fluoranthene	0.17	mg/kg dw		2.47						
B6b	2.2	LDWRI-Benthic	9/18/2004	Benzofluoranthenes (total-calc'd)	0.37	mg/kg dw		2.96	13	230	450	mg/kg OC	0.057	0.029
DR105	2	EPA SI	8/19/1998	Benzofluoranthenes (total-calc'd)	0.49	mg/kg dw		2.07	24	230	450	mg/kg OC	0.1	0.053
DR107	2.1	EPA SI	8/19/1998	Benzofluoranthenes (total-calc'd)	0.97	mg/kg dw		2.5	39	230	450	mg/kg OC	0.17	0.087
DR108	2.1	EPA SI	8/19/1998	Benzofluoranthenes (total-calc'd)	0.91	mg/kg dw		2.33	39	230	450	mg/kg OC	0.17	0.087
DR109	2.1	EPA SI	9/1/1998	Benzofluoranthenes (total-calc'd)	0.79	mg/kg dw		2.35	34	230	450	mg/kg OC	0.15	0.076
DR110	2.1	EPA SI	8/19/1998	Benzofluoranthenes (total-calc'd)	0.99	mg/kg dw		2.67	37	230	450	mg/kg OC	0.16	0.082
DR111	2.1	EPA SI	8/19/1998	Benzofluoranthenes (total-calc'd)	1.07	mg/kg dw	J	2.26	47.3	230	450	mg/kg OC	0.21	0.11
DR112	2.1	EPA SI	8/19/1998	Benzofluoranthenes (total-calc'd)	2.1	mg/kg dw		2.64	80	230	450	mg/kg OC	0.35	0.18
DR114	2.3	EPA SI	8/19/1998	Benzofluoranthenes (total-calc'd)	0.65	mg/kg dw		2.51	26	230	450	mg/kg OC	0.11	0.058
DR115	2.3	EPA SI	9/14/1998	Benzofluoranthenes (total-calc'd)	0.79	mg/kg dw		1.3	61	230	450	mg/kg OC	0.27	0.14
DR148	2.1	EPA SI	8/18/1998	Benzofluoranthenes (total-calc'd)	130	ug/kg dw		4.51		3200	3600	ug/kg dw	0.041	0.036
DR149	2.3	EPA SI	8/19/1998	Benzofluoranthenes (total-calc'd)	0.91	mg/kg dw		2.01	45	230	450	mg/kg OC	0.2	0.1
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzofluoranthenes (total-calc'd)	0.21	mg/kg dw		0.972	22	230	450	mg/kg OC	0.096	0.049
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzofluoranthenes (total-calc'd)	0.16	mg/kg dw	J	1.59	10	230	450	mg/kg OC	0.043	0.022
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Benzofluoranthenes (total-calc'd)	1.22	mg/kg dw		2.57	47.5	230	450	mg/kg OC	0.21	0.11
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzofluoranthenes (total-calc'd)	1.29	mg/kg dw		2.43	53.1	230	450	mg/kg OC	0.23	0.12
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzofluoranthenes (total-calc'd)	0.25	mg/kg dw		1.46	17	230	450	mg/kg OC	0.074	0.038
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Benzofluoranthenes (total-calc'd)	0.19	mg/kg dw		2.17	8.8	230	450	mg/kg OC	0.038	0.02
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Benzofluoranthenes (total-calc'd)	1.7	mg/kg dw		2.08	82	230	450	mg/kg OC	0.36	0.18
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzofluoranthenes (total-calc'd)	0.62	mg/kg dw		2.55	24	230	450	mg/kg OC	0.1	0.053
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Benzofluoranthenes (total-calc'd)	0.44	mg/kg dw		2.47	18	230	450	mg/kg OC	0.078	0.04
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Benzoic acid	66	ug/kg dw		2.17		650	650	ug/kg dw	0.1	0.1
B6b	2.2	LDWRI-Benthic	9/18/2004	Benzyl alcohol	13	ug/kg dw		2.96		57	73	ug/kg dw	0.23	0.18
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Benzyl alcohol	150	ug/kg dw		2.43		57	73	ug/kg dw	2.6	2.1
DR105	2	EPA SI	8/19/1998	Beryllium	0.4	mg/kg dw		2.07						
DR107	2.1	EPA SI	8/19/1998	Beryllium	0.46	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Beryllium	0.49	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Beryllium	0.45	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Beryllium	0.47	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Beryllium	0.45	mg/kg dw		2.26						
DR112	2.1	EPA SI	8/19/1998	Beryllium	0.46	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Beryllium	0.42	mg/kg dw		2.51						
DR115	2.3	EPA SI	9/14/1998	Beryllium	0.33	mg/kg dw	J	1.3						
DR148	2.1	EPA SI	8/18/1998	Beryllium	0.55	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Beryllium	0.4	mg/kg dw		2.01						
B6b	2.2	LDWRI-Benthic	9/18/2004	Biphenyl	0.0038	mg/kg dw	J	2.96						
B6b	2.2	LDWRI-Benthic	9/18/2004	Bis(2-ethylhexyl)phthalate	0.16	mg/kg dw	J	2.96	5.4	47	78	mg/kg OC	0.11	0.069
DR105	2	EPA SI	8/19/1998	Bis(2-ethylhexyl)phthalate	0.37	mg/kg dw		2.07	18	47	78	mg/kg OC	0.38	0.23
DR107	2.1	EPA SI	8/19/1998	Bis(2-ethylhexyl)phthalate	0.42	mg/kg dw		2.5	17	47	78	mg/kg OC	0.36	0.22
DR108	2.1	EPA SI	8/19/1998	Bis(2-ethylhexyl)phthalate	0.4	mg/kg dw		2.33	17	47	78	mg/kg OC	0.36	0.22
DR109	2.1	EPA SI	9/1/1998	Bis(2-ethylhexyl)phthalate	0.41	mg/kg dw		2.35	17	47	78	mg/kg OC	0.36	0.22
DR110	2.1	EPA SI	8/19/1998	Bis(2-ethylhexyl)phthalate	0.52	mg/kg dw		2.67	19	47	78	mg/kg OC	0.4	0.24
DR111	2.1	EPA SI	8/19/1998	Bis(2-ethylhexyl)phthalate	0.41	mg/kg dw		2.26	18	47	78	mg/kg OC	0.38	0.23
DR112	2.1	EPA SI	8/19/1998	Bis(2-ethylhexyl)phthalate	0.44	mg/kg dw		2.64	17	47	78	mg/kg OC	0.36	0.22
DR114	2.3	EPA SI	8/19/1998	Bis(2-ethylhexyl)phthalate	0.33	mg/kg dw		2.51	13	47	78	mg/kg OC	0.28	0.17
DR148	2.1	EPA SI	8/18/1998	Bis(2-ethylhexyl)phthalate	100	ug/kg dw		4.51		1300	1900	ug/kg dw	0.077	0.053
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Bis(2-ethylhexyl)phthalate	0.14	mg/kg dw		0.972	14	47	78	mg/kg OC	0.3	0.18
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Bis(2-ethylhexyl)phthalate	0.18	mg/kg dw		1.59	11	47	78	mg/kg OC	0.23	0.14
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Bis(2-ethylhexyl)phthalate	0.31	mg/kg dw		2.57	12	47	78	mg/kg OC	0.26	0.15
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Bis(2-ethylhexyl)phthalate	0.37	mg/kg dw		2.43	15	47	78	mg/kg OC	0.32	0.19

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Bis(2-ethylhexyl)phthalate	0.12	mg/kg dw		1.46	8.2	47	78	mg/kg OC	0.17	0.11
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Bis(2-ethylhexyl)phthalate	0.059	mg/kg dw		2.17	2.7	47	78	mg/kg OC	0.057	0.035
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Bis(2-ethylhexyl)phthalate	0.2	mg/kg dw		2.08	9.6	47	78	mg/kg OC	0.2	0.12
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Bis(2-ethylhexyl)phthalate	0.26	mg/kg dw		2.55	10	47	78	mg/kg OC	0.21	0.13
B6b	2.2	LDWRI-Benthic	9/18/2004	Butyl benzyl phthalate	0.023	mg/kg dw		2.96	0.78	4.9	64	mg/kg OC	0.16	0.012
DR105	2	EPA SI	8/19/1998	Butyl benzyl phthalate	0.03	mg/kg dw		2.07	1.4	4.9	64	mg/kg OC	0.29	0.022
DR107	2.1	EPA SI	8/19/1998	Butyl benzyl phthalate	0.03	mg/kg dw		2.5	1.2	4.9	64	mg/kg OC	0.24	0.019
DR108	2.1	EPA SI	8/19/1998	Butyl benzyl phthalate	0.04	mg/kg dw		2.33	1.7	4.9	64	mg/kg OC	0.35	0.027
DR109	2.1	EPA SI	9/1/1998	Butyl benzyl phthalate	0.03	mg/kg dw		2.35	1.3	4.9	64	mg/kg OC	0.27	0.02
DR110	2.1	EPA SI	8/19/1998	Butyl benzyl phthalate	0.03	mg/kg dw		2.67	1.1	4.9	64	mg/kg OC	0.22	0.017
DR111	2.1	EPA SI	8/19/1998	Butyl benzyl phthalate	0.03	mg/kg dw		2.26	1.3	4.9	64	mg/kg OC	0.27	0.02
DR112	2.1	EPA SI	8/19/1998	Butyl benzyl phthalate	0.03	mg/kg dw		2.64	1.1	4.9	64	mg/kg OC	0.22	0.017
DR114	2.3	EPA SI	8/19/1998	Butyl benzyl phthalate	0.02	mg/kg dw		2.51	0.8	4.9	64	mg/kg OC	0.16	0.013
DR115	2.3	EPA SI	9/14/1998	Butyl benzyl phthalate	0.03	mg/kg dw		1.3	2.3	4.9	64	mg/kg OC	0.47	0.036
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Butyl benzyl phthalate	0.012	mg/kg dw		0.972	1.2	4.9	64	mg/kg OC	0.24	0.019
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Butyl benzyl phthalate	0.012	mg/kg dw		1.59	0.75	4.9	64	mg/kg OC	0.15	0.012
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Butyl benzyl phthalate	0.044	mg/kg dw		2.57	1.7	4.9	64	mg/kg OC	0.35	0.027
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Butyl benzyl phthalate	0.0099	mg/kg dw		2.17	0.46	4.9	64	mg/kg OC	0.094	0.0072
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Butyl benzyl phthalate	0.024	mg/kg dw		2.08	1.2	4.9	64	mg/kg OC	0.24	0.019
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Butyl benzyl phthalate	0.042	mg/kg dw		2.47	1.7	4.9	64	mg/kg OC	0.35	0.027
B6b	2.2	LDWRI-Benthic	9/18/2004	Cadmium	0.492	mg/kg dw		2.96		5.1	6.7	mg/kg dw	0.096	0.073
DR105	2	EPA SI	8/19/1998	Cadmium	0.4	mg/kg dw		2.07		5.1	6.7	mg/kg dw	0.078	0.06
DR107	2.1	EPA SI	8/19/1998	Cadmium	0.38	mg/kg dw		2.5		5.1	6.7	mg/kg dw	0.075	0.057
DR108	2.1	EPA SI	8/19/1998	Cadmium	0.39	mg/kg dw		2.33		5.1	6.7	mg/kg dw	0.076	0.058
DR109	2.1	EPA SI	9/1/1998	Cadmium	0.48	mg/kg dw		2.35		5.1	6.7	mg/kg dw	0.094	0.072
DR110	2.1	EPA SI	8/19/1998	Cadmium	0.42	mg/kg dw		2.67		5.1	6.7	mg/kg dw	0.082	0.063
DR111	2.1	EPA SI	8/19/1998	Cadmium	0.48	mg/kg dw		2.26		5.1	6.7	mg/kg dw	0.094	0.072
DR112	2.1	EPA SI	8/19/1998	Cadmium	0.36	mg/kg dw		2.64		5.1	6.7	mg/kg dw	0.071	0.054
DR114	2.3	EPA SI	8/19/1998	Cadmium	0.6	mg/kg dw		2.51		5.1	6.7	mg/kg dw	0.12	0.09
DR115	2.3	EPA SI	9/14/1998	Cadmium	0.2	mg/kg dw		1.3		5.1	6.7	mg/kg dw	0.039	0.03
DR148	2.1	EPA SI	8/18/1998	Cadmium	0.5	mg/kg dw		4.51		5.1	6.7	mg/kg dw	0.098	0.075
DR149	2.3	EPA SI	8/19/1998	Cadmium	0.4	mg/kg dw		2.01		5.1	6.7	mg/kg dw	0.078	0.06
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Cadmium	0.4	mg/kg dw		2.43		5.1	6.7	mg/kg dw	0.078	0.06
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Cadmium	0.5	mg/kg dw		1.46		5.1	6.7	mg/kg dw	0.098	0.075
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Cadmium	0.4	mg/kg dw		2.08		5.1	6.7	mg/kg dw	0.078	0.06
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Cadmium	0.7	mg/kg dw		2.55		5.1	6.7	mg/kg dw	0.14	0.1
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Cadmium	0.7	mg/kg dw		2.47		5.1	6.7	mg/kg dw	0.14	0.1
B6b	2.2	LDWRI-Benthic	9/18/2004	Carbazole	0.041	mg/kg dw		2.96						
DR105	2	EPA SI	8/19/1998	Carbazole	0.02	mg/kg dw		2.07						
DR107	2.1	EPA SI	8/19/1998	Carbazole	0.05	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Carbazole	0.03	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Carbazole	0.03	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Carbazole	0.04	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Carbazole	0.02	mg/kg dw		2.26						
DR112	2.1	EPA SI	8/19/1998	Carbazole	0.1	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Carbazole	0.1	mg/kg dw		2.51						
DR115	2.3	EPA SI	9/14/1998	Carbazole	0.03	mg/kg dw		1.3						
DR149	2.3	EPA SI	8/19/1998	Carbazole	0.04	mg/kg dw		2.01						
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Carbazole	0.073	mg/kg dw		2.08						
DR111	2.1	EPA SI	8/19/1998	Carbon disulfide	0.0012	mg/kg dw	J	2.26						
B6b	2.2	LDWRI-Benthic	9/18/2004	Chromium	33.8	mg/kg dw		2.96		260	270	mg/kg dw	0.13	0.13
DR105	2	EPA SI	8/19/1998	Chromium	33	mg/kg dw		2.07		260	270	mg/kg dw	0.13	0.12
DR107	2.1	EPA SI	8/19/1998	Chromium	27	mg/kg dw		2.5		260	270	mg/kg dw	0.1	0.1

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR108	2.1	EPA SI	8/19/1998	Chromium	28	mg/kg dw		2.33		260	270	mg/kg dw	0.11	0.1
DR109	2.1	EPA SI	9/1/1998	Chromium	38	mg/kg dw		2.35		260	270	mg/kg dw	0.15	0.14
DR110	2.1	EPA SI	8/19/1998	Chromium	29	mg/kg dw		2.67		260	270	mg/kg dw	0.11	0.11
DR111	2.1	EPA SI	8/19/1998	Chromium	26	mg/kg dw		2.26		260	270	mg/kg dw	0.1	0.096
DR112	2.1	EPA SI	8/19/1998	Chromium	27	mg/kg dw		2.64		260	270	mg/kg dw	0.1	0.1
DR114	2.3	EPA SI	8/19/1998	Chromium	26	mg/kg dw		2.51		260	270	mg/kg dw	0.1	0.096
DR115	2.3	EPA SI	9/14/1998	Chromium	29	mg/kg dw		1.3		260	270	mg/kg dw	0.11	0.11
DR148	2.1	EPA SI	8/18/1998	Chromium	30	mg/kg dw		4.51		260	270	mg/kg dw	0.12	0.11
DR149	2.3	EPA SI	8/19/1998	Chromium	26	mg/kg dw		2.01		260	270	mg/kg dw	0.1	0.096
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Chromium	26.5	mg/kg dw		0.972		260	270	mg/kg dw	0.1	0.098
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Chromium	38.8	mg/kg dw		1.59		260	270	mg/kg dw	0.15	0.14
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Chromium	36	mg/kg dw		2.57		260	270	mg/kg dw	0.14	0.13
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Chromium	28.6	mg/kg dw		2.43		260	270	mg/kg dw	0.11	0.11
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Chromium	36.5	mg/kg dw		1.46		260	270	mg/kg dw	0.14	0.14
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Chromium	36	mg/kg dw	J	2.17		260	270	mg/kg dw	0.14	0.13
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Chromium	28.7	mg/kg dw		2.08		260	270	mg/kg dw	0.11	0.11
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Chromium	36	mg/kg dw		2.55		260	270	mg/kg dw	0.14	0.13
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Chromium	35	mg/kg dw		2.47		260	270	mg/kg dw	0.13	0.13
B6b	2.2	LDWRI-Benthic	9/18/2004	Chrysene	0.26	mg/kg dw		2.96	8.8	110	460	mg/kg OC	0.08	0.019
DR105	2	EPA SI	8/19/1998	Chrysene	0.29	mg/kg dw		2.07	14	110	460	mg/kg OC	0.13	0.03
DR107	2.1	EPA SI	8/19/1998	Chrysene	0.59	mg/kg dw		2.5	24	110	460	mg/kg OC	0.22	0.052
DR108	2.1	EPA SI	8/19/1998	Chrysene	0.46	mg/kg dw		2.33	20	110	460	mg/kg OC	0.18	0.043
DR109	2.1	EPA SI	9/1/1998	Chrysene	0.46	mg/kg dw		2.35	20	110	460	mg/kg OC	0.18	0.043
DR110	2.1	EPA SI	8/19/1998	Chrysene	0.57	mg/kg dw		2.67	21	110	460	mg/kg OC	0.19	0.046
DR111	2.1	EPA SI	8/19/1998	Chrysene	0.45	mg/kg dw		2.26	20	110	460	mg/kg OC	0.18	0.043
DR112	2.1	EPA SI	8/19/1998	Chrysene	1.5	mg/kg dw		2.64	57	110	460	mg/kg OC	0.52	0.12
DR114	2.3	EPA SI	8/19/1998	Chrysene	0.43	mg/kg dw		2.51	17	110	460	mg/kg OC	0.15	0.037
DR115	2.3	EPA SI	9/14/1998	Chrysene	0.61	mg/kg dw		1.3	47	110	460	mg/kg OC	0.43	0.1
DR148	2.1	EPA SI	8/18/1998	Chrysene	90	ug/kg dw		4.51		1400	2800	ug/kg dw	0.064	0.032
DR149	2.3	EPA SI	8/19/1998	Chrysene	0.74	mg/kg dw		2.01	37	110	460	mg/kg OC	0.34	0.08
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Chrysene	0.17	mg/kg dw		0.972	17	110	460	mg/kg OC	0.15	0.037
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Chrysene	0.073	mg/kg dw		1.59	4.6	110	460	mg/kg OC	0.042	0.01
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Chrysene	0.81	mg/kg dw		2.57	32	110	460	mg/kg OC	0.29	0.07
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Chrysene	0.71	mg/kg dw		2.43	29	110	460	mg/kg OC	0.26	0.063
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Chrysene	0.12	mg/kg dw		1.46	8.2	110	460	mg/kg OC	0.075	0.018
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Chrysene	0.13	mg/kg dw		2.17	6	110	460	mg/kg OC	0.055	0.013
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Chrysene	0.82	mg/kg dw		2.08	39	110	460	mg/kg OC	0.35	0.085
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Chrysene	0.34	mg/kg dw		2.55	13	110	460	mg/kg OC	0.12	0.028
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Chrysene	0.26	mg/kg dw		2.47	11	110	460	mg/kg OC	0.1	0.024
B6b	2.2	LDWRI-Benthic	9/18/2004	Cobalt	11.2	mg/kg dw		2.96						
DR105	2	EPA SI	8/19/1998	Cobalt	10	mg/kg dw		2.07						
DR107	2.1	EPA SI	8/19/1998	Cobalt	10	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Cobalt	10	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Cobalt	13	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Cobalt	9	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Cobalt	9	mg/kg dw		2.26						
DR112	2.1	EPA SI	8/19/1998	Cobalt	10	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Cobalt	8	mg/kg dw		2.51						
DR115	2.3	EPA SI	9/14/1998	Cobalt	8	mg/kg dw		1.3						
DR148	2.1	EPA SI	8/18/1998	Cobalt	11	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Cobalt	10	mg/kg dw		2.01						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Cobalt	6.1	mg/kg dw		0.972						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Cobalt	6.4	mg/kg dw		1.59						

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Cobalt	10.3	mg/kg dw		2.57						
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Cobalt	8.6	mg/kg dw		2.43						
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Cobalt	7	mg/kg dw		1.46						
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Cobalt	10.8	mg/kg dw		2.17						
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Cobalt	8.4	mg/kg dw		2.08						
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Cobalt	10.8	mg/kg dw		2.55						
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Cobalt	10.7	mg/kg dw		2.47						
B6b	2.2	LDWRI-Benthic	9/18/2004	Copper	80.8	mg/kg dw		2.96		390	390	mg/kg dw	0.21	0.21
DR105	2	EPA SI	8/19/1998	Copper	59	mg/kg dw		2.07		390	390	mg/kg dw	0.15	0.15
DR107	2.1	EPA SI	8/19/1998	Copper	82	mg/kg dw		2.5		390	390	mg/kg dw	0.21	0.21
DR108	2.1	EPA SI	8/19/1998	Copper	84	mg/kg dw		2.33		390	390	mg/kg dw	0.22	0.22
DR109	2.1	EPA SI	9/1/1998	Copper	93	mg/kg dw		2.35		390	390	mg/kg dw	0.24	0.24
DR110	2.1	EPA SI	8/19/1998	Copper	65	mg/kg dw		2.67		390	390	mg/kg dw	0.17	0.17
DR111	2.1	EPA SI	8/19/1998	Copper	62	mg/kg dw		2.26		390	390	mg/kg dw	0.16	0.16
DR112	2.1	EPA SI	8/19/1998	Copper	56	mg/kg dw		2.64		390	390	mg/kg dw	0.14	0.14
DR114	2.3	EPA SI	8/19/1998	Copper	59	mg/kg dw		2.51		390	390	mg/kg dw	0.15	0.15
DR115	2.3	EPA SI	9/14/1998	Copper	83	mg/kg dw		1.3		390	390	mg/kg dw	0.21	0.21
DR148	2.1	EPA SI	8/18/1998	Copper	51	mg/kg dw		4.51		390	390	mg/kg dw	0.13	0.13
DR149	2.3	EPA SI	8/19/1998	Copper	53	mg/kg dw		2.01		390	390	mg/kg dw	0.14	0.14
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Copper	62.9	mg/kg dw		0.972		390	390	mg/kg dw	0.16	0.16
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Copper	41.9	mg/kg dw		1.59		390	390	mg/kg dw	0.11	0.11
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Copper	100	mg/kg dw		2.57		390	390	mg/kg dw	0.26	0.26
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Copper	70.1	mg/kg dw		2.43		390	390	mg/kg dw	0.18	0.18
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Copper	132	mg/kg dw		1.46		390	390	mg/kg dw	0.34	0.34
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Copper	75.3	mg/kg dw		2.17		390	390	mg/kg dw	0.19	0.19
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Copper	98.4	mg/kg dw	J	2.08		390	390	mg/kg dw	0.25	0.25
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Copper	82.8	mg/kg dw		2.55		390	390	mg/kg dw	0.21	0.21
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Copper	89.4	mg/kg dw		2.47		390	390	mg/kg dw	0.23	0.23
B6b	2.2	LDWRI-Benthic	9/18/2004	DDTs (total-calc'd)	0.022	mg/kg dw	JN	2.96						
DR111	2.1	EPA SI	8/19/1998	DDTs (total-calc'd)	0.075	mg/kg dw	J	2.26						
B6b	2.2	LDWRI-Benthic	9/18/2004	Dibenzo(a,h)anthracene	0.024	mg/kg dw		2.96	0.81	12	33	mg/kg OC	0.068	0.025
DR105	2	EPA SI	8/19/1998	Dibenzo(a,h)anthracene	0.04	mg/kg dw		2.07	1.9	12	33	mg/kg OC	0.16	0.058
DR107	2.1	EPA SI	8/19/1998	Dibenzo(a,h)anthracene	0.07	mg/kg dw		2.5	2.8	12	33	mg/kg OC	0.23	0.085
DR108	2.1	EPA SI	8/19/1998	Dibenzo(a,h)anthracene	0.07	mg/kg dw		2.33	3	12	33	mg/kg OC	0.25	0.091
DR109	2.1	EPA SI	9/1/1998	Dibenzo(a,h)anthracene	0.07	mg/kg dw		2.35	3	12	33	mg/kg OC	0.25	0.091
DR110	2.1	EPA SI	8/19/1998	Dibenzo(a,h)anthracene	0.05	mg/kg dw		2.67	1.9	12	33	mg/kg OC	0.16	0.058
DR111	2.1	EPA SI	8/19/1998	Dibenzo(a,h)anthracene	0.05	mg/kg dw		2.26	2.2	12	33	mg/kg OC	0.18	0.067
DR112	2.1	EPA SI	8/19/1998	Dibenzo(a,h)anthracene	0.11	mg/kg dw		2.64	4.2	12	33	mg/kg OC	0.35	0.13
DR114	2.3	EPA SI	8/19/1998	Dibenzo(a,h)anthracene	0.05	mg/kg dw		2.51	2	12	33	mg/kg OC	0.17	0.061
DR115	2.3	EPA SI	9/14/1998	Dibenzo(a,h)anthracene	0.05	mg/kg dw		1.3	3.8	12	33	mg/kg OC	0.32	0.12
DR149	2.3	EPA SI	8/19/1998	Dibenzo(a,h)anthracene	0.05	mg/kg dw		2.01	2.5	12	33	mg/kg OC	0.21	0.076
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Dibenzo(a,h)anthracene	0.013	mg/kg dw		0.972	1.3	12	33	mg/kg OC	0.11	0.039
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Dibenzo(a,h)anthracene	0.0092	mg/kg dw		1.59	0.58	12	33	mg/kg OC	0.048	0.018
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Dibenzo(a,h)anthracene	0.11	mg/kg dw		2.57	4.3	12	33	mg/kg OC	0.36	0.13
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Dibenzo(a,h)anthracene	0.084	mg/kg dw		2.08	4	12	33	mg/kg OC	0.33	0.12
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Dibenzo(a,h)anthracene	0.042	mg/kg dw		2.47	1.7	12	33	mg/kg OC	0.14	0.052
B6b	2.2	LDWRI-Benthic	9/18/2004	Dibenzofuran	0.013	mg/kg dw		2.96	0.44	15	58	mg/kg OC	0.029	0.0076
DR107	2.1	EPA SI	8/19/1998	Dibenzofuran	0.03	mg/kg dw		2.5	1.2	15	58	mg/kg OC	0.08	0.021
DR109	2.1	EPA SI	9/1/1998	Dibenzofuran	0.02	mg/kg dw		2.35	0.85	15	58	mg/kg OC	0.057	0.015
DR110	2.1	EPA SI	8/19/1998	Dibenzofuran	0.05	mg/kg dw		2.67	1.9	15	58	mg/kg OC	0.13	0.033
DR111	2.1	EPA SI	8/19/1998	Dibenzofuran	0.02	mg/kg dw		2.26	0.88	15	58	mg/kg OC	0.059	0.015
DR112	2.1	EPA SI	8/19/1998	Dibenzofuran	0.04	mg/kg dw		2.64	1.5	15	58	mg/kg OC	0.1	0.026
DR114	2.3	EPA SI	8/19/1998	Dibenzofuran	0.04	mg/kg dw		2.51	1.6	15	58	mg/kg OC	0.11	0.028

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR115	2.3	EPA SI	9/14/1998	Dibenzofuran	0.02	mg/kg dw		1.3	1.5	15	58	mg/kg OC	0.1	0.026
DR149	2.3	EPA SI	8/19/1998	Dibenzofuran	0.07	mg/kg dw		2.01	3.5	15	58	mg/kg OC	0.23	0.06
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Dibenzofuran	0.021	mg/kg dw		2.08	1	15	58	mg/kg OC	0.067	0.017
B6b	2.2	LDWRI-Benthic	9/18/2004	Dibenzothiophene	0.0076	mg/kg dw		2.96						
B6b	2.2	LDWRI-Benthic	9/18/2004	Dibutyltin as ion	0.012	mg/kg dw		2.96						
DR109	2.1	EPA SI	9/1/1998	Dibutyltin as ion	0.026	mg/kg dw	J	2.35						
DR110	2.1	EPA SI	8/19/1998	Dibutyltin as ion	0.021	mg/kg dw	J	2.67						
DR111	2.1	EPA SI	8/19/1998	Dibutyltin as ion	0.051	mg/kg dw	J	2.26						
DR112	2.1	EPA SI	8/19/1998	Dibutyltin as ion	0.012	mg/kg dw	J	2.64						
DR115	2.3	EPA SI	9/14/1998	Dibutyltin as ion	0.009	mg/kg dw	J	1.3						
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Dibutyltin as ion	0.049	mg/kg dw	J	1.46						
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Dibutyltin as ion	0.0038	mg/kg dw	J	2.55						
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Diethyl phthalate	0.014	mg/kg dw		2.55	0.55	61	110	mg/kg OC	0.009	0.005
B6b	2.2	LDWRI-Benthic	9/18/2004	Dimethyl phthalate	0.0064	mg/kg dw	J	2.96	0.22	53	53	mg/kg OC	0.0042	0.0042
DR107	2.1	EPA SI	8/19/1998	Dimethyl phthalate	0.02	mg/kg dw		2.5	0.8	53	53	mg/kg OC	0.015	0.015
DR110	2.1	EPA SI	8/19/1998	Dimethyl phthalate	0.02	mg/kg dw		2.67	0.75	53	53	mg/kg OC	0.014	0.014
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Dimethyl phthalate	0.0062	mg/kg dw	J	0.972	0.64	53	53	mg/kg OC	0.012	0.012
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Dimethyl phthalate	0.016	mg/kg dw	J	2.57	0.62	53	53	mg/kg OC	0.012	0.012
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Dimethyl phthalate	0.083	mg/kg dw		1.46	5.7	53	53	mg/kg OC	0.11	0.11
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Dimethyl phthalate	0.0071	mg/kg dw		2.47	0.29	53	53	mg/kg OC	0.0055	0.0055
B6b	2.2	LDWRI-Benthic	9/18/2004	Di-n-butyl phthalate	0.037	mg/kg dw		2.96	1.3	220	1700	mg/kg OC	0.0059	0.00076
DR108	2.1	EPA SI	8/19/1998	Di-n-butyl phthalate	0.03	mg/kg dw		2.33	1.3	220	1700	mg/kg OC	0.0059	0.00076
DR114	2.3	EPA SI	8/19/1998	Di-n-butyl phthalate	0.02	mg/kg dw		2.51	0.8	220	1700	mg/kg OC	0.0036	0.00047
DR148	2.1	EPA SI	8/18/1998	Di-n-butyl phthalate	20	ug/kg dw		4.51		1400	5100	ug/kg dw	0.014	0.0039
B6b	2.2	LDWRI-Benthic	9/18/2004	Endrin ketone	0.0014	mg/kg dw	JN	2.96						
B6b	2.2	LDWRI-Benthic	9/18/2004	Fluoranthene	0.4	mg/kg dw		2.96	14	160	1200	mg/kg OC	0.088	0.012
DR105	2	EPA SI	8/19/1998	Fluoranthene	0.4	mg/kg dw		2.07	19	160	1200	mg/kg OC	0.12	0.016
DR107	2.1	EPA SI	8/19/1998	Fluoranthene	1.3	mg/kg dw		2.5	52	160	1200	mg/kg OC	0.33	0.043
DR108	2.1	EPA SI	8/19/1998	Fluoranthene	0.94	mg/kg dw		2.33	40	160	1200	mg/kg OC	0.25	0.033
DR109	2.1	EPA SI	9/1/1998	Fluoranthene	0.65	mg/kg dw		2.35	28	160	1200	mg/kg OC	0.18	0.023
DR110	2.1	EPA SI	8/19/1998	Fluoranthene	1.3	mg/kg dw		2.67	49	160	1200	mg/kg OC	0.31	0.041
DR111	2.1	EPA SI	8/19/1998	Fluoranthene	0.88	mg/kg dw	J	2.26	39	160	1200	mg/kg OC	0.24	0.033
DR112	2.1	EPA SI	8/19/1998	Fluoranthene	5.3	mg/kg dw		2.64	200	160	1200	mg/kg OC	1.3	0.17
DR114	2.3	EPA SI	8/19/1998	Fluoranthene	0.8	mg/kg dw		2.51	32	160	1200	mg/kg OC	0.2	0.027
DR115	2.3	EPA SI	9/14/1998	Fluoranthene	1	mg/kg dw		1.3	77	160	1200	mg/kg OC	0.48	0.064
DR148	2.1	EPA SI	8/18/1998	Fluoranthene	140	ug/kg dw		4.51		1700	2500	ug/kg dw	0.082	0.056
DR149	2.3	EPA SI	8/19/1998	Fluoranthene	2.2	mg/kg dw		2.01	110	160	1200	mg/kg OC	0.69	0.092
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Fluoranthene	0.17	mg/kg dw		0.972	17	160	1200	mg/kg OC	0.11	0.014
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Fluoranthene	0.094	mg/kg dw		1.59	5.9	160	1200	mg/kg OC	0.037	0.0049
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Fluoranthene	1.5	mg/kg dw		2.57	58	160	1200	mg/kg OC	0.36	0.048
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Fluoranthene	0.56	mg/kg dw		2.43	23	160	1200	mg/kg OC	0.14	0.019
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Fluoranthene	0.16	mg/kg dw		1.46	11	160	1200	mg/kg OC	0.069	0.0092
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Fluoranthene	0.13	mg/kg dw		2.17	6	160	1200	mg/kg OC	0.038	0.005
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Fluoranthene	1.2	mg/kg dw		2.08	58	160	1200	mg/kg OC	0.36	0.048
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Fluoranthene	0.39	mg/kg dw		2.55	15	160	1200	mg/kg OC	0.094	0.013
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Fluoranthene	0.3	mg/kg dw		2.47	12	160	1200	mg/kg OC	0.075	0.01
B6b	2.2	LDWRI-Benthic	9/18/2004	Fluorene	0.018	mg/kg dw		2.96	0.61	23	79	mg/kg OC	0.027	0.0077
DR107	2.1	EPA SI	8/19/1998	Fluorene	0.05	mg/kg dw		2.5	2	23	79	mg/kg OC	0.087	0.025
DR108	2.1	EPA SI	8/19/1998	Fluorene	0.03	mg/kg dw		2.33	1.3	23	79	mg/kg OC	0.057	0.016
DR109	2.1	EPA SI	9/1/1998	Fluorene	0.03	mg/kg dw		2.35	1.3	23	79	mg/kg OC	0.057	0.016
DR110	2.1	EPA SI	8/19/1998	Fluorene	0.09	mg/kg dw		2.67	3.4	23	79	mg/kg OC	0.15	0.043
DR111	2.1	EPA SI	8/19/1998	Fluorene	0.04	mg/kg dw		2.26	1.8	23	79	mg/kg OC	0.078	0.023
DR112	2.1	EPA SI	8/19/1998	Fluorene	0.09	mg/kg dw		2.64	3.4	23	79	mg/kg OC	0.15	0.043

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR114	2.3	EPA SI	8/19/1998	Fluorene	0.09	mg/kg dw		2.51	3.6	23	79	mg/kg OC	0.16	0.046
DR115	2.3	EPA SI	9/14/1998	Fluorene	0.03	mg/kg dw		1.3	2.3	23	79	mg/kg OC	0.1	0.029
DR148	2.1	EPA SI	8/18/1998	Fluorene	30	ug/kg dw		4.51		540	1000	ug/kg dw	0.056	0.03
DR149	2.3	EPA SI	8/19/1998	Fluorene	0.11	mg/kg dw		2.01	5.5	23	79	mg/kg OC	0.24	0.07
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Fluorene	0.086	mg/kg dw		2.57	3.3	23	79	mg/kg OC	0.14	0.042
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Fluorene	0.044	mg/kg dw		2.08	2.1	23	79	mg/kg OC	0.091	0.027
B6b	2.2	LDWRI-Benthic	9/18/2004	Hexachlorobenzene	0.0019	mg/kg dw	JN	2.96	0.064	0.38	2.3	mg/kg OC	0.17	0.028
B6b	2.2	LDWRI-Benthic	9/18/2004	Indeno(1,2,3-cd)pyrene	0.11	mg/kg dw		2.96	3.7	34	88	mg/kg OC	0.11	0.042
DR105	2	EPA SI	8/19/1998	Indeno(1,2,3-cd)pyrene	0.2	mg/kg dw		2.07	9.7	34	88	mg/kg OC	0.29	0.11
DR107	2.1	EPA SI	8/19/1998	Indeno(1,2,3-cd)pyrene	0.3	mg/kg dw		2.5	12	34	88	mg/kg OC	0.35	0.14
DR108	2.1	EPA SI	8/19/1998	Indeno(1,2,3-cd)pyrene	0.28	mg/kg dw		2.33	12	34	88	mg/kg OC	0.35	0.14
DR109	2.1	EPA SI	9/1/1998	Indeno(1,2,3-cd)pyrene	0.25	mg/kg dw		2.35	11	34	88	mg/kg OC	0.32	0.13
DR110	2.1	EPA SI	8/19/1998	Indeno(1,2,3-cd)pyrene	0.29	mg/kg dw		2.67	11	34	88	mg/kg OC	0.32	0.13
DR111	2.1	EPA SI	8/19/1998	Indeno(1,2,3-cd)pyrene	0.3	mg/kg dw	J	2.26	13	34	88	mg/kg OC	0.38	0.15
DR112	2.1	EPA SI	8/19/1998	Indeno(1,2,3-cd)pyrene	0.47	mg/kg dw		2.64	18	34	88	mg/kg OC	0.53	0.2
DR114	2.3	EPA SI	8/19/1998	Indeno(1,2,3-cd)pyrene	0.19	mg/kg dw		2.51	7.6	34	88	mg/kg OC	0.22	0.086
DR115	2.3	EPA SI	9/14/1998	Indeno(1,2,3-cd)pyrene	0.21	mg/kg dw		1.3	16	34	88	mg/kg OC	0.47	0.18
DR148	2.1	EPA SI	8/18/1998	Indeno(1,2,3-cd)pyrene	50	ug/kg dw		4.51		600	690	ug/kg dw	0.083	0.072
DR149	2.3	EPA SI	8/19/1998	Indeno(1,2,3-cd)pyrene	0.24	mg/kg dw		2.01	12	34	88	mg/kg OC	0.35	0.14
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Indeno(1,2,3-cd)pyrene	0.053	mg/kg dw	J	0.972	5.5	34	88	mg/kg OC	0.16	0.063
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Indeno(1,2,3-cd)pyrene	0.038	mg/kg dw	J	1.59	2.4	34	88	mg/kg OC	0.071	0.027
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Indeno(1,2,3-cd)pyrene	0.26	mg/kg dw		2.57	10	34	88	mg/kg OC	0.29	0.11
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Indeno(1,2,3-cd)pyrene	0.22	mg/kg dw		2.43	9.1	34	88	mg/kg OC	0.27	0.1
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Indeno(1,2,3-cd)pyrene	0.1	mg/kg dw		1.46	6.8	34	88	mg/kg OC	0.2	0.077
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Indeno(1,2,3-cd)pyrene	0.032	mg/kg dw		2.17	1.5	34	88	mg/kg OC	0.044	0.017
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Indeno(1,2,3-cd)pyrene	0.26	mg/kg dw		2.08	13	34	88	mg/kg OC	0.38	0.15
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Indeno(1,2,3-cd)pyrene	0.12	mg/kg dw		2.55	4.7	34	88	mg/kg OC	0.14	0.053
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Indeno(1,2,3-cd)pyrene	0.11	mg/kg dw		2.47	4.5	34	88	mg/kg OC	0.13	0.051
DR105	2	EPA SI	8/19/1998	Iron	25600	mg/kg dw	J	2.07						
DR107	2.1	EPA SI	8/19/1998	Iron	29200	mg/kg dw	J	2.5						
DR108	2.1	EPA SI	8/19/1998	Iron	31300	mg/kg dw	J	2.33						
DR109	2.1	EPA SI	9/1/1998	Iron	42900	mg/kg dw	J	2.35						
DR110	2.1	EPA SI	8/19/1998	Iron	28400	mg/kg dw	J	2.67						
DR111	2.1	EPA SI	8/19/1998	Iron	25400	mg/kg dw	J	2.26						
DR112	2.1	EPA SI	8/19/1998	Iron	27500	mg/kg dw	J	2.64						
DR114	2.3	EPA SI	8/19/1998	Iron	25800	mg/kg dw	J	2.51						
DR115	2.3	EPA SI	9/14/1998	Iron	28500	mg/kg dw		1.3						
DR148	2.1	EPA SI	8/18/1998	Iron	30500	mg/kg dw	J	4.51						
DR149	2.3	EPA SI	8/19/1998	Iron	25800	mg/kg dw	J	2.01						
B6b	2.2	LDWRI-Benthic	9/18/2004	Lead	40.9	mg/kg dw	J	2.96		450	530	mg/kg dw	0.091	0.077
DR105	2	EPA SI	8/19/1998	Lead	365	mg/kg dw		2.07		450	530	mg/kg dw	0.81	0.69
DR107	2.1	EPA SI	8/19/1998	Lead	52.3	mg/kg dw		2.5		450	530	mg/kg dw	0.12	0.099
DR108	2.1	EPA SI	8/19/1998	Lead	49.3	mg/kg dw		2.33		450	530	mg/kg dw	0.11	0.093
DR109	2.1	EPA SI	9/1/1998	Lead	43.9	mg/kg dw		2.35		450	530	mg/kg dw	0.098	0.083
DR110	2.1	EPA SI	8/19/1998	Lead	40.8	mg/kg dw		2.67		450	530	mg/kg dw	0.091	0.077
DR111	2.1	EPA SI	8/19/1998	Lead	39.3	mg/kg dw		2.26		450	530	mg/kg dw	0.087	0.074
DR112	2.1	EPA SI	8/19/1998	Lead	33	mg/kg dw		2.64		450	530	mg/kg dw	0.073	0.062
DR114	2.3	EPA SI	8/19/1998	Lead	30.7	mg/kg dw		2.51		450	530	mg/kg dw	0.068	0.058
DR115	2.3	EPA SI	9/14/1998	Lead	29.8	mg/kg dw	J	1.3		450	530	mg/kg dw	0.066	0.056
DR148	2.1	EPA SI	8/18/1998	Lead	24.5	mg/kg dw		4.51		450	530	mg/kg dw	0.054	0.046
DR149	2.3	EPA SI	8/19/1998	Lead	23.1	mg/kg dw		2.01		450	530	mg/kg dw	0.051	0.044
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Lead	303	mg/kg dw		0.972		450	530	mg/kg dw	0.67	0.57
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Lead	44	mg/kg dw		1.59		450	530	mg/kg dw	0.098	0.083

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Lead	50	mg/kg dw		2.57		450	530	mg/kg dw	0.11	0.094
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Lead	48	mg/kg dw		2.43		450	530	mg/kg dw	0.11	0.091
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Lead	75	mg/kg dw		1.46		450	530	mg/kg dw	0.17	0.14
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Lead	41	mg/kg dw		2.17		450	530	mg/kg dw	0.091	0.077
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Lead	81	mg/kg dw		2.08		450	530	mg/kg dw	0.18	0.15
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Lead	41	mg/kg dw		2.55		450	530	mg/kg dw	0.091	0.077
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Lead	52	mg/kg dw		2.47		450	530	mg/kg dw	0.12	0.098
DR105	2	EPA SI	8/19/1998	Magnesium	7520	mg/kg dw		2.07						
DR107	2.1	EPA SI	8/19/1998	Magnesium	7730	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Magnesium	8140	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Magnesium	9800	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Magnesium	7690	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Magnesium	7100	mg/kg dw		2.26						
DR112	2.1	EPA SI	8/19/1998	Magnesium	7720	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Magnesium	7480	mg/kg dw		2.51						
DR115	2.3	EPA SI	9/14/1998	Magnesium	6510	mg/kg dw		1.3						
DR148	2.1	EPA SI	8/18/1998	Magnesium	7750	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Magnesium	7660	mg/kg dw		2.01						
DR105	2	EPA SI	8/19/1998	Manganese	266	mg/kg dw		2.07						
DR107	2.1	EPA SI	8/19/1998	Manganese	367	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Manganese	367	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Manganese	404	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Manganese	337	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Manganese	265	mg/kg dw		2.26						
DR112	2.1	EPA SI	8/19/1998	Manganese	305	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Manganese	284	mg/kg dw		2.51						
DR115	2.3	EPA SI	9/14/1998	Manganese	294	mg/kg dw		1.3						
DR148	2.1	EPA SI	8/18/1998	Manganese	377	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Manganese	257	mg/kg dw		2.01						
B6b	2.2	LDWRI-Benthic	9/18/2004	Mercury	0.178	mg/kg dw		2.96		0.41	0.59	mg/kg dw	0.43	0.3
DR105	2	EPA SI	8/19/1998	Mercury	0.15	mg/kg dw		2.07		0.41	0.59	mg/kg dw	0.37	0.25
DR107	2.1	EPA SI	8/19/1998	Mercury	0.22	mg/kg dw		2.5		0.41	0.59	mg/kg dw	0.54	0.37
DR108	2.1	EPA SI	8/19/1998	Mercury	0.25	mg/kg dw		2.33		0.41	0.59	mg/kg dw	0.61	0.42
DR109	2.1	EPA SI	9/1/1998	Mercury	0.29	mg/kg dw		2.35		0.41	0.59	mg/kg dw	0.71	0.49
DR110	2.1	EPA SI	8/19/1998	Mercury	0.19	mg/kg dw		2.67		0.41	0.59	mg/kg dw	0.46	0.32
DR111	2.1	EPA SI	8/19/1998	Mercury	0.2	mg/kg dw		2.26		0.41	0.59	mg/kg dw	0.49	0.34
DR112	2.1	EPA SI	8/19/1998	Mercury	0.17	mg/kg dw		2.64		0.41	0.59	mg/kg dw	0.41	0.29
DR114	2.3	EPA SI	8/19/1998	Mercury	0.16	mg/kg dw		2.51		0.41	0.59	mg/kg dw	0.39	0.27
DR115	2.3	EPA SI	9/14/1998	Mercury	0.1	mg/kg dw		1.3		0.41	0.59	mg/kg dw	0.24	0.17
DR148	2.1	EPA SI	8/18/1998	Mercury	0.26	mg/kg dw		4.51		0.41	0.59	mg/kg dw	0.63	0.44
DR149	2.3	EPA SI	8/19/1998	Mercury	0.13	mg/kg dw		2.01		0.41	0.59	mg/kg dw	0.32	0.22
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Mercury	0.06	mg/kg dw		0.972		0.41	0.59	mg/kg dw	0.15	0.1
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Mercury	0.1	mg/kg dw		1.59		0.41	0.59	mg/kg dw	0.24	0.17
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Mercury	0.26	mg/kg dw		2.57		0.41	0.59	mg/kg dw	0.63	0.44
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Mercury	0.13	mg/kg dw		2.43		0.41	0.59	mg/kg dw	0.32	0.22
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Mercury	0.11	mg/kg dw		1.46		0.41	0.59	mg/kg dw	0.27	0.19
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Mercury	0.2	mg/kg dw		2.17		0.41	0.59	mg/kg dw	0.49	0.34
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Mercury	0.08	mg/kg dw		2.08		0.41	0.59	mg/kg dw	0.2	0.14
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Mercury	0.3	mg/kg dw		2.55		0.41	0.59	mg/kg dw	0.73	0.51
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Mercury	0.2	mg/kg dw		2.47		0.41	0.59	mg/kg dw	0.49	0.34
DR111	2.1	EPA SI	8/19/1998	Methyl ethyl ketone	0.0101	mg/kg dw		2.26						
B6b	2.2	LDWRI-Benthic	9/18/2004	Molybdenum	0.731	mg/kg dw		2.96						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Molybdenum	0.5	mg/kg dw		0.972						

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Molybdenum	0.6	mg/kg dw		1.59						
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Molybdenum	0.9	mg/kg dw		2.57						
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Molybdenum	1.8	mg/kg dw		2.43						
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Molybdenum	2.3	mg/kg dw		1.46						
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Molybdenum	1	mg/kg dw		2.17						
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Molybdenum	7.7	mg/kg dw		2.08						
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Molybdenum	2	mg/kg dw		2.55						
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Molybdenum	2	mg/kg dw		2.47						
B6b	2.2	LDWRI-Benthic	9/18/2004	Monobutyltin as ion	0.0082	mg/kg dw		2.96						
DR109	2.1	EPA SI	9/1/1998	Monobutyltin as ion	0.017	mg/kg dw	J	2.35						
DR110	2.1	EPA SI	8/19/1998	Monobutyltin as ion	0.026	mg/kg dw	J	2.67						
DR111	2.1	EPA SI	8/19/1998	Monobutyltin as ion	0.066	mg/kg dw	J	2.26						
DR112	2.1	EPA SI	8/19/1998	Monobutyltin as ion	0.017	mg/kg dw	J	2.64						
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Monobutyltin as ion	0.003	mg/kg dw	J	1.46						
B6b	2.2	LDWRI-Benthic	9/18/2004	Naphthalene	0.011	mg/kg dw		2.96	0.37	99	170	mg/kg OC	0.0037	0.0022
DR111	2.1	EPA SI	8/19/1998	Naphthalene	0.0043	mg/kg dw		2.26	0.19	99	170	mg/kg OC	0.0019	0.0011
DR112	2.1	EPA SI	8/19/1998	Naphthalene	0.02	mg/kg dw		2.64	0.76	99	170	mg/kg OC	0.0077	0.0045
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Naphthalene	0.038	mg/kg dw	J	2.57	1.5	99	170	mg/kg OC	0.015	0.0088
B6b	2.2	LDWRI-Benthic	9/18/2004	Nickel	23.8	mg/kg dw		2.96						
DR105	2	EPA SI	8/19/1998	Nickel	20.3	mg/kg dw		2.07						
DR107	2.1	EPA SI	8/19/1998	Nickel	20.3	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Nickel	21.6	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Nickel	23.4	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Nickel	20.7	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Nickel	20.5	mg/kg dw		2.26						
DR112	2.1	EPA SI	8/19/1998	Nickel	20	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Nickel	19.6	mg/kg dw		2.51						
DR115	2.3	EPA SI	9/14/1998	Nickel	20.9	mg/kg dw		1.3						
DR148	2.1	EPA SI	8/18/1998	Nickel	17.9	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Nickel	20.6	mg/kg dw		2.01						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Nickel	18.9	mg/kg dw		0.972						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Nickel	16.9	mg/kg dw		1.59						
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Nickel	29	mg/kg dw		2.57						
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Nickel	21	mg/kg dw		2.43						
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Nickel	21	mg/kg dw		1.46						
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Nickel	26	mg/kg dw		2.17						
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Nickel	22	mg/kg dw		2.08						
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Nickel	24	mg/kg dw		2.55						
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Nickel	23	mg/kg dw		2.47						
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	N-Nitrosodiphenylamine	0.0072	mg/kg dw		2.17	0.33	11	11	mg/kg OC	0.03	0.03
DR111	2.1	EPA SI	8/19/1998	OCDD	0.0033	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	OCDD	0.0026	mg/kg dw		1.3						
DR111	2.1	EPA SI	8/19/1998	OCDF	0.00016	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	OCDF	0.000095	mg/kg dw		1.3						
B6b	2.2	LDWRI-Benthic	9/18/2004	PCBs (total calc'd)	0.42	mg/kg dw		2.96	14	12	65	mg/kg OC	1.2	0.22
DR105	2	EPA SI	8/19/1998	PCBs (total calc'd)	0.124	mg/kg dw	J	2.07	5.99	12	65	mg/kg OC	0.5	0.092
DR107	2.1	EPA SI	8/19/1998	PCBs (total calc'd)	0.296	mg/kg dw		2.5	11.8	12	65	mg/kg OC	0.98	0.18
DR108	2.1	EPA SI	8/19/1998	PCBs (total calc'd)	0.258	mg/kg dw		2.33	11.1	12	65	mg/kg OC	0.93	0.17
DR109	2.1	EPA SI	9/1/1998	PCBs (total calc'd)	0.28	mg/kg dw	J	2.35	12	12	65	mg/kg OC	1	0.18
DR110	2.1	EPA SI	8/19/1998	PCBs (total calc'd)	0.28	mg/kg dw		2.67	10	12	65	mg/kg OC	0.83	0.15
DR111	2.1	EPA SI	8/19/1998	PCBs (total calc'd)	0.311	mg/kg dw		2.26	13.8	12	65	mg/kg OC	1.2	0.21
DR112	2.1	EPA SI	8/19/1998	PCBs (total calc'd)	0.243	mg/kg dw		2.64	9.2	12	65	mg/kg OC	0.77	0.14
DR114	2.3	EPA SI	8/19/1998	PCBs (total calc'd)	0.189	mg/kg dw	J	2.51	7.53	12	65	mg/kg OC	0.63	0.12

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR115	2.3	EPA SI	9/14/1998	PCBs (total calc'd)	0.142	mg/kg dw		1.3	10.9	12	65	mg/kg OC	0.91	0.17
DR148	2.1	EPA SI	8/18/1998	PCBs (total calc'd)	279	ug/kg dw	J	4.51		130	1000	ug/kg dw	2.1	0.28
DR149	2.3	EPA SI	8/19/1998	PCBs (total calc'd)	0.095	mg/kg dw	J	2.01	4.7	12	65	mg/kg OC	0.39	0.072
EST187	2.1	NOAA SiteChar	10/10/1997	PCBs (total calc'd)	0.14	mg/kg dw		2.34	6	12	65	mg/kg OC	0.5	0.092
EST188	2.2	NOAA SiteChar	10/17/1997	PCBs (total calc'd)	0.17	mg/kg dw		2.25	7.6	12	65	mg/kg OC	0.63	0.12
EST189	2.3	NOAA SiteChar	10/17/1997	PCBs (total calc'd)	0.14	mg/kg dw		2.24	6.3	12	65	mg/kg OC	0.53	0.097
EST190	2	NOAA SiteChar	10/16/1997	PCBs (total calc'd)	0.14	mg/kg dw		1.86	7.5	12	65	mg/kg OC	0.63	0.12
EST191	2.1	NOAA SiteChar	10/22/1997	PCBs (total calc'd)	0.12	mg/kg dw		2.22	5.4	12	65	mg/kg OC	0.45	0.083
EST192	2.1	NOAA SiteChar	10/16/1997	PCBs (total calc'd)	0.17	mg/kg dw		2.18	7.8	12	65	mg/kg OC	0.65	0.12
EST193	2.1	NOAA SiteChar	10/10/1997	PCBs (total calc'd)	0.2	mg/kg dw		1.86	10	12	65	mg/kg OC	0.83	0.15
EST194	2.1	NOAA SiteChar	10/14/1997	PCBs (total calc'd)	0.19	mg/kg dw		1.91	9.9	12	65	mg/kg OC	0.83	0.15
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	PCBs (total calc'd)	0.124	mg/kg dw		0.972	12.8	12	65	mg/kg OC	1.1	0.2
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	PCBs (total calc'd)	0.122	mg/kg dw		1.59	7.67	12	65	mg/kg OC	0.64	0.12
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	PCBs (total calc'd)	0.25	mg/kg dw		2.57	9.7	12	65	mg/kg OC	0.81	0.15
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	PCBs (total calc'd)	0.23	mg/kg dw		2.43	9.5	12	65	mg/kg OC	0.79	0.15
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	PCBs (total calc'd)	0.166	mg/kg dw		1.46	11.4	12	65	mg/kg OC	0.95	0.18
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	PCBs (total calc'd)	0.117	mg/kg dw		2.17	5.39	12	65	mg/kg OC	0.45	0.083
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	PCBs (total calc'd)	0.07	mg/kg dw		2.08	3.4	12	65	mg/kg OC	0.28	0.052
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	PCBs (total calc'd)	0.11	mg/kg dw		2.55	4.31	12	65	mg/kg OC	0.36	0.066
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	PCBs (total calc'd)	0.21	mg/kg dw		2.47	8.5	12	65	mg/kg OC	0.71	0.13
DR111	2.1	EPA SI	8/19/1998	p-Cymene	0.025	mg/kg dw		2.26						
B6b	2.2	LDWRI-Benthic	9/18/2004	Perylene	0.066	mg/kg dw		2.96						
B6b	2.2	LDWRI-Benthic	9/18/2004	Phenanthrene	0.13	mg/kg dw		2.96	4.4	100	480	mg/kg OC	0.044	0.0092
DR105	2	EPA SI	8/19/1998	Phenanthrene	0.14	mg/kg dw		2.07	6.8	100	480	mg/kg OC	0.068	0.014
DR107	2.1	EPA SI	8/19/1998	Phenanthrene	0.28	mg/kg dw		2.5	11	100	480	mg/kg OC	0.11	0.023
DR108	2.1	EPA SI	8/19/1998	Phenanthrene	0.21	mg/kg dw		2.33	9	100	480	mg/kg OC	0.09	0.019
DR109	2.1	EPA SI	9/1/1998	Phenanthrene	0.19	mg/kg dw		2.35	8.1	100	480	mg/kg OC	0.081	0.017
DR110	2.1	EPA SI	8/19/1998	Phenanthrene	0.5	mg/kg dw		2.67	19	100	480	mg/kg OC	0.19	0.04
DR111	2.1	EPA SI	8/19/1998	Phenanthrene	0.25	mg/kg dw		2.26	11	100	480	mg/kg OC	0.11	0.023
DR112	2.1	EPA SI	8/19/1998	Phenanthrene	0.8	mg/kg dw		2.64	30	100	480	mg/kg OC	0.3	0.063
DR114	2.3	EPA SI	8/19/1998	Phenanthrene	0.3	mg/kg dw		2.51	12	100	480	mg/kg OC	0.12	0.025
DR115	2.3	EPA SI	9/14/1998	Phenanthrene	0.24	mg/kg dw		1.3	18	100	480	mg/kg OC	0.18	0.038
DR148	2.1	EPA SI	8/18/1998	Phenanthrene	80	ug/kg dw		4.51		1500	5400	ug/kg dw	0.053	0.015
DR149	2.3	EPA SI	8/19/1998	Phenanthrene	0.82	mg/kg dw		2.01	41	100	480	mg/kg OC	0.41	0.085
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Phenanthrene	0.072	mg/kg dw		0.972	7.4	100	480	mg/kg OC	0.074	0.015
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Phenanthrene	0.039	mg/kg dw	J	1.59	2.5	100	480	mg/kg OC	0.025	0.0052
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Phenanthrene	0.43	mg/kg dw		2.57	17	100	480	mg/kg OC	0.17	0.035
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Phenanthrene	0.22	mg/kg dw		2.43	9.1	100	480	mg/kg OC	0.091	0.019
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Phenanthrene	0.071	mg/kg dw	J	1.46	4.9	100	480	mg/kg OC	0.049	0.01
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Phenanthrene	0.045	mg/kg dw		2.17	2.1	100	480	mg/kg OC	0.021	0.0044
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Phenanthrene	0.39	mg/kg dw		2.08	19	100	480	mg/kg OC	0.19	0.04
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Phenanthrene	0.12	mg/kg dw		2.55	4.7	100	480	mg/kg OC	0.047	0.0098
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Phenanthrene	0.09	mg/kg dw		2.47	3.6	100	480	mg/kg OC	0.036	0.0075
B6b	2.2	LDWRI-Benthic	9/18/2004	Phenol	35	ug/kg dw		2.96		420	1200	ug/kg dw	0.083	0.029
DR105	2	EPA SI	8/19/1998	Phenol	20	ug/kg dw		2.07		420	1200	ug/kg dw	0.048	0.017
DR107	2.1	EPA SI	8/19/1998	Phenol	230	ug/kg dw		2.5		420	1200	ug/kg dw	0.55	0.19
DR108	2.1	EPA SI	8/19/1998	Phenol	140	ug/kg dw		2.33		420	1200	ug/kg dw	0.33	0.12
DR109	2.1	EPA SI	9/1/1998	Phenol	400	ug/kg dw		2.35		420	1200	ug/kg dw	0.95	0.33
DR110	2.1	EPA SI	8/19/1998	Phenol	120	ug/kg dw		2.67		420	1200	ug/kg dw	0.29	0.1
DR111	2.1	EPA SI	8/19/1998	Phenol	30	ug/kg dw		2.26		420	1200	ug/kg dw	0.071	0.025
DR112	2.1	EPA SI	8/19/1998	Phenol	20	ug/kg dw		2.64		420	1200	ug/kg dw	0.048	0.017
DR114	2.3	EPA SI	8/19/1998	Phenol	20	ug/kg dw		2.51		420	1200	ug/kg dw	0.048	0.017
DR148	2.1	EPA SI	8/18/1998	Phenol	20	ug/kg dw		4.51		420	1200	ug/kg dw	0.048	0.017

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Phenol	280	ug/kg dw	J	1.46		420	1200	ug/kg dw	0.67	0.23
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Phenol	90	ug/kg dw		2.47		420	1200	ug/kg dw	0.21	0.075
B6b	2.2	LDWRI-Benthic	9/18/2004	Pyrene	0.31	mg/kg dw		2.96	10	1000	1400	mg/kg OC	0.01	0.0071
DR105	2	EPA SI	8/19/1998	Pyrene	0.37	mg/kg dw		2.07	18	1000	1400	mg/kg OC	0.018	0.013
DR107	2.1	EPA SI	8/19/1998	Pyrene	0.88	mg/kg dw		2.5	35	1000	1400	mg/kg OC	0.035	0.025
DR108	2.1	EPA SI	8/19/1998	Pyrene	0.67	mg/kg dw		2.33	29	1000	1400	mg/kg OC	0.029	0.021
DR109	2.1	EPA SI	9/1/1998	Pyrene	0.61	mg/kg dw		2.35	26	1000	1400	mg/kg OC	0.026	0.019
DR110	2.1	EPA SI	8/19/1998	Pyrene	0.96	mg/kg dw		2.67	36	1000	1400	mg/kg OC	0.036	0.026
DR111	2.1	EPA SI	8/19/1998	Pyrene	0.89	mg/kg dw	J	2.26	39	1000	1400	mg/kg OC	0.039	0.028
DR112	2.1	EPA SI	8/19/1998	Pyrene	2.8	mg/kg dw		2.64	110	1000	1400	mg/kg OC	0.11	0.079
DR114	2.3	EPA SI	8/19/1998	Pyrene	0.68	mg/kg dw		2.51	27	1000	1400	mg/kg OC	0.027	0.019
DR115	2.3	EPA SI	9/14/1998	Pyrene	0.76	mg/kg dw		1.3	58	1000	1400	mg/kg OC	0.058	0.041
DR148	2.1	EPA SI	8/18/1998	Pyrene	130	ug/kg dw		4.51		2600	3300	ug/kg dw	0.05	0.039
DR149	2.3	EPA SI	8/19/1998	Pyrene	1.5	mg/kg dw		2.01	75	1000	1400	mg/kg OC	0.075	0.054
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Pyrene	0.21	mg/kg dw		0.972	22	1000	1400	mg/kg OC	0.022	0.016
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Pyrene	0.14	mg/kg dw		1.59	8.8	1000	1400	mg/kg OC	0.0088	0.0063
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Pyrene	0.95	mg/kg dw		2.57	37	1000	1400	mg/kg OC	0.037	0.026
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Pyrene	0.54	mg/kg dw		2.43	22	1000	1400	mg/kg OC	0.022	0.016
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Pyrene	0.13	mg/kg dw		1.46	8.9	1000	1400	mg/kg OC	0.0089	0.0064
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Pyrene	0.12	mg/kg dw		2.17	5.5	1000	1400	mg/kg OC	0.0055	0.0039
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Pyrene	1	mg/kg dw		2.08	48	1000	1400	mg/kg OC	0.048	0.034
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Pyrene	0.42	mg/kg dw		2.55	16	1000	1400	mg/kg OC	0.016	0.011
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Pyrene	0.22	mg/kg dw		2.47	8.9	1000	1400	mg/kg OC	0.0089	0.0064
B6b	2.2	LDWRI-Benthic	9/18/2004	Selenium	0.9	mg/kg dw	J	2.96						
DR105	2	EPA SI	8/19/1998	Selenium	5	mg/kg dw	J	2.07						
DR107	2.1	EPA SI	8/19/1998	Selenium	9	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Selenium	9	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Selenium	26	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Selenium	9	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Selenium	9	mg/kg dw		2.26						
DR112	2.1	EPA SI	8/19/1998	Selenium	8	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Selenium	5	mg/kg dw	J	2.51						
DR148	2.1	EPA SI	8/18/1998	Selenium	8	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Selenium	5	mg/kg dw	J	2.01						
B6b	2.2	LDWRI-Benthic	9/18/2004	Silver	0.46	mg/kg dw		2.96		6.1	6.1	mg/kg dw	0.075	0.075
DR105	2	EPA SI	8/19/1998	Silver	0.4	mg/kg dw		2.07		6.1	6.1	mg/kg dw	0.066	0.066
DR107	2.1	EPA SI	8/19/1998	Silver	0.46	mg/kg dw		2.5		6.1	6.1	mg/kg dw	0.075	0.075
DR108	2.1	EPA SI	8/19/1998	Silver	0.5	mg/kg dw		2.33		6.1	6.1	mg/kg dw	0.082	0.082
DR109	2.1	EPA SI	9/1/1998	Silver	0.38	mg/kg dw		2.35		6.1	6.1	mg/kg dw	0.062	0.062
DR110	2.1	EPA SI	8/19/1998	Silver	0.41	mg/kg dw		2.67		6.1	6.1	mg/kg dw	0.067	0.067
DR111	2.1	EPA SI	8/19/1998	Silver	0.41	mg/kg dw		2.26		6.1	6.1	mg/kg dw	0.067	0.067
DR112	2.1	EPA SI	8/19/1998	Silver	0.36	mg/kg dw		2.64		6.1	6.1	mg/kg dw	0.059	0.059
DR114	2.3	EPA SI	8/19/1998	Silver	0.39	mg/kg dw		2.51		6.1	6.1	mg/kg dw	0.064	0.064
DR115	2.3	EPA SI	9/14/1998	Silver	0.19	mg/kg dw		1.3		6.1	6.1	mg/kg dw	0.031	0.031
DR148	2.1	EPA SI	8/18/1998	Silver	0.49	mg/kg dw		4.51		6.1	6.1	mg/kg dw	0.08	0.08
DR149	2.3	EPA SI	8/19/1998	Silver	0.29	mg/kg dw		2.01		6.1	6.1	mg/kg dw	0.048	0.048
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Silver	0.7	mg/kg dw	J	2.57		6.1	6.1	mg/kg dw	0.11	0.11
B6b	2.2	LDWRI-Benthic	9/18/2004	Tetrabutyltin as ion	0.00046	mg/kg dw	J	2.96						
B6b	2.2	LDWRI-Benthic	9/18/2004	Thallium	0.121	mg/kg dw		2.96						
DR105	2	EPA SI	8/19/1998	Thallium	0.09	mg/kg dw	J	2.07						
DR107	2.1	EPA SI	8/19/1998	Thallium	0.12	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Thallium	0.12	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Thallium	0.13	mg/kg dw		2.35						

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR110	2.1	EPA SI	8/19/1998	Thallium	0.13	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Thallium	0.12	mg/kg dw		2.26						
DR112	2.1	EPA SI	8/19/1998	Thallium	0.12	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Thallium	0.09	mg/kg dw	J	2.51						
DR115	2.3	EPA SI	9/14/1998	Thallium	0.09	mg/kg dw	J	1.3						
DR148	2.1	EPA SI	8/18/1998	Thallium	0.12	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Thallium	0.08	mg/kg dw	J	2.01						
DR105	2	EPA SI	8/19/1998	Tin	5	mg/kg dw		2.07						
DR107	2.1	EPA SI	8/19/1998	Tin	5	mg/kg dw	J	2.5						
DR108	2.1	EPA SI	8/19/1998	Tin	5	mg/kg dw	J	2.33						
DR109	2.1	EPA SI	9/1/1998	Tin	6	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Tin	5	mg/kg dw	J	2.67						
DR111	2.1	EPA SI	8/19/1998	Tin	4.09	mg/kg dw	J	2.26						
DR112	2.1	EPA SI	8/19/1998	Tin	4	mg/kg dw	J	2.64						
DR114	2.3	EPA SI	8/19/1998	Tin	4	mg/kg dw		2.51						
DR148	2.1	EPA SI	8/18/1998	Tin	3	mg/kg dw	J	4.51						
DR149	2.3	EPA SI	8/19/1998	Tin	3	mg/kg dw		2.01						
DR111	2.1	EPA SI	8/19/1998	Toluene	0.001	mg/kg dw	J	2.26						
B6b	2.2	LDWRI-Benthic	9/18/2004	Total Chlordane (calc'd)	0.00024	mg/kg dw	JN	2.96						
B6b	2.2	LDWRI-Benthic	9/18/2004	Total HPAH (calc'd)	1.9	mg/kg dw		2.96	64.2	960	5300	mg/kg OC	0.067	0.012
DR105	2	EPA SI	8/19/1998	Total HPAH (calc'd)	2.38	mg/kg dw		2.07	115	960	5300	mg/kg OC	0.12	0.022
DR107	2.1	EPA SI	8/19/1998	Total HPAH (calc'd)	5.2	mg/kg dw		2.5	210	960	5300	mg/kg OC	0.22	0.04
DR108	2.1	EPA SI	8/19/1998	Total HPAH (calc'd)	4.34	mg/kg dw		2.33	186	960	5300	mg/kg OC	0.19	0.035
DR109	2.1	EPA SI	9/1/1998	Total HPAH (calc'd)	3.74	mg/kg dw		2.35	159	960	5300	mg/kg OC	0.17	0.03
DR110	2.1	EPA SI	8/19/1998	Total HPAH (calc'd)	5.3	mg/kg dw		2.67	200	960	5300	mg/kg OC	0.21	0.038
DR111	2.1	EPA SI	8/19/1998	Total HPAH (calc'd)	4.8	mg/kg dw	J	2.26	212	960	5300	mg/kg OC	0.22	0.04
DR112	2.1	EPA SI	8/19/1998	Total HPAH (calc'd)	14.5	mg/kg dw		2.64	549	960	5300	mg/kg OC	0.57	0.1
DR114	2.3	EPA SI	8/19/1998	Total HPAH (calc'd)	3.57	mg/kg dw		2.51	142	960	5300	mg/kg OC	0.15	0.027
DR115	2.3	EPA SI	9/14/1998	Total HPAH (calc'd)	4.3	mg/kg dw		1.3	330	960	5300	mg/kg OC	0.34	0.062
DR148	2.1	EPA SI	8/18/1998	Total HPAH (calc'd)	700	ug/kg dw		4.51		12000	17000	ug/kg dw	0.058	0.041
DR149	2.3	EPA SI	8/19/1998	Total HPAH (calc'd)	6.8	mg/kg dw		2.01	340	960	5300	mg/kg OC	0.35	0.064
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Total HPAH (calc'd)	1.09	mg/kg dw	J	0.972	112	960	5300	mg/kg OC	0.12	0.021
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Total HPAH (calc'd)	0.68	mg/kg dw	J	1.59	43	960	5300	mg/kg OC	0.045	0.0081
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Total HPAH (calc'd)	6.2	mg/kg dw		2.57	240	960	5300	mg/kg OC	0.25	0.045
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Total HPAH (calc'd)	4.4	mg/kg dw		2.43	181	960	5300	mg/kg OC	0.19	0.034
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Total HPAH (calc'd)	0.94	mg/kg dw	J	1.46	64	960	5300	mg/kg OC	0.067	0.012
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Total HPAH (calc'd)	0.78	mg/kg dw		2.17	36	960	5300	mg/kg OC	0.038	0.0068
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Total HPAH (calc'd)	6.5	mg/kg dw		2.08	310	960	5300	mg/kg OC	0.32	0.058
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Total HPAH (calc'd)	2.45	mg/kg dw	J	2.55	96.1	960	5300	mg/kg OC	0.1	0.018
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Total HPAH (calc'd)	1.81	mg/kg dw		2.47	73.3	960	5300	mg/kg OC	0.076	0.014
DR111	2.1	EPA SI	8/19/1998	Total HpCDD	0.00095	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	Total HpCDD	0.0009	mg/kg dw		1.3						
DR111	2.1	EPA SI	8/19/1998	Total HpCDF	0.00021	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	Total HpCDF	0.00011	mg/kg dw		1.3						
DR111	2.1	EPA SI	8/19/1998	Total HxCDD	0.0001	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	Total HxCDD	0.000097	mg/kg dw		1.3						
DR111	2.1	EPA SI	8/19/1998	Total HxCDF	0.000068	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	Total HxCDF	0.000028	mg/kg dw		1.3						
B6b	2.2	LDWRI-Benthic	9/18/2004	Total LPAH (calc'd)	0.26	mg/kg dw		2.96	8.8	370	780	mg/kg OC	0.024	0.011
DR105	2	EPA SI	8/19/1998	Total LPAH (calc'd)	0.18	mg/kg dw		2.07	8.7	370	780	mg/kg OC	0.024	0.011
DR107	2.1	EPA SI	8/19/1998	Total LPAH (calc'd)	0.53	mg/kg dw		2.5	21	370	780	mg/kg OC	0.057	0.027
DR108	2.1	EPA SI	8/19/1998	Total LPAH (calc'd)	0.34	mg/kg dw		2.33	15	370	780	mg/kg OC	0.041	0.019
DR109	2.1	EPA SI	9/1/1998	Total LPAH (calc'd)	0.32	mg/kg dw		2.35	14	370	780	mg/kg OC	0.038	0.018

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR110	2.1	EPA SI	8/19/1998	Total LPAH (calc'd)	0.81	mg/kg dw		2.67	30	370	780	mg/kg OC	0.081	0.038
DR111	2.1	EPA SI	8/19/1998	Total LPAH (calc'd)	0.4	mg/kg dw		2.26	18	370	780	mg/kg OC	0.049	0.023
DR112	2.1	EPA SI	8/19/1998	Total LPAH (calc'd)	1.31	mg/kg dw		2.64	49.6	370	780	mg/kg OC	0.13	0.064
DR114	2.3	EPA SI	8/19/1998	Total LPAH (calc'd)	0.81	mg/kg dw		2.51	32	370	780	mg/kg OC	0.086	0.041
DR115	2.3	EPA SI	9/14/1998	Total LPAH (calc'd)	0.4	mg/kg dw		1.3	31	370	780	mg/kg OC	0.084	0.04
DR148	2.1	EPA SI	8/18/1998	Total LPAH (calc'd)	160	ug/kg dw		4.51		5200	13000	ug/kg dw	0.031	0.012
DR149	2.3	EPA SI	8/19/1998	Total LPAH (calc'd)	1.24	mg/kg dw		2.01	61.7	370	780	mg/kg OC	0.17	0.079
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Total LPAH (calc'd)	0.108	mg/kg dw	J	0.972	11.1	370	780	mg/kg OC	0.03	0.014
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Total LPAH (calc'd)	0.039	mg/kg dw	J	1.59	2.5	370	780	mg/kg OC	0.0068	0.0032
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Total LPAH (calc'd)	0.88	mg/kg dw	J	2.57	34	370	780	mg/kg OC	0.092	0.044
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Total LPAH (calc'd)	0.34	mg/kg dw		2.43	14	370	780	mg/kg OC	0.038	0.018
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Total LPAH (calc'd)	0.071	mg/kg dw	J	1.46	4.9	370	780	mg/kg OC	0.013	0.0063
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Total LPAH (calc'd)	0.045	mg/kg dw		2.17	2.1	370	780	mg/kg OC	0.0057	0.0027
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Total LPAH (calc'd)	0.72	mg/kg dw		2.08	35	370	780	mg/kg OC	0.095	0.045
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Total LPAH (calc'd)	0.18	mg/kg dw	J	2.55	7.1	370	780	mg/kg OC	0.019	0.0091
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Total LPAH (calc'd)	0.133	mg/kg dw		2.47	5.38	370	780	mg/kg OC	0.015	0.0069
B6b	2.2	LDWRI-Benthic	9/18/2004	Total PAH (calc'd)	2.17	mg/kg dw		2.96						
DR105	2	EPA SI	8/19/1998	Total PAH (calc'd)	2.56	mg/kg dw		2.07						
DR107	2.1	EPA SI	8/19/1998	Total PAH (calc'd)	5.8	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Total PAH (calc'd)	4.68	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Total PAH (calc'd)	4.06	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Total PAH (calc'd)	6.1	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Total PAH (calc'd)	5.2	mg/kg dw	J	2.26						
DR112	2.1	EPA SI	8/19/1998	Total PAH (calc'd)	15.8	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Total PAH (calc'd)	4.38	mg/kg dw		2.51						
DR115	2.3	EPA SI	9/14/1998	Total PAH (calc'd)	4.7	mg/kg dw		1.3						
DR148	2.1	EPA SI	8/18/1998	Total PAH (calc'd)	0.86	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Total PAH (calc'd)	8.1	mg/kg dw		2.01						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Total PAH (calc'd)	1.2	mg/kg dw	J	0.972						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Total PAH (calc'd)	0.72	mg/kg dw	J	1.59						
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Total PAH (calc'd)	7	mg/kg dw	J	2.57						
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Total PAH (calc'd)	4.74	mg/kg dw		2.43						
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Total PAH (calc'd)	1.01	mg/kg dw	J	1.46						
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Total PAH (calc'd)	0.82	mg/kg dw		2.17						
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Total PAH (calc'd)	7.2	mg/kg dw		2.08						
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Total PAH (calc'd)	2.63	mg/kg dw	J	2.55						
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Total PAH (calc'd)	1.94	mg/kg dw		2.47						
DR111	2.1	EPA SI	8/19/1998	Total PeCDF	0.000031	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	Total PeCDF	0.000023	mg/kg dw		1.3						
DR111	2.1	EPA SI	8/19/1998	Total TCDD	0.0000052	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	Total TCDD	0.0000016	mg/kg dw		1.3						
DR111	2.1	EPA SI	8/19/1998	Total TCDF	0.000036	mg/kg dw		2.26						
DR115	2.3	EPA SI	9/14/1998	Total TCDF	0.000013	mg/kg dw		1.3						
B6b	2.2	LDWRI-Benthic	9/18/2004	Tributyltin as ion	0.02	mg/kg dw		2.96						
DR109	2.1	EPA SI	9/1/1998	Tributyltin as ion	0.077	mg/kg dw	J	2.35						
DR110	2.1	EPA SI	8/19/1998	Tributyltin as ion	0.13	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Tributyltin as ion	0.24	mg/kg dw	J	2.26						
DR112	2.1	EPA SI	8/19/1998	Tributyltin as ion	0.071	mg/kg dw		2.64						
DR115	2.3	EPA SI	9/14/1998	Tributyltin as ion	0.031	mg/kg dw	J	1.3						
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Tributyltin as ion	0.11	mg/kg dw		1.46						
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Tributyltin as ion	0.019	mg/kg dw		2.55						
B6b	2.2	LDWRI-Benthic	9/18/2004	Vanadium	70.7	mg/kg dw		2.96						
DR105	2	EPA SI	8/19/1998	Vanadium	60	mg/kg dw		2.07						

Sample Location Name	Sample River Mile Location	Sampling Event	Sample Collection Date	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR107	2.1	EPA SI	8/19/1998	Vanadium	51	mg/kg dw		2.5						
DR108	2.1	EPA SI	8/19/1998	Vanadium	54	mg/kg dw		2.33						
DR109	2.1	EPA SI	9/1/1998	Vanadium	83	mg/kg dw		2.35						
DR110	2.1	EPA SI	8/19/1998	Vanadium	54	mg/kg dw		2.67						
DR111	2.1	EPA SI	8/19/1998	Vanadium	52	mg/kg dw		2.26						
DR112	2.1	EPA SI	8/19/1998	Vanadium	54	mg/kg dw		2.64						
DR114	2.3	EPA SI	8/19/1998	Vanadium	56	mg/kg dw		2.51						
DR115	2.3	EPA SI	9/14/1998	Vanadium	61	mg/kg dw		1.3						
DR148	2.1	EPA SI	8/18/1998	Vanadium	75	mg/kg dw		4.51						
DR149	2.3	EPA SI	8/19/1998	Vanadium	56	mg/kg dw		2.01						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Vanadium	39	mg/kg dw		0.972						
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Vanadium	41.1	mg/kg dw		1.59						
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Vanadium	71.9	mg/kg dw		2.57						
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Vanadium	65.3	mg/kg dw		2.43						
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Vanadium	52.3	mg/kg dw		1.46						
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Vanadium	78.3	mg/kg dw		2.17						
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Vanadium	44.3	mg/kg dw		2.08						
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Vanadium	78	mg/kg dw		2.55						
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Vanadium	76.5	mg/kg dw		2.47						
B6b	2.2	LDWRI-Benthic	9/18/2004	Zinc	157	mg/kg dw		2.96		410	960	mg/kg dw	0.38	0.16
DR105	2	EPA SI	8/19/1998	Zinc	115	mg/kg dw		2.07		410	960	mg/kg dw	0.28	0.12
DR107	2.1	EPA SI	8/19/1998	Zinc	148	mg/kg dw		2.5		410	960	mg/kg dw	0.36	0.15
DR108	2.1	EPA SI	8/19/1998	Zinc	153	mg/kg dw		2.33		410	960	mg/kg dw	0.37	0.16
DR109	2.1	EPA SI	9/1/1998	Zinc	175	mg/kg dw		2.35		410	960	mg/kg dw	0.43	0.18
DR110	2.1	EPA SI	8/19/1998	Zinc	126	mg/kg dw		2.67		410	960	mg/kg dw	0.31	0.13
DR111	2.1	EPA SI	8/19/1998	Zinc	120	mg/kg dw		2.26		410	960	mg/kg dw	0.29	0.13
DR112	2.1	EPA SI	8/19/1998	Zinc	111	mg/kg dw		2.64		410	960	mg/kg dw	0.27	0.12
DR114	2.3	EPA SI	8/19/1998	Zinc	124	mg/kg dw		2.51		410	960	mg/kg dw	0.3	0.13
DR115	2.3	EPA SI	9/14/1998	Zinc	111	mg/kg dw		1.3		410	960	mg/kg dw	0.27	0.12
DR148	2.1	EPA SI	8/18/1998	Zinc	93	mg/kg dw		4.51		410	960	mg/kg dw	0.23	0.097
DR149	2.3	EPA SI	8/19/1998	Zinc	100	mg/kg dw		2.01		410	960	mg/kg dw	0.24	0.1
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Zinc	75	mg/kg dw		0.972		410	960	mg/kg dw	0.18	0.078
LDW-SS329	2	LDWRI-SurfaceSedimentRound3	10/2/2006	Zinc	74	mg/kg dw		1.59		410	960	mg/kg dw	0.18	0.077
LDW-SS330	2.1	LDWRI-SurfaceSedimentRound3	10/2/2006	Zinc	170	mg/kg dw		2.57		410	960	mg/kg dw	0.41	0.18
LDW-SS73	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Zinc	133	mg/kg dw		2.43		410	960	mg/kg dw	0.32	0.14
LDW-SS74	2	LDWRI-SurfaceSedimentRound2	3/7/2005	Zinc	401	mg/kg dw		1.46		410	960	mg/kg dw	0.98	0.42
LDW-SS76	2.1	LDWRI-SurfaceSedimentRound1	1/20/2005	Zinc	134	mg/kg dw		2.17		410	960	mg/kg dw	0.33	0.14
LDW-SS77	2.2	LDWRI-SurfaceSedimentRound2	3/14/2005	Zinc	259	mg/kg dw	J	2.08		410	960	mg/kg dw	0.63	0.27
LDW-SS78	2.1	LDWRI-SurfaceSedimentRound2	3/7/2005	Zinc	142	mg/kg dw		2.55		410	960	mg/kg dw	0.35	0.15
LDW-SS81	2.2	LDWRI-SurfaceSedimentRound2	3/8/2005	Zinc	159	mg/kg dw		2.47		410	960	mg/kg dw	0.39	0.17

Key:

DW - Dry weight

CSL - Cleanup Screening Level

OC - Organic carbon

TOC - Total organic carbon

SQS - Sediment Quality Standard

Notes:

1. SQS and CSL values are substituted with AET values for dry weight comparison where organic compounds are not OC-normalized (when TOC % DW is outside of the 0.5-4.0% range).
2. Exceedance factors are the ratio of the detected concentration to the CSL or SQS (or to AET values where applicable); chemicals with one or more exceedance factors greater than 1 are highlighted.

Source:

Lower Duwamish Waterway Group, 2007. Online Lower Duwamish Waterway Group Draft Remedial Investigation Report (November 2007) Database. http://www.ldwg.org.

Table A-2
Contaminants Detected in Subsurface Sediment
RM 2.0-2.3 East

Sample Location Name	Sample River Mile Location	Sample Depth Interval (feet)	Sampling Event	Sampling Event Year	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	1,2,4-Trichlorobenzene	0.0042	mg/kg dw	J	2.67	0.16	0.81	1.8	mg/kg OC	0.2	0.089
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	1,2,4-Trichlorobenzene	0.046	mg/kg dw		2.24	2.1	0.81	1.8	mg/kg OC	2.6	1.2
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	1,2-Dichlorobenzene	0.0042	mg/kg dw	J	2.25	0.19	2.3	2.3	mg/kg OC	0.083	0.083
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	1,2-Dichlorobenzene	0.0096	mg/kg dw		2.67	0.36	2.3	2.3	mg/kg OC	0.16	0.16
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	1,2-Dichlorobenzene	0.15	mg/kg dw		2.24	6.7	2.3	2.3	mg/kg OC	2.9	2.9
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	1,4-Dichlorobenzene	0.0054	mg/kg dw	J	2.25	0.24	3.1	9	mg/kg OC	0.077	0.027
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	1,4-Dichlorobenzene	0.021	mg/kg dw		2.24	0.94	3.1	9	mg/kg OC	0.3	0.1
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	1-Methylnaphthalene	0.27	mg/kg dw		2.24						
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	2,4-Dimethylphenol	11	ug/kg dw	J	2.67		29	29	ug/kg dw	0.38	0.38
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	2-Methylnaphthalene	0.33	mg/kg dw		2.24	15	38	64	mg/kg OC	0.39	0.23
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	2-Methylphenol	16	ug/kg dw	J	2.67		63	63	ug/kg dw	0.25	0.25
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	2-Methylphenol	5.7	ug/kg dw	J	2.24		63	63	ug/kg dw	0.09	0.09
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	4-Methylphenol	110	ug/kg dw	J	2.24		670	670	ug/kg dw	0.16	0.16
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Acenaphthene	0.12	mg/kg dw		2.67	4.5	16	57	mg/kg OC	0.28	0.079
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Acenaphthene	0.62	mg/kg dw		2.24	28	16	57	mg/kg OC	1.8	0.49
DR106	2.1	2 to 4	EPA SI	1998	Acenaphthylene	0.03	mg/kg dw		1.9	1.6	66	66	mg/kg OC	0.024	0.024
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Acenaphthylene	0.077	mg/kg dw	J	2.25	3.4	66	66	mg/kg OC	0.052	0.052
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Acenaphthylene	0.16	mg/kg dw		2.67	6	66	66	mg/kg OC	0.091	0.091
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Acenaphthylene	0.064	mg/kg dw	J	2.24	2.9	66	66	mg/kg OC	0.044	0.044
DR106	2.1	0 to 2	EPA SI	1998	Aluminum	22000	mg/kg dw		2.1						
DR106	2.1	2 to 4	EPA SI	1998	Aluminum	23000	mg/kg dw		1.9						
DR112	2.1	0 to 2	EPA SI	1998	Aluminum	26000	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Aluminum	26000	mg/kg dw		2.93						
DR106	2.1	0 to 2	EPA SI	1998	Anthracene	0.03	mg/kg dw		2.1	1.4	220	1200	mg/kg OC	0.0064	0.0012
DR106	2.1	2 to 4	EPA SI	1998	Anthracene	0.04	mg/kg dw		1.9	2.1	220	1200	mg/kg OC	0.0095	0.0018
DR112	2.1	0 to 2	EPA SI	1998	Anthracene	0.12	mg/kg dw		2.47	4.9	220	1200	mg/kg OC	0.022	0.0041
DR112	2.1	2 to 4	EPA SI	1998	Anthracene	0.09	mg/kg dw		2.93	3.1	220	1200	mg/kg OC	0.014	0.0026
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Anthracene	0.014	mg/kg dw	J	1.27	1.1	220	1200	mg/kg OC	0.005	0.00092
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Anthracene	0.029	mg/kg dw	J	1.42	2	220	1200	mg/kg OC	0.0091	0.0017
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Anthracene	0.22	mg/kg dw		2.25	9.8	220	1200	mg/kg OC	0.045	0.0082
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Anthracene	0.67	mg/kg dw		2.67	25	220	1200	mg/kg OC	0.11	0.021
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Anthracene	1.2	mg/kg dw		2.24	54	220	1200	mg/kg OC	0.25	0.045
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Antimony	30	mg/kg dw	J	2.25						
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Antimony	30	mg/kg dw	J	2.67						
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Antimony	590	mg/kg dw	J	2.24						
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Antimony	8	mg/kg dw	J	0.543						
DR106	2.1	0 to 2	EPA SI	1998	Arsenic	12	mg/kg dw		2.1		57	93	mg/kg dw	0.21	0.13
DR106	2.1	2 to 4	EPA SI	1998	Arsenic	11	mg/kg dw		1.9		57	93	mg/kg dw	0.19	0.12
DR112	2.1	0 to 2	EPA SI	1998	Arsenic	13	mg/kg dw		2.47		57	93	mg/kg dw	0.23	0.14
DR112	2.1	2 to 4	EPA SI	1998	Arsenic	14	mg/kg dw		2.93		57	93	mg/kg dw	0.25	0.15
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Arsenic	13	mg/kg dw		1.27		57	93	mg/kg dw	0.23	0.14
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Arsenic	12	mg/kg dw		1.75		57	93	mg/kg dw	0.21	0.13
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Arsenic	9	mg/kg dw		1.24		57	93	mg/kg dw	0.16	0.097
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Arsenic	12	mg/kg dw		1.42		57	93	mg/kg dw	0.21	0.13
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Arsenic	11	mg/kg dw		1.46		57	93	mg/kg dw	0.19	0.12
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Arsenic	10	mg/kg dw		1.32		57	93	mg/kg dw	0.18	0.11
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Arsenic	150	mg/kg dw		2.25		57	93	mg/kg dw	2.6	1.6
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Arsenic	121	mg/kg dw		2.67		57	93	mg/kg dw	2.1	1.3
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Arsenic	2000	mg/kg dw		2.24		57	93	mg/kg dw	35	22

Sample Location Name	Sample River Mile Location	Sample Depth Interval (feet)	Sampling Event	Sampling Event Year	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Arsenic	21	mg/kg dw		0.543		57	93	mg/kg dw	0.37	0.23
DR106	2.1	0 to 2	EPA SI	1998	Barium	81	mg/kg dw		2.1						
DR106	2.1	2 to 4	EPA SI	1998	Barium	65	mg/kg dw		1.9						
DR112	2.1	0 to 2	EPA SI	1998	Barium	92	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Barium	110	mg/kg dw		2.93						
DR106	2.1	0 to 2	EPA SI	1998	Benzo(a)anthracene	0.08	mg/kg dw		2.1	3.8	110	270	mg/kg OC	0.035	0.014
DR106	2.1	2 to 4	EPA SI	1998	Benzo(a)anthracene	0.17	mg/kg dw		1.9	8.9	110	270	mg/kg OC	0.081	0.033
DR112	2.1	0 to 2	EPA SI	1998	Benzo(a)anthracene	0.23	mg/kg dw		2.47	9.3	110	270	mg/kg OC	0.085	0.034
DR112	2.1	2 to 4	EPA SI	1998	Benzo(a)anthracene	0.3	mg/kg dw		2.93	10	110	270	mg/kg OC	0.091	0.037
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(a)anthracene	0.051	mg/kg dw		1.27	4	110	270	mg/kg OC	0.036	0.015
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(a)anthracene	0.028	mg/kg dw	J	1.75	1.6	110	270	mg/kg OC	0.015	0.0059
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(a)anthracene	0.081	mg/kg dw		1.42	5.7	110	270	mg/kg OC	0.052	0.021
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(a)anthracene	0.03	mg/kg dw	J	1.46	2.1	110	270	mg/kg OC	0.019	0.0078
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(a)anthracene	1.1	mg/kg dw		2.25	49	110	270	mg/kg OC	0.45	0.18
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(a)anthracene	3.1	mg/kg dw		2.67	120	110	270	mg/kg OC	1.1	0.44
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Benzo(a)anthracene	4.5	mg/kg dw		2.24	200	110	270	mg/kg OC	1.8	0.74
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Benzo(a)anthracene	0.039	mg/kg dw	J	0.543	7.2	110	270	mg/kg OC	0.065	0.027
DR106	2.1	0 to 2	EPA SI	1998	Benzo(a)pyrene	0.09	mg/kg dw		2.1	4.3	99	210	mg/kg OC	0.043	0.02
DR106	2.1	2 to 4	EPA SI	1998	Benzo(a)pyrene	0.19	mg/kg dw		1.9	10	99	210	mg/kg OC	0.1	0.048
DR112	2.1	0 to 2	EPA SI	1998	Benzo(a)pyrene	0.24	mg/kg dw		2.47	9.7	99	210	mg/kg OC	0.098	0.046
DR112	2.1	2 to 4	EPA SI	1998	Benzo(a)pyrene	0.4	mg/kg dw		2.93	14	99	210	mg/kg OC	0.14	0.067
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(a)pyrene	0.056	mg/kg dw		1.27	4.4	99	210	mg/kg OC	0.044	0.021
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(a)pyrene	0.02	mg/kg dw	J	1.75	1.1	99	210	mg/kg OC	0.011	0.0052
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(a)pyrene	0.074	mg/kg dw		1.42	5.2	99	210	mg/kg OC	0.053	0.025
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(a)pyrene	0.02	mg/kg dw	J	1.46	1.4	99	210	mg/kg OC	0.014	0.0067
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(a)pyrene	2	mg/kg dw		2.25	89	99	210	mg/kg OC	0.9	0.42
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(a)pyrene	5.3	mg/kg dw		2.67	200	99	210	mg/kg OC	2	0.95
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Benzo(a)pyrene	4	mg/kg dw		2.24	180	99	210	mg/kg OC	1.8	0.86
DR106	2.1	0 to 2	EPA SI	1998	Benzo(b)fluoranthene	0.09	mg/kg dw		2.1						
DR106	2.1	2 to 4	EPA SI	1998	Benzo(b)fluoranthene	0.14	mg/kg dw		1.9						
DR112	2.1	0 to 2	EPA SI	1998	Benzo(b)fluoranthene	0.31	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Benzo(b)fluoranthene	0.45	mg/kg dw		2.93						
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(b)fluoranthene	0.12	mg/kg dw		1.27						
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(b)fluoranthene	0.029	mg/kg dw	J	1.75						
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(b)fluoranthene	0.092	mg/kg dw		1.42						
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(b)fluoranthene	0.025	mg/kg dw	J	1.46						
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(b)fluoranthene	3	mg/kg dw		2.25						
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(b)fluoranthene	6.4	mg/kg dw		2.67						
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Benzo(b)fluoranthene	5	mg/kg dw		2.24						
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Benzo(b)fluoranthene	0.033	mg/kg dw	J	0.543						
DR106	2.1	0 to 2	EPA SI	1998	Benzo(g,h,i)perylene	0.07	mg/kg dw		2.1	3.3	31	78	mg/kg OC	0.11	0.042
DR106	2.1	2 to 4	EPA SI	1998	Benzo(g,h,i)perylene	0.11	mg/kg dw		1.9	5.8	31	78	mg/kg OC	0.19	0.074
DR112	2.1	0 to 2	EPA SI	1998	Benzo(g,h,i)perylene	0.16	mg/kg dw		2.47	6.5	31	78	mg/kg OC	0.21	0.083
DR112	2.1	2 to 4	EPA SI	1998	Benzo(g,h,i)perylene	0.23	mg/kg dw		2.93	7.8	31	78	mg/kg OC	0.25	0.1
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(g,h,i)perylene	0.016	mg/kg dw	J	1.27	1.3	31	78	mg/kg OC	0.042	0.017
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(g,h,i)perylene	0.031	mg/kg dw	J	1.42	2.2	31	78	mg/kg OC	0.071	0.028
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(g,h,i)perylene	0.53	mg/kg dw		2.25	24	31	78	mg/kg OC	0.77	0.31
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(g,h,i)perylene	1	mg/kg dw		2.67	37	31	78	mg/kg OC	1.2	0.47
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Benzo(g,h,i)perylene	0.83	mg/kg dw		2.24	37	31	78	mg/kg OC	1.2	0.47
DR106	2.1	0 to 2	EPA SI	1998	Benzo(k)fluoranthene	0.08	mg/kg dw		2.1						
DR106	2.1	2 to 4	EPA SI	1998	Benzo(k)fluoranthene	0.15	mg/kg dw		1.9						
DR112	2.1	0 to 2	EPA SI	1998	Benzo(k)fluoranthene	0.23	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Benzo(k)fluoranthene	0.41	mg/kg dw		2.93						

Sample Location Name	Sample River Mile Location	Sample Depth Interval (feet)	Sampling Event	Sampling Event Year	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(k)fluoranthene	0.091	mg/kg dw		1.27						
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(k)fluoranthene	0.027	mg/kg dw	J	1.75						
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(k)fluoranthene	0.096	mg/kg dw		1.42						
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(k)fluoranthene	0.028	mg/kg dw	J	1.46						
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzo(k)fluoranthene	2.1	mg/kg dw		2.25						
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzo(k)fluoranthene	3.8	mg/kg dw		2.67						
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Benzo(k)fluoranthene	4.1	mg/kg dw		2.24						
DR106	2.1	0 to 2	EPA SI	1998	Benzofluoranthenes (total-calc'd)	0.17	mg/kg dw		2.1	8.1	230	450	mg/kg OC	0.035	0.018
DR106	2.1	2 to 4	EPA SI	1998	Benzofluoranthenes (total-calc'd)	0.29	mg/kg dw		1.9	15	230	450	mg/kg OC	0.065	0.033
DR112	2.1	0 to 2	EPA SI	1998	Benzofluoranthenes (total-calc'd)	0.54	mg/kg dw		2.47	22	230	450	mg/kg OC	0.096	0.049
DR112	2.1	2 to 4	EPA SI	1998	Benzofluoranthenes (total-calc'd)	0.86	mg/kg dw		2.93	29	230	450	mg/kg OC	0.13	0.064
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzofluoranthenes (total-calc'd)	0.21	mg/kg dw		1.27	17	230	450	mg/kg OC	0.074	0.038
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzofluoranthenes (total-calc'd)	0.056	mg/kg dw	J	1.75	3.2	230	450	mg/kg OC	0.014	0.0071
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzofluoranthenes (total-calc'd)	0.188	mg/kg dw		1.42	13	230	450	mg/kg OC	0.057	0.029
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzofluoranthenes (total-calc'd)	0.053	mg/kg dw	J	1.46	3.6	230	450	mg/kg OC	0.016	0.008
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzofluoranthenes (total-calc'd)	5.1	mg/kg dw		2.25	230	230	450	mg/kg OC	1	0.51
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzofluoranthenes (total-calc'd)	10.2	mg/kg dw		2.67	380	230	450	mg/kg OC	1.7	0.84
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Benzofluoranthenes (total-calc'd)	9.1	mg/kg dw		2.24	410	230	450	mg/kg OC	1.8	0.91
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Benzofluoranthenes (total-calc'd)	0.033	mg/kg dw	J	0.543	6.1	230	450	mg/kg OC	0.027	0.014
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzoic acid	140	ug/kg dw		2.25		650	650	ug/kg dw	0.22	0.22
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzoic acid	130	ug/kg dw		2.67		650	650	ug/kg dw	0.2	0.2
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Benzoic acid	230	ug/kg dw		2.24		650	650	ug/kg dw	0.35	0.35
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Benzyl alcohol	22	ug/kg dw	J	2.25		57	73	ug/kg dw	0.39	0.3
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Benzyl alcohol	22	ug/kg dw	J	2.67		57	73	ug/kg dw	0.39	0.3
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Benzyl alcohol	34	ug/kg dw	J	2.24		57	73	ug/kg dw	0.6	0.47
DR106	2.1	0 to 2	EPA SI	1998	Beryllium	0.33	mg/kg dw		2.1						
DR106	2.1	2 to 4	EPA SI	1998	Beryllium	0.33	mg/kg dw		1.9						
DR112	2.1	0 to 2	EPA SI	1998	Beryllium	0.37	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Beryllium	0.41	mg/kg dw		2.93						
DR106	2.1	0 to 2	EPA SI	1998	Bis(2-ethylhexyl)phthalate	0.08	mg/kg dw		2.1	3.8	47	78	mg/kg OC	0.081	0.049
DR112	2.1	0 to 2	EPA SI	1998	Bis(2-ethylhexyl)phthalate	0.38	mg/kg dw		2.47	15	47	78	mg/kg OC	0.32	0.19
DR112	2.1	2 to 4	EPA SI	1998	Bis(2-ethylhexyl)phthalate	0.57	mg/kg dw		2.93	19	47	78	mg/kg OC	0.4	0.24
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Bis(2-ethylhexyl)phthalate	0.054	mg/kg dw	J	1.27	4.3	47	78	mg/kg OC	0.091	0.055
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Bis(2-ethylhexyl)phthalate	0.073	mg/kg dw		1.42	5.1	47	78	mg/kg OC	0.11	0.065
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Bis(2-ethylhexyl)phthalate	0.85	mg/kg dw		2.25	38	47	78	mg/kg OC	0.81	0.49
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Bis(2-ethylhexyl)phthalate	1.1	mg/kg dw	J	2.67	41	47	78	mg/kg OC	0.87	0.53
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Bis(2-ethylhexyl)phthalate	0.54	mg/kg dw	J	2.24	24	47	78	mg/kg OC	0.51	0.31
DR112	2.1	0 to 2	EPA SI	1998	Butyl benzyl phthalate	0.06	mg/kg dw		2.47	2.4	4.9	64	mg/kg OC	0.49	0.038
DR112	2.1	2 to 4	EPA SI	1998	Butyl benzyl phthalate	0.05	mg/kg dw		2.93	1.7	4.9	64	mg/kg OC	0.35	0.027
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Butyl benzyl phthalate	0.0095	mg/kg dw		1.27	0.75	4.9	64	mg/kg OC	0.15	0.012
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Butyl benzyl phthalate	0.0058	mg/kg dw	J	1.32	0.44	4.9	64	mg/kg OC	0.09	0.0069
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Butyl benzyl phthalate	0.041	mg/kg dw	J	2.25	1.8	4.9	64	mg/kg OC	0.37	0.028
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Butyl benzyl phthalate	0.051	mg/kg dw		2.67	1.9	4.9	64	mg/kg OC	0.39	0.03
DR106	2.1	0 to 2	EPA SI	1998	Cadmium	0.3	mg/kg dw		2.1		5.1	6.7	mg/kg dw	0.059	0.045
DR106	2.1	2 to 4	EPA SI	1998	Cadmium	0.3	mg/kg dw		1.9		5.1	6.7	mg/kg dw	0.059	0.045
DR112	2.1	0 to 2	EPA SI	1998	Cadmium	0.3	mg/kg dw		2.47		5.1	6.7	mg/kg dw	0.059	0.045
DR112	2.1	2 to 4	EPA SI	1998	Cadmium	0.4	mg/kg dw		2.93		5.1	6.7	mg/kg dw	0.078	0.06
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Cadmium	0.3	mg/kg dw		1.42		5.1	6.7	mg/kg dw	0.059	0.045
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Cadmium	0.7	mg/kg dw		2.67		5.1	6.7	mg/kg dw	0.14	0.1
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Cadmium	4	mg/kg dw		2.24		5.1	6.7	mg/kg dw	0.78	0.6
DR112	2.1	0 to 2	EPA SI	1998	Carbazole	0.03	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Carbazole	0.03	mg/kg dw		2.93						
DR106	2.1	0 to 2	EPA SI	1998	Chromium	29	mg/kg dw		2.1		260	270	mg/kg dw	0.11	0.11

Sample Location Name	Sample River Mile Location	Sample Depth Interval (feet)	Sampling Event	Sampling Event Year	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR106	2.1	2 to 4	EPA SI	1998	Chromium	28	mg/kg dw		1.9		260	270	mg/kg dw	0.11	0.1
DR112	2.1	0 to 2	EPA SI	1998	Chromium	33	mg/kg dw		2.47		260	270	mg/kg dw	0.13	0.12
DR112	2.1	2 to 4	EPA SI	1998	Chromium	34	mg/kg dw		2.93		260	270	mg/kg dw	0.13	0.13
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Chromium	24.8	mg/kg dw		1.27		260	270	mg/kg dw	0.095	0.092
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Chromium	23.3	mg/kg dw		1.75		260	270	mg/kg dw	0.09	0.086
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Chromium	17.7	mg/kg dw		1.24		260	270	mg/kg dw	0.068	0.066
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Chromium	24.4	mg/kg dw		1.42		260	270	mg/kg dw	0.094	0.09
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Chromium	25.2	mg/kg dw		1.46		260	270	mg/kg dw	0.097	0.093
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Chromium	17.3	mg/kg dw		1.32		260	270	mg/kg dw	0.067	0.064
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Chromium	48	mg/kg dw		2.25		260	270	mg/kg dw	0.18	0.18
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Chromium	44.7	mg/kg dw		2.67		260	270	mg/kg dw	0.17	0.17
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Chromium	126	mg/kg dw		2.24		260	270	mg/kg dw	0.48	0.47
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Chromium	10.3	mg/kg dw		0.543		260	270	mg/kg dw	0.04	0.038
DR106	2.1	0 to 2	EPA SI	1998	Chrysene	0.09	mg/kg dw		2.1	4.3	110	460	mg/kg OC	0.039	0.0093
DR106	2.1	2 to 4	EPA SI	1998	Chrysene	0.18	mg/kg dw		1.9	9.5	110	460	mg/kg OC	0.086	0.021
DR112	2.1	0 to 2	EPA SI	1998	Chrysene	0.31	mg/kg dw		2.47	13	110	460	mg/kg OC	0.12	0.028
DR112	2.1	2 to 4	EPA SI	1998	Chrysene	0.47	mg/kg dw		2.93	16	110	460	mg/kg OC	0.15	0.035
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Chrysene	0.072	mg/kg dw		1.27	5.7	110	460	mg/kg OC	0.052	0.012
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Chrysene	0.03	mg/kg dw	J	1.75	1.7	110	460	mg/kg OC	0.015	0.0037
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Chrysene	0.11	mg/kg dw		1.42	7.7	110	460	mg/kg OC	0.07	0.017
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Chrysene	0.036	mg/kg dw	J	1.46	2.5	110	460	mg/kg OC	0.023	0.0054
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Chrysene	1.6	mg/kg dw		2.25	71	110	460	mg/kg OC	0.65	0.15
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Chrysene	4.8	mg/kg dw		2.67	180	110	460	mg/kg OC	1.6	0.39
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Chrysene	5	mg/kg dw		2.24	220	110	460	mg/kg OC	2	0.48
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Chrysene	0.04	mg/kg dw	J	0.543	7.4	110	460	mg/kg OC	0.067	0.016
DR106	2.1	0 to 2	EPA SI	1998	Cobalt	9	mg/kg dw		2.1						
DR106	2.1	2 to 4	EPA SI	1998	Cobalt	9	mg/kg dw		1.9						
DR112	2.1	0 to 2	EPA SI	1998	Cobalt	11	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Cobalt	11	mg/kg dw		2.93						
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Cobalt	8.1	mg/kg dw		1.27						
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Cobalt	8	mg/kg dw		1.75						
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Cobalt	6.5	mg/kg dw		1.24						
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Cobalt	7.6	mg/kg dw		1.42						
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Cobalt	7.8	mg/kg dw		1.46						
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Cobalt	6.2	mg/kg dw		1.32						
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Cobalt	18	mg/kg dw		2.25						
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Cobalt	12.2	mg/kg dw		2.67						
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Cobalt	100	mg/kg dw		2.24						
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Cobalt	4.9	mg/kg dw		0.543						
DR106	2.1	0 to 2	EPA SI	1998	Copper	50	mg/kg dw		2.1		390	390	mg/kg dw	0.13	0.13
DR106	2.1	2 to 4	EPA SI	1998	Copper	46	mg/kg dw		1.9		390	390	mg/kg dw	0.12	0.12
DR112	2.1	0 to 2	EPA SI	1998	Copper	57	mg/kg dw		2.47		390	390	mg/kg dw	0.15	0.15
DR112	2.1	2 to 4	EPA SI	1998	Copper	72	mg/kg dw		2.93		390	390	mg/kg dw	0.18	0.18
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Copper	56.3	mg/kg dw		1.27		390	390	mg/kg dw	0.14	0.14
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Copper	37.6	mg/kg dw		1.75		390	390	mg/kg dw	0.096	0.096
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Copper	25.6	mg/kg dw		1.24		390	390	mg/kg dw	0.066	0.066
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Copper	45.8	mg/kg dw		1.42		390	390	mg/kg dw	0.12	0.12
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Copper	36.9	mg/kg dw		1.46		390	390	mg/kg dw	0.095	0.095
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Copper	24.5	mg/kg dw		1.32		390	390	mg/kg dw	0.063	0.063
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Copper	236	mg/kg dw		2.25		390	390	mg/kg dw	0.61	0.61
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Copper	330	mg/kg dw		2.67		390	390	mg/kg dw	0.85	0.85
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Copper	2940	mg/kg dw		2.24		390	390	mg/kg dw	7.5	7.5
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Copper	21.3	mg/kg dw		0.543		390	390	mg/kg dw	0.055	0.055

Sample Location Name	Sample River Mile Location	Sample Depth Interval (feet)	Sampling Event	Sampling Event Year	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR106	2.1	2 to 4	EPA SI	1998	Dibenzo(a,h)anthracene	0.03	mg/kg dw		1.9	1.6	12	33	mg/kg OC	0.13	0.048
DR112	2.1	0 to 2	EPA SI	1998	Dibenzo(a,h)anthracene	0.04	mg/kg dw		2.47	1.6	12	33	mg/kg OC	0.13	0.048
DR112	2.1	2 to 4	EPA SI	1998	Dibenzo(a,h)anthracene	0.07	mg/kg dw		2.93	2.4	12	33	mg/kg OC	0.2	0.073
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Dibenzo(a,h)anthracene	0.17	mg/kg dw		2.25	7.6	12	33	mg/kg OC	0.63	0.23
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Dibenzo(a,h)anthracene	0.36	mg/kg dw		2.67	13	12	33	mg/kg OC	1.1	0.39
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Dibenzo(a,h)anthracene	0.27	mg/kg dw		2.24	12	12	33	mg/kg OC	1	0.36
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Dibenzo(a,h)anthracene	0.014	mg/kg dw		0.543	2.6	12	33	mg/kg OC	0.22	0.079
DR112	2.1	0 to 2	EPA SI	1998	Dibenzofuran	0.02	mg/kg dw		2.47	0.81	15	58	mg/kg OC	0.054	0.014
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Dibenzofuran	0.088	mg/kg dw	J	2.67	3.3	15	58	mg/kg OC	0.22	0.057
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Dibenzofuran	0.57	mg/kg dw		2.24	25	15	58	mg/kg OC	1.7	0.43
DR112	2.1	0 to 2	EPA SI	1998	Dibutyltin as ion	0.017	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Dibutyltin as ion	0.057	mg/kg dw		2.93						
DR106	2.1	2 to 4	EPA SI	1998	Di-n-butyl phthalate	0.03	mg/kg dw		1.9	1.6	220	1700	mg/kg OC	0.0073	0.00094
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Di-n-butyl phthalate	0.014	mg/kg dw	J	1.27	1.1	220	1700	mg/kg OC	0.005	0.00065
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Di-n-butyl phthalate	0.024	mg/kg dw	J	1.42	1.7	220	1700	mg/kg OC	0.0077	0.001
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Di-n-octyl phthalate	0.079	mg/kg dw	J	2.67	3	58	4500	mg/kg OC	0.052	0.00067
DR106	2.1	0 to 2	EPA SI	1998	Fluoranthene	0.16	mg/kg dw		2.1	7.6	160	1200	mg/kg OC	0.048	0.0063
DR106	2.1	2 to 4	EPA SI	1998	Fluoranthene	0.23	mg/kg dw		1.9	12	160	1200	mg/kg OC	0.075	0.01
DR112	2.1	0 to 2	EPA SI	1998	Fluoranthene	0.55	mg/kg dw		2.47	22	160	1200	mg/kg OC	0.14	0.018
DR112	2.1	2 to 4	EPA SI	1998	Fluoranthene	0.47	mg/kg dw		2.93	16	160	1200	mg/kg OC	0.1	0.013
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Fluoranthene	0.11	mg/kg dw		1.27	8.7	160	1200	mg/kg OC	0.054	0.0073
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Fluoranthene	0.069	mg/kg dw		1.75	3.9	160	1200	mg/kg OC	0.024	0.0033
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Fluoranthene	0.042	mg/kg dw		1.24	3.4	160	1200	mg/kg OC	0.021	0.0028
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Fluoranthene	0.16	mg/kg dw		1.42	11	160	1200	mg/kg OC	0.069	0.0092
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Fluoranthene	0.065	mg/kg dw		1.46	4.5	160	1200	mg/kg OC	0.028	0.0038
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Fluoranthene	0.034	mg/kg dw	J	1.32	2.6	160	1200	mg/kg OC	0.016	0.0022
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Fluoranthene	1.6	mg/kg dw		2.25	71	160	1200	mg/kg OC	0.44	0.059
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Fluoranthene	4.5	mg/kg dw		2.67	170	160	1200	mg/kg OC	1.1	0.14
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Fluoranthene	13	mg/kg dw		2.24	580	160	1200	mg/kg OC	3.6	0.48
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Fluoranthene	0.094	mg/kg dw		0.543	17	160	1200	mg/kg OC	0.11	0.014
DR112	2.1	0 to 2	EPA SI	1998	Fluorene	0.03	mg/kg dw		2.47	1.2	23	79	mg/kg OC	0.052	0.015
DR112	2.1	2 to 4	EPA SI	1998	Fluorene	0.02	mg/kg dw		2.93	0.68	23	79	mg/kg OC	0.03	0.0086
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Fluorene	0.17	mg/kg dw		2.67	6.4	23	79	mg/kg OC	0.28	0.081
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Fluorene	0.75	mg/kg dw		2.24	33	23	79	mg/kg OC	1.4	0.42
DR106	2.1	0 to 2	EPA SI	1998	Indeno(1,2,3-cd)pyrene	0.07	mg/kg dw		2.1	3.3	34	88	mg/kg OC	0.097	0.038
DR106	2.1	2 to 4	EPA SI	1998	Indeno(1,2,3-cd)pyrene	0.12	mg/kg dw		1.9	6.3	34	88	mg/kg OC	0.19	0.072
DR112	2.1	0 to 2	EPA SI	1998	Indeno(1,2,3-cd)pyrene	0.18	mg/kg dw		2.47	7.3	34	88	mg/kg OC	0.21	0.083
DR112	2.1	2 to 4	EPA SI	1998	Indeno(1,2,3-cd)pyrene	0.27	mg/kg dw		2.93	9.2	34	88	mg/kg OC	0.27	0.1
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Indeno(1,2,3-cd)pyrene	0.019	mg/kg dw	J	1.27	1.5	34	88	mg/kg OC	0.044	0.017
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Indeno(1,2,3-cd)pyrene	0.035	mg/kg dw	J	1.42	2.5	34	88	mg/kg OC	0.074	0.028
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Indeno(1,2,3-cd)pyrene	0.75	mg/kg dw		2.25	33	34	88	mg/kg OC	0.97	0.38
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Indeno(1,2,3-cd)pyrene	1.5	mg/kg dw		2.67	56	34	88	mg/kg OC	1.6	0.64
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Indeno(1,2,3-cd)pyrene	1.2	mg/kg dw		2.24	54	34	88	mg/kg OC	1.6	0.61
DR106	2.1	0 to 2	EPA SI	1998	Iron	29000	mg/kg dw	J	2.1						
DR106	2.1	2 to 4	EPA SI	1998	Iron	30000	mg/kg dw	J	1.9						
DR112	2.1	0 to 2	EPA SI	1998	Iron	32000	mg/kg dw	J	2.47						
DR112	2.1	2 to 4	EPA SI	1998	Iron	33000	mg/kg dw	J	2.93						
DR106	2.1	0 to 2	EPA SI	1998	Lead	30	mg/kg dw		2.1		450	530	mg/kg dw	0.067	0.057
DR106	2.1	2 to 4	EPA SI	1998	Lead	23	mg/kg dw		1.9		450	530	mg/kg dw	0.051	0.043
DR112	2.1	0 to 2	EPA SI	1998	Lead	29	mg/kg dw		2.47		450	530	mg/kg dw	0.064	0.055
DR112	2.1	2 to 4	EPA SI	1998	Lead	51	mg/kg dw		2.93		450	530	mg/kg dw	0.11	0.096
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Lead	19	mg/kg dw		1.27		450	530	mg/kg dw	0.042	0.036
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Lead	16	mg/kg dw		1.75		450	530	mg/kg dw	0.036	0.03

Sample Location Name	Sample River Mile Location	Sample Depth Interval (feet)	Sampling Event	Sampling Event Year	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Lead	6	mg/kg dw		1.24		450	530	mg/kg dw	0.013	0.011
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Lead	26	mg/kg dw		1.42		450	530	mg/kg dw	0.058	0.049
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Lead	16	mg/kg dw		1.46		450	530	mg/kg dw	0.036	0.03
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Lead	7	mg/kg dw		1.32		450	530	mg/kg dw	0.016	0.013
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Lead	121	mg/kg dw	J	2.25		450	530	mg/kg dw	0.27	0.23
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Lead	247	mg/kg dw	J	2.67		450	530	mg/kg dw	0.55	0.47
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Lead	3520	mg/kg dw	J	2.24		450	530	mg/kg dw	7.8	6.6
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Lead	16	mg/kg dw		0.543		450	530	mg/kg dw	0.036	0.03
DR106	2.1	0 to 2	EPA SI	1998	Magnesium	7200	mg/kg dw		2.1						
DR106	2.1	2 to 4	EPA SI	1998	Magnesium	6900	mg/kg dw		1.9						
DR112	2.1	0 to 2	EPA SI	1998	Magnesium	8200	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Magnesium	8300	mg/kg dw		2.93						
DR106	2.1	0 to 2	EPA SI	1998	Manganese	280	mg/kg dw		2.1						
DR106	2.1	2 to 4	EPA SI	1998	Manganese	260	mg/kg dw		1.9						
DR112	2.1	0 to 2	EPA SI	1998	Manganese	360	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Manganese	340	mg/kg dw		2.93						
DR106	2.1	0 to 2	EPA SI	1998	Mercury	0.24	mg/kg dw		2.1		0.41	0.59	mg/kg dw	0.59	0.41
DR106	2.1	2 to 4	EPA SI	1998	Mercury	0.25	mg/kg dw		1.9		0.41	0.59	mg/kg dw	0.61	0.42
DR112	2.1	0 to 2	EPA SI	1998	Mercury	0.17	mg/kg dw		2.47		0.41	0.59	mg/kg dw	0.41	0.29
DR112	2.1	2 to 4	EPA SI	1998	Mercury	0.17	mg/kg dw		2.93		0.41	0.59	mg/kg dw	0.41	0.29
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Mercury	0.14	mg/kg dw		1.27		0.41	0.59	mg/kg dw	0.34	0.24
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Mercury	0.21	mg/kg dw		1.75		0.41	0.59	mg/kg dw	0.51	0.36
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Mercury	0.11	mg/kg dw		1.24		0.41	0.59	mg/kg dw	0.27	0.19
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Mercury	0.28	mg/kg dw		1.42		0.41	0.59	mg/kg dw	0.68	0.47
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Mercury	0.33	mg/kg dw		1.46		0.41	0.59	mg/kg dw	0.8	0.56
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Mercury	0.13	mg/kg dw		1.32		0.41	0.59	mg/kg dw	0.32	0.22
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Mercury	0.26	mg/kg dw	J	2.25		0.41	0.59	mg/kg dw	0.63	0.44
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Mercury	0.45	mg/kg dw	J	2.67		0.41	0.59	mg/kg dw	1.1	0.76
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Mercury	0.37	mg/kg dw	J	2.24		0.41	0.59	mg/kg dw	0.9	0.63
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Molybdenum	0.9	mg/kg dw		1.42						
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Molybdenum	9	mg/kg dw		2.25						
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Molybdenum	9.3	mg/kg dw		2.67						
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Molybdenum	113	mg/kg dw		2.24						
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Molybdenum	1.6	mg/kg dw		0.543						
DR112	2.1	0 to 2	EPA SI	1998	Monobutyltin as ion	0.008	mg/kg dw	J	2.47						
DR112	2.1	2 to 4	EPA SI	1998	Monobutyltin as ion	0.018	mg/kg dw	J	2.93						
DR106	2.1	0 to 2	EPA SI	1998	Naphthalene	0.02	mg/kg dw		2.1	0.95	99	170	mg/kg OC	0.0096	0.0056
DR106	2.1	2 to 4	EPA SI	1998	Naphthalene	0.02	mg/kg dw		1.9	1.1	99	170	mg/kg OC	0.011	0.0065
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Naphthalene	0.087	mg/kg dw	J	2.67	3.3	99	170	mg/kg OC	0.033	0.019
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Naphthalene	0.4	mg/kg dw		2.24	18	99	170	mg/kg OC	0.18	0.11
DR106	2.1	0 to 2	EPA SI	1998	Nickel	22	mg/kg dw		2.1						
DR106	2.1	2 to 4	EPA SI	1998	Nickel	21	mg/kg dw		1.9						
DR112	2.1	0 to 2	EPA SI	1998	Nickel	25	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Nickel	25	mg/kg dw		2.93						
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Nickel	21	mg/kg dw		1.27						
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Nickel	18	mg/kg dw		1.75						
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Nickel	14	mg/kg dw		1.24						
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Nickel	19	mg/kg dw		1.42						
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Nickel	22	mg/kg dw		1.46						
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Nickel	13	mg/kg dw		1.32						
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Nickel	35	mg/kg dw		2.25						
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Nickel	20	mg/kg dw		2.67						
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Nickel	48	mg/kg dw		2.24						

Sample Location Name	Sample River Mile Location	Sample Depth Interval (feet)	Sampling Event	Sampling Event Year	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Nickel	7	mg/kg dw		0.543						
DR106	2.1	0 to 2	EPA SI	1998	PCBs (total calc'd)	0.061	mg/kg dw		2.1	2.9	12	65	mg/kg OC	0.24	0.045
DR112	2.1	0 to 2	EPA SI	1998	PCBs (total calc'd)	0.24	mg/kg dw		2.47	9.7	12	65	mg/kg OC	0.81	0.15
DR112	2.1	2 to 4	EPA SI	1998	PCBs (total calc'd)	0.33	mg/kg dw		2.93	11	12	65	mg/kg OC	0.92	0.17
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	PCBs (total calc'd)	0.03	mg/kg dw		1.27	2.4	12	65	mg/kg OC	0.2	0.037
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	PCBs (total calc'd)	0.075	mg/kg dw		1.42	5.3	12	65	mg/kg OC	0.44	0.082
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	PCBs (total calc'd)	0.45	mg/kg dw		2.25	20	12	65	mg/kg OC	1.7	0.31
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	PCBs (total calc'd)	0.95	mg/kg dw	J	2.67	36	12	65	mg/kg OC	3.0	0.55
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	PCBs (total calc'd)	0.55	mg/kg dw		2.24	25	12	65	mg/kg OC	2.1	0.38
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Pentachlorophenol	28	ug/kg dw	J	2.25		360	690	ug/kg dw	0.078	0.041
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Pentachlorophenol	74	ug/kg dw		2.67		360	690	ug/kg dw	0.21	0.11
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Pentachlorophenol	190	ug/kg dw		2.24		360	690	ug/kg dw	0.53	0.28
DR106	2.1	0 to 2	EPA SI	1998	Phenanthrene	0.1	mg/kg dw		2.1	4.8	100	480	mg/kg OC	0.048	0.01
DR106	2.1	2 to 4	EPA SI	1998	Phenanthrene	0.07	mg/kg dw		1.9	3.7	100	480	mg/kg OC	0.037	0.0077
DR112	2.1	0 to 2	EPA SI	1998	Phenanthrene	0.17	mg/kg dw		2.47	6.9	100	480	mg/kg OC	0.069	0.014
DR112	2.1	2 to 4	EPA SI	1998	Phenanthrene	0.18	mg/kg dw		2.93	6.1	100	480	mg/kg OC	0.061	0.013
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Phenanthrene	0.037	mg/kg dw		1.27	2.9	100	480	mg/kg OC	0.029	0.006
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Phenanthrene	0.027	mg/kg dw	J	1.75	1.5	100	480	mg/kg OC	0.015	0.0031
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Phenanthrene	0.024	mg/kg dw	J	1.24	1.9	100	480	mg/kg OC	0.019	0.004
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Phenanthrene	0.051	mg/kg dw		1.42	3.6	100	480	mg/kg OC	0.036	0.0075
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Phenanthrene	0.024	mg/kg dw	J	1.46	1.6	100	480	mg/kg OC	0.016	0.0033
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Phenanthrene	0.35	mg/kg dw		2.25	16	100	480	mg/kg OC	0.16	0.033
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Phenanthrene	1.4	mg/kg dw		2.67	52	100	480	mg/kg OC	0.52	0.11
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Phenanthrene	7.5	mg/kg dw		2.24	330	100	480	mg/kg OC	3.3	0.69
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Phenanthrene	0.046	mg/kg dw	J	0.543	8.5	100	480	mg/kg OC	0.085	0.018
DR106	2.1	0 to 2	EPA SI	1998	Pyrene	0.34	mg/kg dw		2.1	16	1000	1400	mg/kg OC	0.016	0.011
DR106	2.1	2 to 4	EPA SI	1998	Pyrene	0.31	mg/kg dw		1.9	16	1000	1400	mg/kg OC	0.016	0.011
DR112	2.1	0 to 2	EPA SI	1998	Pyrene	0.58	mg/kg dw		2.47	23	1000	1400	mg/kg OC	0.023	0.016
DR112	2.1	2 to 4	EPA SI	1998	Pyrene	0.74	mg/kg dw		2.93	25	1000	1400	mg/kg OC	0.025	0.018
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Pyrene	0.093	mg/kg dw		1.27	7.3	1000	1400	mg/kg OC	0.0073	0.0052
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Pyrene	0.078	mg/kg dw		1.75	4.5	1000	1400	mg/kg OC	0.0045	0.0032
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Pyrene	0.028	mg/kg dw	J	1.24	2.3	1000	1400	mg/kg OC	0.0023	0.0016
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Pyrene	0.15	mg/kg dw		1.42	11	1000	1400	mg/kg OC	0.011	0.0079
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Pyrene	0.07	mg/kg dw		1.46	4.8	1000	1400	mg/kg OC	0.0048	0.0034
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Pyrene	0.022	mg/kg dw	J	1.32	1.7	1000	1400	mg/kg OC	0.0017	0.0012
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Pyrene	2.9	mg/kg dw		2.25	130	1000	1400	mg/kg OC	0.13	0.093
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Pyrene	9.2	mg/kg dw		2.67	340	1000	1400	mg/kg OC	0.34	0.24
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Pyrene	8.9	mg/kg dw		2.24	400	1000	1400	mg/kg OC	0.4	0.29
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Pyrene	0.13	mg/kg dw		0.543	24	1000	1400	mg/kg OC	0.024	0.017
DR106	2.1	0 to 2	EPA SI	1998	Silver	0.28	mg/kg dw		2.1		6.1	6.1	mg/kg dw	0.046	0.046
DR106	2.1	2 to 4	EPA SI	1998	Silver	0.17	mg/kg dw		1.9		6.1	6.1	mg/kg dw	0.028	0.028
DR112	2.1	0 to 2	EPA SI	1998	Silver	0.21	mg/kg dw		2.47		6.1	6.1	mg/kg dw	0.034	0.034
DR112	2.1	2 to 4	EPA SI	1998	Silver	0.45	mg/kg dw		2.93		6.1	6.1	mg/kg dw	0.074	0.074
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Silver	0.9	mg/kg dw		2.67		6.1	6.1	mg/kg dw	0.15	0.15
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Silver	3	mg/kg dw		2.24		6.1	6.1	mg/kg dw	0.49	0.49
DR106	2.1	0 to 2	EPA SI	1998	Thallium	0.04	mg/kg dw	J	2.1						
DR106	2.1	2 to 4	EPA SI	1998	Thallium	0.05	mg/kg dw	J	1.9						
DR106	2.1	0 to 2	EPA SI	1998	Tin	4	mg/kg dw		2.1						
DR106	2.1	2 to 4	EPA SI	1998	Tin	4	mg/kg dw		1.9						
DR112	2.1	0 to 2	EPA SI	1998	Tin	5	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Tin	7	mg/kg dw		2.93						
DR106	2.1	0 to 2	EPA SI	1998	Total HPAH (calc'd)	1.07	mg/kg dw		2.1	51	960	5300	mg/kg OC	0.053	0.0096
DR106	2.1	2 to 4	EPA SI	1998	Total HPAH (calc'd)	1.63	mg/kg dw		1.9	86	960	5300	mg/kg OC	0.09	0.016

Sample Location Name	Sample River Mile Location	Sample Depth Interval (feet)	Sampling Event	Sampling Event Year	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
DR112	2.1	0 to 2	EPA SI	1998	Total HPAH (calc'd)	2.83	mg/kg dw		2.47	110	960	5300	mg/kg OC	0.11	0.021
DR112	2.1	2 to 4	EPA SI	1998	Total HPAH (calc'd)	3.81	mg/kg dw		2.93	130	960	5300	mg/kg OC	0.14	0.025
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Total HPAH (calc'd)	0.63	mg/kg dw	J	1.27	50	960	5300	mg/kg OC	0.052	0.0094
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Total HPAH (calc'd)	0.281	mg/kg dw	J	1.75	16	960	5300	mg/kg OC	0.017	0.003
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Total HPAH (calc'd)	0.07	mg/kg dw	J	1.24	5.6	960	5300	mg/kg OC	0.0058	0.0011
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Total HPAH (calc'd)	0.83	mg/kg dw	J	1.42	58	960	5300	mg/kg OC	0.06	0.011
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Total HPAH (calc'd)	0.274	mg/kg dw	J	1.46	19	960	5300	mg/kg OC	0.02	0.0036
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Total HPAH (calc'd)	0.056	mg/kg dw	J	1.32	4.2	960	5300	mg/kg OC	0.0044	0.00079
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Total HPAH (calc'd)	15.8	mg/kg dw		2.25	700	960	5300	mg/kg OC	0.73	0.13
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Total HPAH (calc'd)	40	mg/kg dw		2.67	1500	960	5300	mg/kg OC	1.6	0.28
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Total HPAH (calc'd)	47	mg/kg dw		2.24	2100	960	5300	mg/kg OC	2.2	0.4
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Total HPAH (calc'd)	0.35	mg/kg dw	J	0.543	64	960	5300	mg/kg OC	0.067	0.012
DR106	2.1	0 to 2	EPA SI	1998	Total LPAH (calc'd)	0.15	mg/kg dw		2.1	7.1	370	780	mg/kg OC	0.019	0.0091
DR106	2.1	2 to 4	EPA SI	1998	Total LPAH (calc'd)	0.16	mg/kg dw		1.9	8.4	370	780	mg/kg OC	0.023	0.011
DR112	2.1	0 to 2	EPA SI	1998	Total LPAH (calc'd)	0.32	mg/kg dw		2.47	13	370	780	mg/kg OC	0.035	0.017
DR112	2.1	2 to 4	EPA SI	1998	Total LPAH (calc'd)	0.29	mg/kg dw		2.93	9.9	370	780	mg/kg OC	0.027	0.013
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Total LPAH (calc'd)	0.051	mg/kg dw	J	1.27	4	370	780	mg/kg OC	0.011	0.0051
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Total LPAH (calc'd)	0.027	mg/kg dw	J	1.75	1.5	370	780	mg/kg OC	0.0041	0.0019
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Total LPAH (calc'd)	0.024	mg/kg dw	J	1.24	1.9	370	780	mg/kg OC	0.0051	0.0024
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Total LPAH (calc'd)	0.08	mg/kg dw	J	1.42	5.6	370	780	mg/kg OC	0.015	0.0072
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Total LPAH (calc'd)	0.024	mg/kg dw	J	1.46	1.6	370	780	mg/kg OC	0.0043	0.0021
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Total LPAH (calc'd)	0.65	mg/kg dw	J	2.25	29	370	780	mg/kg OC	0.078	0.037
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Total LPAH (calc'd)	2.6	mg/kg dw	J	2.67	97	370	780	mg/kg OC	0.26	0.12
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Total LPAH (calc'd)	10.5	mg/kg dw	J	2.24	470	370	780	mg/kg OC	1.3	0.6
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Total LPAH (calc'd)	0.046	mg/kg dw	J	0.543	8.5	370	780	mg/kg OC	0.023	0.011
DR106	2.1	0 to 2	EPA SI	1998	Total PAH (calc'd)	1.22	mg/kg dw		2.1						
DR106	2.1	2 to 4	EPA SI	1998	Total PAH (calc'd)	1.79	mg/kg dw		1.9						
DR112	2.1	0 to 2	EPA SI	1998	Total PAH (calc'd)	3.15	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Total PAH (calc'd)	4.1	mg/kg dw		2.93						
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Total PAH (calc'd)	0.68	mg/kg dw	J	1.27						
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Total PAH (calc'd)	0.308	mg/kg dw	J	1.75						
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Total PAH (calc'd)	0.094	mg/kg dw	J	1.24						
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Total PAH (calc'd)	0.91	mg/kg dw	J	1.42						
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Total PAH (calc'd)	0.298	mg/kg dw	J	1.46						
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Total PAH (calc'd)	0.056	mg/kg dw	J	1.32						
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Total PAH (calc'd)	16.4	mg/kg dw	J	2.25						
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Total PAH (calc'd)	42.6	mg/kg dw	J	2.67						
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Total PAH (calc'd)	57	mg/kg dw	J	2.24						
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Total PAH (calc'd)	0.4	mg/kg dw	J	0.543						
DR112	2.1	0 to 2	EPA SI	1998	Tributyltin as ion	0.039	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Tributyltin as ion	0.17	mg/kg dw		2.93						
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Tributyltin as ion	0.0055	mg/kg dw		1.27						
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Tributyltin as ion	0.028	mg/kg dw		1.42						
DR106	2.1	0 to 2	EPA SI	1998	Vanadium	71	mg/kg dw		2.1						
DR106	2.1	2 to 4	EPA SI	1998	Vanadium	76	mg/kg dw		1.9						
DR112	2.1	0 to 2	EPA SI	1998	Vanadium	76	mg/kg dw		2.47						
DR112	2.1	2 to 4	EPA SI	1998	Vanadium	77	mg/kg dw		2.93						
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Vanadium	65.2	mg/kg dw		1.27						
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Vanadium	64	mg/kg dw		1.75						
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Vanadium	58.2	mg/kg dw		1.24						
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Vanadium	63.2	mg/kg dw		1.42						
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Vanadium	63.4	mg/kg dw		1.46						
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Vanadium	56.5	mg/kg dw		1.32						

Sample Location Name	Sample River Mile Location	Sample Depth Interval (feet)	Sampling Event	Sampling Event Year	Contaminant	Concentration Value	Concentration Units		TOC % DW	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Vanadium	85	mg/kg dw		2.25						
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Vanadium	58.8	mg/kg dw		2.67						
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Vanadium	55	mg/kg dw		2.24						
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Vanadium	39	mg/kg dw		0.543						
DR106	2.1	0 to 2	EPA SI	1998	Zinc	90	mg/kg dw		2.1		410	960	mg/kg dw	0.22	0.094
DR106	2.1	2 to 4	EPA SI	1998	Zinc	79	mg/kg dw		1.9		410	960	mg/kg dw	0.19	0.082
DR112	2.1	0 to 2	EPA SI	1998	Zinc	120	mg/kg dw		2.47		410	960	mg/kg dw	0.29	0.13
DR112	2.1	2 to 4	EPA SI	1998	Zinc	140	mg/kg dw		2.93		410	960	mg/kg dw	0.34	0.15
LDW-SC202	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Zinc	74	mg/kg dw		1.27		410	960	mg/kg dw	0.18	0.077
LDW-SC202	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Zinc	65.2	mg/kg dw		1.75		410	960	mg/kg dw	0.16	0.068
LDW-SC202	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Zinc	42	mg/kg dw		1.24		410	960	mg/kg dw	0.1	0.044
LDW-SC36	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Zinc	81.2	mg/kg dw		1.42		410	960	mg/kg dw	0.2	0.085
LDW-SC36	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Zinc	67.1	mg/kg dw		1.46		410	960	mg/kg dw	0.16	0.07
LDW-SC36	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Zinc	40.6	mg/kg dw		1.32		410	960	mg/kg dw	0.099	0.042
LDW-SC37	2.1	0 to 1	LDW Subsurface Sediment 2006	2006	Zinc	386	mg/kg dw		2.25		410	960	mg/kg dw	0.94	0.4
LDW-SC37	2.1	1 to 2	LDW Subsurface Sediment 2006	2006	Zinc	490	mg/kg dw		2.67		410	960	mg/kg dw	1.2	0.51
LDW-SC37	2.1	2 to 4	LDW Subsurface Sediment 2006	2006	Zinc	4720	mg/kg dw		2.24		410	960	mg/kg dw	12	4.9
LDW-SC37	2.1	5 to 7	LDW Subsurface Sediment 2006	2006	Zinc	78.5	mg/kg dw		0.543		410	960	mg/kg dw	0.19	0.082

Key:

DW - Dry weight

CSL - Cleanup Screening Level

OC - Organic carbon

TOC - Total organic carbon

SQS - Sediment Quality Standard

Notes:

1. SQS and CSL values are substituted with AET values for dry weight comparison where organic compounds are not OC-normalized (when TOC % DW is outside of the 0.5-4.0% range).

2. Exceedance factors are the ratio of the detected concentration to the CSL or SQS (or to AET values where applicable); chemicals with one or more exceedance factors greater than 1 are highlighted.

Source:

Lower Duwamish Waterway Group, 2007. Online Lower Duwamish Waterway Group Draft Remedial Investigation Report (November 2007) Database. http://www.ldwg.org.

Appendix B

Glacier Marine Services Sampling Results

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Appendix B–1

Fox Street/Slip 3 Sampling and Analysis
Marine Power & Equipment
1984
Sample Results

	FOX ST.	UPSTREAM	DRAIN	DOWN STREAM SYNCRO	BF WEST DRY DOCK	EAST DRY DOCK	EPA Step 3	NPDES Runoff (water)	dry dock solids	MICHIGAN ST DUST	4 MILE ROCK
)	1389**	59.8	148**	82.6	117	148**	157**	6.16*	125	460	126
NIC	3709**	21.1**	212**	26.5**	317**	215**	60**	6.5*	1481	41	15
JC	5583**	159	996**	248	220	580**	375**	43*	1124	540	359
PPER	1245**	60.5	284**	195**	140**	287**	273**	39.2*	456	117	92
DMIUM	4.88**	ND	.521	ND	.684	.422	.8**	.031	.526	1.5	.7
CKEL	48.4	31.7	33.0	33.0	27.3	35.7	29	.37	1049	36	
HROMIUM	92.6	29.3	40.1	31.1	37.7	47.5	35	.71	769	50	
ERCURY	.109	.480	.140	.148	.719	.285	.18		.024	.05	1.1
L & GREASE	33,000**	1,100	1,600	840	3,800	3,500					

.57

* Exceeds EPA acute criteria for water

** Exceeds EPA criteria for 4 mile Rock disposal sediment

Relative concentrations of heavy metals

	upriver	Fox & drain	below drain	dock runoff	Syncro lift (sediment)	Syncrolift (water)	dry dock solids	west drydock	[illegible]
Pb	.17	.12	.09	.06	.10	.06	.03	.15	.1[illegible]
As	.07	.31	.13	.07	.05	.06	.46	.39	[illegible]
Zn	.54	.46	.61	.45	.48	.46	.35	.27	[illegible]
Cu	.21	.10	.17	.41	.37	.41	.14	.17	[illegible]
[illegible] total metal concentrations	292	11926	1640	94.8	522	110	3185	794	1[illegible]

Appendix B–2

Storm Drain and Sediment Sampling
Marine Power & Equipment
1986
Sample Results

MPE #1 River St #1 Fox St #1

Table

Parameter (mg/kg)	#1 4/84	#1 2/85	#1 3/86	#2	#3	#4
As	3,766.2	1,200	1,153.8	183.3	111.8	211.5
Cd	4.4	6.7	5.38	7.5	6.2	.5
Cr	92.2	113.3	101.9	266.7	120.6	40.4
Cu	1246.8	900	711.5	466.7	382.4	288.5
Hg	.11	1.0	.65	.45	.56	.14
Ni	48.1	53.3	36.5	41.7	50	32.7
Pb	1428.6	900	730.8	683.3	617.6	148.1
Zn	5,584.4	2,266.7	2,307.7	1,300	852.9	1,000

Parameter	#5	#6	#7	#8	#11	#12
As	20.8	26.1	326.5	212.8	1814.8	1,152
Cd	<.3	<.3	.69	.43	13.1	17.9
Cr	28.3	30.4	38.8	48.9	203.7	239.4
Cu	60.4	195.7	140.9	297.9	4,814.8	6,061
Hg	.5	.15	.71	.28	.63	.68
Ni	32.1	32.6	26.5	36.2	64.8	60.6
Pb	50.9	52.2	118.4	148.9	1,093	1,485
Zn	158.5	239.1	224.5	595.7	8,333	13,939

Parameter	#13	#14	#15	#16	#17	#18
As	2,043.5	2,597.4	2,564.1	1,045.5	2,373	3,871
Cd	11.5	14.3	9.5	13.2	18.6	17.7
Cr	184.8	207.8	166.7	140.9	237.3	225.8
Cu	4,565.2	4,155.8	3,333.3	2,272.7	7,627	7,258
Hg	.26	.25	.31	.75	.13	.09
Ni	82.6	105.2	58.9	70.5	67.8	37.1
Pb	1,891.3	1,129.9	1,538.5	954.5	1,525	1,774
Zn	6,956.5	10,779	6,153.8	5,454.5	13,559	15,323

Parameter	#19
As	2,181.8
Cd	13.2
Cr	236.4
Cu	5,272.7
Hg	.32
Ni	69.1
Pb	1,381.8
Zn	9,818.2