Lower Duwamish Waterway
Early Action Area 2

Supplemental Data Gaps Report

Douglas Management Company Property
7100 2nd Avenue SW, Seattle

Prepared for

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Acronyms and Abbreviations

BMP	best management practice
BTEX	benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
COC	chemical of concern
CSL	Cleanup Screening Level
DMC	Douglas Management Company
DW	dry weight
EAA	Early Action Area
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FOIA	Freedom of Information Act
LDW	Lower Duwamish Waterway
METRO	Municipality of Metropolitan Seattle
MTCA	Model Toxics Control Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OC	organic carbon
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
Ppm	parts per million
PSAPCA	Puget Sound Air Pollution Control Agency
RI	Remedial Investigation
SAIC	Science Applications International Corporation
SCAP	Source Control Action Plan
SEPA	State Environmental Policy Act
SIC	Standard Industrial Classification
SMS	Sediment Management Standards
SPU	Seattle Public Utilities
SQS	Sediment Quality Standard
SVOC	semivolatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
TEPH	total extractable petroleum hydrocarbons
TOC	total organic carbon
TPH	total petroleum hydrocarbons
UST	underground storage tank
VOC	volatile organic compound
WSDOT	Washington State Department of Transportation

1.0 Introduction

1.1 Background and Purpose

In February 2007, Science Applications International Corporation (SAIC) prepared a *Summary of Existing Information and Identification of Data Gaps* (Data Gaps) report for Early Action Area 2 (EAA-2), one of several source control areas identified as part of the overall cleanup process for the Lower Duwamish Waterway Superfund Site (Figure 1). The EAA-2 Data Gaps report, prepared for the Washington Department of Ecology (Ecology), included available information about the Douglas Management Company (DMC) property located at 7100 2nd Avenue SW.

On October 10, 2006, the U.S. Environmental Protection Agency (EPA) notified DMC and Swan Bay Holdings of their potential liability pursuant to Section 107(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for the LDW Superfund site due to the release or threatened release of hazardous substances at this site (USEPA 2006). EPA's letter also requested information and documents relating to the environmental conditions at, and cleanup of, the site. The response from DMC/Swan Bay Holdings was not received in time to incorporate relevant information into the EAA-2 Data Gaps report.

This Supplemental Data Gaps report was prepared to incorporate the information provided in response to EPA's request for information, and updates the February 2007 EAA-2 Data Gaps report. Information regarding the DMC property presented in this technical memorandum supersedes that presented in the EAA-2 Data Gaps report and the EAA-2 Source Control Action Plan (SCAP).

1.2 DMC Property Description

The DMC property is located at 7100 2nd Avenue SW, in the northern part of the South Park industrial area. It consists of a 3.09-acre triangular-shaped parcel as shown in Figures 2 and 3. The property extends approximately 548 feet in the north-south direction and 433 feet in the east-west direction. It is bounded by the Lower Duwamish Waterway (LDW) to the north and east, the Trotsky property and an inlet of the LDW (referred to in this report as the Trotsky inlet) to the south, and Washington State Department of Transportation (WSDOT) property and the 1st Avenue Bridge to the west. DMC currently leases an additional 1.2 acres on the west side (along 1st Avenue S.) from WSDOT (WSDOT 2004, DMC 2006), as shown in Figure 3.

In addition, DMC owns a small (0.04-acre) parcel (Parcel No. 6871200035) on the south side of the Trotsky inlet (Figure 3). This parcel is vacant.

The site is currently used by Alaska Marine Lines (a DMC subsidiary) for storage of shipping containers. It is an auxiliary storage facility to the Alaska Marine Lines Operations & Maintenance site located at 5615 West Marginal Way SW. In addition, a portion of the site is leased to a company that operates an automobile loading rack.

1.3 Report Organization

Section 2 of this report identifies the chemicals of concern in sediment in the vicinity of the DMC property. Section 3 describes available information about the DMC property, including current and historical operations, environmental investigations and cleanups, and the potential for sediment recontamination. Section 4 summarizes remaining data gaps and updates the action items for the DMC property identified in the EAA-2 SCAP. Section 5 lists the documents reviewed during preparation of this report.

2.0 Chemicals of Concern in Sediment

Results of sediment sampling in the Trotsky Inlet were discussed in the EAA-2 Data Gaps report. That document did not include sediment data along the LDW shoreline adjacent to the DMC property. For completeness, and to provide a comprehensive assessment of the potential for recontamination of LDW sediments associated with the DMC property, this supplemental data gaps report provides a review of sediment data along the LDW shoreline as shown in Figure 4. Sediment data for detected chemicals are provided in Appendix A; sampling locations are listed in Table 1.

2.1.1 Chemicals of Concern

A chemical of concern (COC) is defined in this report as a chemical that is present at concentrations above regulatory criteria in sediments, and is therefore of particular interest with respect to source control. These COCs are the initial focus of the evaluation of potential contaminant sources.

The Washington Sediment Management Standards (SMS; Chapter 173-204 WAC) establish marine Sediment Quality Standard (SQS) and Cleanup Screening Level (CSL) values for some chemicals that may be present in sediments. The SQS values correspond to a sediment quality level that will result in no adverse effects on biological resources and no significant human health risk. CSLs represent minor adverse effects levels used as an upper regulatory threshold for making decisions about source control and cleanup.

A chemical was identified as a COC for the DMC property if it was detected in surface or subsurface sediment at concentrations above the SQS and/or CSL. A comparison of sample results to the SQS and CSL values is provided in Appendix A, and those chemicals that were detected at concentrations above their respective SQS/CSL values are listed in Table 2. For non-polar organics, the measured dry weight concentrations were organic carbon (OC)-normalized to allow comparison to the SQS/CSL.

Additional contaminants may be present in soil, groundwater, stormwater, or stormwater solids at concentrations above regulatory criteria and/or soil-to-sediment or groundwater-to-sediment screening levels. While not currently considered COCs in sediment, these chemicals may warrant further investigation, depending on site-specific conditions, to evaluate the likelihood that they will lead to exceedance of marine sediment management standards. These additional contaminants are discussed as appropriate in Section 3.

2.1.2 Sediment Investigations near DMC

Sediment samples have been collected from the LDW shoreline in the vicinity of the DMC property as part of the following investigations:

- **National Oceanic and Atmospheric Administration (NOAA) Duwamish Waterway Sediment Characterization Study (NOAA 1998)**

Three surface sediment samples were collected near the DMC property during October 1997 (Table 1). These samples were analyzed for polychlorinated biphenyls (PCBs). PCBs were detected in all three samples, with total PCB concentrations ranging from 0.11 to 0.14 mg/kg dry weight (DW; 5.4 to 9.0 mg/kg OC). None of the samples exceeded the SQS value for total PCBs.

- **EPA Site Inspection, Lower Duwamish River (Weston 1999)**

  Four surface sediment samples were collected near the DMC property in August 1998 as part of EPA's Site Inspection. Samples were analyzed for semivolatile organic compounds (SVOCs), metals, PCBs as Aroclors and congeners, dioxins/furans, and total organic carbon (TOC). Polycyclic aromatic hydrocarbons (PAHs; benzo[g,h,i]perylene and indeno[1,2,3-cd]pyrene) were detected at concentrations above the SQS values in one sample (DR136).

- **LDW Phase 2 Remedial Investigation, Round 2 Sediment Sampling (Windward 2005)**

  One surface sediment sample (LDW-SS82) was collected from this area during the Phase 2 Remedial Investigation (RI) in March 2005. The sample was analyzed for the SMS list of chemicals. None of the analytes were detected above SQS values in this sample.

- **LDW Phase 2 RI Subsurface Sediment Sampling (Windward 2007)**

  Seven sediment samples were collected from two coring locations in February 2006. Samples were analyzed for metals, SVOCs, and PCBs. PCBs (total) were detected above SQS values at both locations; concentrations ranged from 0.15 to 0.44 mg/kg DW (6 to 69.5 mg/kg OC), with the highest concentration at location SC39 at a depth of 1 to 2 feet (Figure 4).

2.1.3 Summary of COCs in Sediment Near DMC

COCs identified for the LDW along the DMC property are listed below. COCs identified in the Trotsky inlet in the February 2007 EAA-2 Data Gaps report are also listed.

Chemical of Concern (COC)	LDW along DMC Property	Trotsky Inlet
Metals		
Lead		●
Mercury		●
Zinc		●
PAHs		
Benzo(g,h,i)perylene	●	
Indeno(1,2,3-cd)pyrene	●	
Phthalates		
Bis(2-ethylhexyl)phthalate		●
PCBs		
PCBs (total)	●	●
Pesticides		
DDTs		●
Dieldrin		●

3.0 Douglas Management Company Property

Facility Summary: Douglas Management Company/ Alaska Marine Lines Dock 2	
Address	7100 2nd Avenue SW, Seattle 98106 7100 1st Avenue S, Seattle 98106 160 S. Orchard Street, Lot 7&8
Property Owner	Douglas Management Company
Tax Parcel No.	2924049090, 6871200035
Parcel Size	3.09 acres, 0.04 acres
Facility/Site ID	97573251 (Douglas Management Dock)
SIC Code	Listed variously as 4491 (Marine Cargo Handling), 4449 (Water Transportation of Freight), 4424 (Deep Sea Domestic Transportation of Freight), 4225 (General Warehousing and Storage)
EPA ID No.	WAD070973300
NPDES Permit No.	SO3002471c: Douglas Management Dock, formerly Swan Bay Holdings Dock (expired May 31, 2008); formerly SO3000908, Alaska Marine Lines, terminated September 1995.
UST/LUST ID No.	100532

3.1 Physical Setting

The DMC property is completely paved with concrete or asphalt. The southern shoreline along the Trotsky inlet is mostly lined with ecology blocks. The facility has a moorage along the LDW, which is actively used.

Approximately 91 percent of the property is upland area; approximately 3 percent is located within the LDW, and the remaining 6 percent is located within the Trotsky inlet to the south. The property has 702 feet of frontage along the Duwamish Waterway and 480 feet along the inlet (City of Seattle 1998). Most of the shoreline is covered with concrete rip-rap. The entire site is paved. Portions of the inlet extend onto the project site by as much as 25 feet.

There is minimal natural flora and fauna on the property, as the area has long been heavily industrialized and the property has been paved since 1978. The topography of the site is relatively flat, dropping approximately 2 feet across the upland portion of the property from east to west (City of Seattle 1998).

A shallow 50 to 70-foot wide shelf extends offshore from the site; this shelf is within the intertidal zone. The shoreline adjacent to the site is covered with rip-rap consisting of pieces of concrete and asphalt. A dirt berm rises above the rip-rap and contains a narrow (3 to 10-foot

wide) riparian zone that is vegetated with grasses and Himalayan blackberry, together with scrub willow and alder (City of Seattle 1998).

As part of the Phase 2 RI, Windward Environmental surveyed seeps along the LDW. Four seeps were identified in the Trotsky inlet; one seep[1] was located near the head of the inlet, on the north (DMC) side of the inlet. This seep has not been sampled (Windward 2004).

3.2 Property Ownership

The DMC property has a convoluted ownership history, as shown in Figure 5 and summarized below.

December 1969: Associated Engineers & Contractors, Inc. sold the property to C.R. Hartman Enterprises, Inc. (Statutory Warranty Deed [date unknown], Deed and Purchaser's Agreement 1977).

September 1974: A stipulated judgment was entered into in the case of Jack Trotsky, et us, et al., v. John Farrell, et us, et al., King County Superior Court Case No. 732439, which awarded all property south of the "common agreement line" to Jack and Louise Trotsky and Lorraine Trotsky. The property north of this line was granted to C.R. Hartman Enterprises, Inc. (Superior Court 1974a, 1974b). A quit claim deed (September 1, 1974) was subsequently recorded in which Knik Construction Co. (presumably the parent company of C.R. Hartman Enterprises, Inc.) granted all property south of the "common agreement line" to Jack and Louise Trotsky and Lorraine Trotsky.

June 1976: The property was sold by Charles R. Hartman to Alaska Western Industries, Inc. (Mortgage 1976).

February 1977: Alaska Western sold the property to Knik Construction Co., Inc. (Deed and Purchaser's Agreement 1977)[2]. Knik operated a sand and gravel batch plant on the property for approximately 6 to 9 months after the purchase (DMC 2006). A November 1979 appraisal of the property indicated that in addition to the 4.1 acres of land owned by Knik Construction/Lynden Transport, the property included 3.1 acres of land owned by the State of Washington and leased to Lynden Transport on a long-term basis, and 5.7 acres of land owned by the city of Seattle which was used by Lynden Transport on a year-by-year permit basis. Lynden, in turn, leased a substantial portion of the property (approximately 4 acres) to Associated Bus Company (General Appraisal Company 1979).

June 1981: Knik Construction Co. transferred at least part of this property (including parcel 2924049108 which had been deeded to the Trotskys in 1976) to DMC (an affiliated corporation) as capital surplus (Quit Claim Deed 1981). A letter from Lynden Transport (the holding company for DMC and Knik Construction Co.) to Herman Trotsky in June 1982 indicated that parcel 2924049108 had been erroneously conveyed to DMC, and that Lynden was revising their quit claim deed to return the parcel to Northwest Cooperage Company (Lynden 1982a). In March 1984, a letter from John Oldfield of Wolfstone, Panchot, Bloch & Kelley (attorneys for

[1] Identified in Windward 2004 as Seep 55.
[2] A 1977 Shoreline Substantial Development Permit application listed the property owner as Lynden Transport.

Northwest Cooperage Company) requested that DMC correct the errors in the property legal description which included the area south of the "common agreement line" as stipulated in the 1974 judgment. This area (parcel 2924049108) had been awarded to the Trotskys. In June and July 1984, the quit claim deed and other legal documents were re-recorded to revise the incorrect legal property description.

September 1984: DMC leased the northern portion of the property, which included a dock and "common area," to Central Alaska Marine Lines, Inc. (Lease Agreement 1984).

October 1984: DMC transferred the property to Alaska Marine Lines, Inc. for use as a barge terminal (Quit Claim Deed 1984).

December 1993: The property was sold by Alaska Marine Lines, Inc. to DMC (Quit Claim Deed 1993) and the property entered its current use as an equipment storage yard and barge mooring facility.

June 1995: The property was sold to Swan Bay Holdings, Inc. on June 29, 1995. On June 30, Swan Bay Holdings leased the property back to DMC (Lease Agreement 1995); the lease was guaranteed by Lynden Incorporated and was for a term of 10 years (Lease Guaranty 1995, Lease Amendment 1996). Based on internal correspondence in November 1997, there was apparently a property line dispute with the State of Washington on the west side of the property. The State apparently claimed that DMC's survey was in error and wanted to move the existing partial fence to the correct location. An internal DMC email indicated that if the state's assertion (that the survey is in error) is correct, DMC would either need to let the state move the fence or would need to purchase the property. DMC apparently decided to complete the fence as soon as possible to improve their chances of buying the disputed property (DMC 1997).

December 2004: Swan Bay Holdings sold the property to DMC (Quit Claim Deed 2004).[3] Knik Construction and Alaska Marine Lines are currently the primary users of the property; they pay usage fees but do not have leases for the property (DMC 2006).

3.3 Current Operations

The property is currently used by Alaska Marine Lines as a satellite to its Operations & Maintenance Area facility, located at 5615 West Marginal Way SW.[4] The 7100 2nd Ave. site is used for "transient operations," according to a 2006 Stormwater Pollution Prevention Plan (SWPPP) for the site (AML 2006). It is used primarily as a staging area and to transfer cargo and materials onto ships and barges. No maintenance is performed onsite, and forklifts are the only diesel-powered equipment that is occasionally fueled at this location.

[3] DMC, Swan Bay Holdings, Alaska Marine Lines, and Knik Construction are all wholly-owned subsidiaries of Lynden Incorporated (18000 International Blvd. #800, Seattle, WA 98188) (DMC 2006).

[4] The Alaska Marine Lines facility at 5615 West Marginal Way SW is within the RM 1.3-1.6 West (Glacier Bay) Source Control Area, and is described in more detail in the *Summary of Existing Information and Identification of Data Gaps* report and *Source Control Action Plan* for that source control area.

There is a containment area for liquid asphalt transfers consisting of a 40-ft by 100-ft cement pad with cement barriers surrounding the area. A contractor performs the actual transfers, and spill kits and sand are available onsite (AML 2006).

The facility operates under an Industrial Stormwater General Permit (No. SO3002471c), which expired on May 31, 2008. According to the June 2006 SWPPP, a catch basin[5] in the northern middle of the area drains most of the stormwater runoff from the site, which then flows to the LDW through an outfall located along the northeastern side of the property (AML 2006). No site map was provided with the SWPPP, so the exact location of this catch basin could not be determined.

Conflicting information on stormwater flow from this property was identified. Site personnel indicated on January 19, 2007 that there are no private drains from the property into the LDW, but that storm drainage is piped away from the LDW and connects to the City of Seattle drainage system (Personal Communication, Mark Gaska, Alaska Marine Lines). Also, according to a 1998 Shoreline Management Substantial Development permit application, most stormwater runoff from onsite impervious surfaces is directed to an on-site catch basin in the north-central portion of the site, which connects to a storm drain along the west portion of the property and discharges into a combined storm/sanitary sewer line located near the southwest corner of the site (shown as "Current Drainage" in Figure 2).

As part of the 1998 Shoreline Development permit application, DMC proposed to design the central catch basin to provide sedimentation control and oil/water separation and conduct a regular maintenance program for the catch basin to ensure operational effectiveness; it is unknown whether these modifications were implemented.

Runoff that occurs near the LDW likely discharges into the waterway by overland flow (City of Seattle 1998). The destination of stormwater on the southern portion of the site is not clear from the available documents, but likely discharges to the Trotsky inlet via overland flow.

Materials that may be used at this property include (AML 2006):

- Hydraulic oil/fluids (mineral oil)
- Brake fluid (ethylene glycol)
- Antifreeze/coolant (ethylene glycol, propylene glycol, copper, lead, zinc)
- Windshield washer fluid (ammonia, methanol)
- Battery acid (sulfuric acid)
- Motor oil (mineral oil, petroleum distillates)
- Diesel fuel (petroleum distillate, oil & grease, naphthalene, xylenes)

Potential activities that could result in releases of pollutants include (AML 2006):

[5] This catch basin is believed to be D01, which is the monitoring point for the facility's Industrial Stormwater General Permit (Ecology Water Quality Search Database, December 2008).

- Minor leaks from tractors, forklifts, and employee cars: diesel fuel, gasoline, brake fluid, transmission fluid, windshield wiper fluid, lubricants, motor oil, antifreeze, hydraulic fluid
- Fueling of forklifts: diesel fuel
- Forklift accidents: miscellaneous pollutants

The SWPPP also lists 10,000 pounds of wood (pallets) that are used/stored daily at this location. Transformers owned by Seattle City Light are reportedly also located on this property (DMC 2006).

Alaska Marine Lines has implemented operational Best Management Practices (BMPs) in compliance with its stormwater permit (AML 2006).

Ecology conducted a stormwater compliance inspection in May 2006. It was observed at that time that wash water was draining to the storm drain system, that it was not known where the oil/water separator discharges to, and that the facility had not submitted Discharge Monitoring Reports as required by the stormwater permit (Ecology 2006). Ecology requested that the facility develop and implement a SWPPP, submit a transfer of ownership and a revised Industrial Stormwater General Permit application, begin to collect and submit stormwater sampling results as required by the permit, and refrain from discharging wash water to the storm drains. The SWPPP and transfer of ownership were submitted. A revised Permit application was not found in the files reviewed during preparation of this document. Stormwater monitoring results were obtained from Ecology's Water Quality Search Database, and listed sampling results from February 14, 2006 through July 1, 2008. Results indicated no permit violations; chemical concentrations ranged as follows:

- Zinc: 70.1 to 1,230 ug/L
- Lead: 11.2 to 25.3 ug/L
- Copper: 25 to 48 ug/L
- Oil & Grease: <5 to 12 mg/L

3.4 Historical Operations

3.4.1 Prior to 1969

The location of this property was once part of a large tidal marsh that encompassed the lower 6 miles of the Duwamish River. Most of this area was filled, dredged, and channelized in the late 1800s and early 1900s. The current location of the DMC property was part of Duwamish Waterway Turning Basin No. 2 (City of Seattle 1998, Dames & Moore 1991d). Aerial photos indicate that the site was filled in sometime between 1960 and 1969 (SAIC 2007)[6]. During preparation of this report, a Freedom of Information Act (FOIA) request was submitted to the U.S. Army Corps of Engineers for information related to the fill history of the site. No relevant information was available.

[6] Historical aerial photographs were presented in Appendix A to the EAA-2 Data Gaps report.

According to a 1945 survey of pollution sources in the Duwamish-Green River drainage area (Foster 1945), the current DMC property is near the former location of Pacific Metal and Salvage Company and Seabell Shipbuilding Company. Pacific Metal and Salvage Company specialized in dismantling, wrecking, and salvaging old boats. Broken pieces of the ships being wrecked often fell into the water. On one occasion, a ship under destruction reportedly sank, releasing a considerable quantity of oil into the water (Foster 1945).

Seabell Shipbuiding Company engaged in construction of large wooden vessels. Their principal waste material was wood scraps, which were burned. Local sewage was discharged to the waterway at this location (Foster 1945). The wooden timbers still present across the Trotsky inlet were likely associated with this operation.

Aerial photos from 1969 show the presence of the triangular piece of land currently owned by DMC; it was undeveloped at that time.

3.4.2 Hartman Enterprises/Alaska Western Industries (December 1969 to February 1977)

For an unknown length of time, but at least 1969 to 1977, the southern portion of the property was occupied by Seattle Ready Mix, a ready-mix concrete plant (Pioneer Title Insurance Company 1981). The northern portion of the site was used as a cargo terminal and as a transshipment facility for sand and gravel at least from 1975 to 1978 (City of Seattle 1998). The northeastern corner (about 1 acre) was used as a staging area for barge loading, with a 10-ft wide by 50-ft long barge loading ramp on the shoreline (City of Seattle 1978a, General Appraisal Company 1979).

An aerial photograph from 1974 shows a large rectangular building (the warehouse/garage building), approximately 60-ft by 100-ft, in the center of the site and a barge dock located on the LDW. A second structure was added to the warehouse building in about 1978. The older portion of the building was constructed of heavy timber columns supporting glue-laminated roof beams; the newer portion was constructed of steel column and roof beams (Coughlin Porter Lundeen 1995).

3.4.3 Knik Construction/Lynden Transport/DMC (February 1977 to September 1984)

In September 1977, Lynden Transport applied to the Army Corps of Engineers for a permit to conduct activities in the LDW (City of Seattle 1978a). The application was for construction of a storm drainage system, and listed 5.97 cubic feet per second (cfs) of stormwater flow based on a 5-year event frequency. In October 1977, Lynden Transport applied for a Shoreline Substantial Development Permit for paving and construction of the storm drainage system (City of Seattle 1978a). Figure 2 shows the storm drainage system as proposed (identified as Former Storm Drainage). A State Environmental Policy Act (SEPA) Declaration of Non-Significance was filed in January 1978.

The permit (SMA 77-63) was granted in March 1978. Under this permit, the entire property, including owned and leased areas, was paved with asphalt, and an asphalt extruded curb was

installed along the northeasterly bank of the LDW at approximately elevation 7 ft. The purpose of the curb was to serve as a safety feature for the vehicular activities on the property, and to prevent runoff from entering the LDW directly. A storm drainage system with catch basins, manholes, and an oil/water separator was installed, and an 18-inch outfall was constructed with 3 cubic yards of rip-rap protection at a 1:1 slope (City of Seattle 1978a).

In June 1978, Lynden obtained authorization from the Seattle Building Department to repair the existing bulkhead along the LDW (City of Seattle 1978b). In August 1978, Lynden was granted another Shoreline Substantial Development Permit (SMA 78-41) to construct a 100-ft by 50-ft by 20-ft addition to the existing warehouse/garage building, to be used as a repair shop (City of Seattle 1978b). At that time, the barge loading facility was located on the northern portion of the site and a school bus servicing and parking facility at the southern portion of the site. In a comment on the permit application, the Municipality of Metropolitan Seattle (METRO) commented that proper control for the "washoff" of the proposed repair shop addition should be implemented; however, the city of Seattle stated that "we believe the drainage system provided in the SMA 77-63 permit would be adequate" (City of Seattle 1978b).

Between 1978 and 1982, most of the property was used by the school bus maintenance and servicing center (operated by Associated Bus Service/Laidlaw) plus accessory parking (Lynden 1982b). Three buildings were located on this portion of the site: an 80-ft by 40-ft garage used as a tire warehouse (General Appraisal Company 1979), a 100-ft by 40-ft garage, and a 65-ft by 30-ft office building (located adjacent to the Trotsky inlet). Gasoline fueling facilities were also located on the property. A three-pump fuel island included one 12,000-gallon underground storage tank (UST); this tank was reportedly installed by Laidlaw and was removed in approximately 1984 (Dames & Moore 1990d, 1991d). A six-pump fuel island included two 10,000-gallon USTs; these are believed to be the tanks that were removed by B&C Construction in January 1991 (see Section 3.4.4 below)[7]. The site at that time was graded with gravel. About 200 buses were serviced on a regular basis, with both major and minor repairs conducted in these buildings (City of Seattle 1978a). All repair work was performed within the garage buildings. The area within 200 feet of the water was used only for vehicular access and maneuvering when the school buses were brought in for servicing.

A 1979 property appraisal indicated that there is a drainage ditch running along the southern boundary of the property (along the Trotsky inlet) (General Appraisal Company 1979). Natural drainage of rainwater was reportedly provided by ditches which direct the water to the LDW and prevent flooding or standing water.

3.4.4 Alaska Marine Lines/DMC (September 1984 to June 1995)

Alaska Marine Lines began operating a barge terminal at the site in approximately 1984. Barges ranging in size from 12,000 sq.ft. to 45,000 sq.ft. (4,000 to 15,000 tons) have historically been

[7] Dames & Moore 1991d refers to "buried waste oil tanks…apparently installed by Laidlaw," however no information on waste oil tanks was available in the files reviewed. Additionally, some reports refer to a gasoline UST and a diesel UST that were installed by Alaska Marine Lines in 1984. Based on a review of the files, however, it is clear that these two USTs were already present at the time of the 1979 property appraisal (General Appraisal Company 1979). It is SAIC's opinion that the two "waste oil tanks" are actually the gasoline and diesel USTs that were removed by B&C Construction in 1991.

moored at this site for varying lengths of time (City of Seattle 1998). The property was used as a freight management facility where cargo and refrigerated containers were transferred between barges and trucks (Dames & Moore 1990d). The property entered its current use as an equipment storage yard and barge mooring/marine cargo handling facility in 1993.

Material excavated from three Alaska Marine Lines sites in Alaska (two in Juneau, one in Ketchikan) were stored at this location in "ore pots" in 1993 (Environmental Services 1993a). The volume of contaminated material in the pots was estimated at 211 cubic yards. Laboratory analysis for the soils from the Juneau sites indicated total petroleum hydrocarbon (TPH) levels of 480 mg/kg and 3,400 mg/kg (Environmental Services 1993a). A 1993 corrective action proposal prepared for Alaska Marine Lines by Environmental Services, Ltd. recommended that the water in the soil containers be removed, tested, and disposed of as appropriate, and that the soil then be transported to the Alaska Marine Lines Kent site, treated at the landfarming operation already in place or a proposed bioremediation system, and used in the construction of Dock One at that property (Environmental Services 1993a).

A subsequent communication from Environmental Services, Ltd. to Ecology indicated that between January 27, 1993 and August 1, 1993, petroleum-contaminated soils associated with UST removals from the 5615 West Marginal Way SW and 7100 2nd Avenue S properties were transported to the 6250 S 228th Street (Kent) property where they were to be remediated and then used in construction at the 5615 West Marginal Way SW property (Environmental Services 1993e).

On March 12, 1993, Ecology granted coverage under the Industrial Stormwater General Permit for this facility (Permit No. SO3-000908) (Ecology 1993b). Permit requirements included preparation of a SWPPP. Coverage was terminated on September 26, 1995 because the site had been vacated and no significant material or equipment remained which were exposed to stormwater (Ecology 1995b).

Dangerous Waste Generation

Alaska Marine Lines operated under EPA ID No. WAD070973300. The following dangerous wastes were generated during 1990 through 1994, the only years for which reports were available:

Waste Description	Dangerous Waste Number	Quantity (pounds) / Year				
		1990	1991	1992	1993	1994
Waste petroleum naphtha, combustible liquid (UN1255)	D001, D018, D039	1,969	1,584	352	NA	--
Waste combustible liquid NOS, mineral spirits (NA1993)	D001, D039	--	--	262	NA	--
Hazardous waste solid, ORM-E (NA9189)	F005	1,860	--	--	NA	--
RQ Hazardous waste liquid, NOS, ORM-E (NA9189)	D018, WT02	55 gallons	--	--	NA	--
Ethylene glycol, water, benzene	D018, WT02	--	968	--	NA	--
Ethylene glycol, benzene, antifreeze (NA9189)	D018, WT02	--	--	484	NA	--

Waste Description	Dangerous Waste Number	Quantity (pounds) / Year				
		1990	1991	1992	1993	1994
Paint sludge: methyl ethyl ketone, vinyl, urethane, epoxy, zinc, primer, diatomite	D035, F005, WT02	--	7,240	--	NA	--
Unused paints and products: methyl ethyl ketone, toluene, methylene chloride, cresols as constituents, lead, unused pure xylene	D001, D002, D008, D026, U239, WP01, WT02	--	--	--	NA	1,668
Absorbent and debris with oil from spill cleanup	WT02	--	--	--	NA	440
Unused acrylic resin with water	WT02	--	--	--	NA	79.23
Water and oil	WT02	--	--	--	NA	435.77
D-Limonene with ethanolamine, dipropylene glycol, pine oil and water	WT02	--	--	--	NA	7,464.3
Dried paint and absorbent, debris	WT02	--	--	--	NA	1,550
Paint and thinner: mineral spirits	D001, WT02	--	--	--	NA	1,800
Water and oil with absorbent pads from spill cleanup	WT02	--	--	--	NA	1,513.71
Unused thinner contaminated with water: toluene as constituent	D001	--	--	--	NA	389.9

NA – No Generator Annual Dangerous Waste Report for 1993 was found in the files reviewed during preparation of this report.

Alaska Marine Lines requested that their EPA ID No. be withdrawn on December 31, 1993 due to facility closure. A Generator Annual Dangerous Waste Report was submitted for 1994 for wastes disposed of as part of facility cleanup; the facility was officially closed on March 1, 1994 after all wastes had been removed.

Petroleum Contamination

In April 1990, two USTs (a 10,000-gallon diesel tank and a 10,000-gallon gasoline tank) failed tank integrity tests. A soil vapor survey and soil and groundwater assessment were conducted by Dames & Moore to evaluate the nature and extent of petroleum contamination associated with these and one additional gasoline tank that had been removed in 1984. Petroleum-contaminated soils were found to a depth of at least 30 feet, and benzene and xylene were detected in groundwater above Model Toxics Control Act (MTCA) cleanup levels. In January 1991, the diesel and gasoline USTs were removed and a closure report was prepared (Dames & Moore 1991c). Soil excavated during tank removal was placed back into the excavation. Dames & Moore estimated the volume of soil containing petroleum hydrocarbons above MTCA cleanup levels at approximately 16,700 cubic yards (Environmental Services 1993a). Environmental investigations performed at the site are described in more detail in Section 3.5.

In a letter dated January 8, 1993, Ecology indicated that because soil and groundwater cleanup levels are exceeded at the site, it cannot be considered a “completed cleanup.” Ecology’s main concern was the potential for migration of contaminants offsite or into the Duwamish River (Ecology 1993a). A long-term groundwater monitoring program, including sampling for all contaminants known to be onsite (including heavy hydrocarbons), was identified as necessary to document that contaminant migration is not occurring. No information was found in the files reviewed during preparation of this report to indicate that a long-term groundwater monitoring program was implemented.

3.4.5 Swan Bay Holdings (June 1995 to December 2004)

The property was purchased by Swan Bay Holdings in 1995 and leased (10-year lease) to DMC; activities included barge loading/unloading and heavy equipment storage (Standard Industrial Classification [SIC] 4491 and 4225). On September 27, 1995, DMC submitted a Notice of Intent to discharge stormwater associated with industrial activity (Ecology 1995a). The facility was identified as the Swan Bay Holdings Dock. The notice indicated that stormwater is discharged directly to the LDW. Activities at the site included material handling and storage (scrap metal), storage and maintenance of material handling equipment, inactive areas where significant materials remain, and temporary container storage (Ecology 1995a). The notice also indicated that the facility has an oil/water separator.

Ecology granted coverage under the Industrial Stormwater General Permit in October 1995 (Permit No. SO3-002471). Coverage was conditionally renewed on April 22, 1996; the facility had not prepared a SWPPP and was therefore out of compliance with federal and state requirements (Ecology 1996). Under the conditions of the permit renewal, Swan Bay Holdings was required to develop and implement a SWPPP by May 22, 1996; implement operational and source control BMPs by November 28, 1996; and implement capital improvements, if necessary, by August 28, 1997 (Ecology 1996). No documentation that these conditions were met was available in the files reviewed for this project.

In February 1998, Swan Bay Holdings applied for a Shoreline Management Substantial Development permit (City of Seattle 1998). The permit was to establish use for future installation of four conveyers and a modular office building to expand a cargo terminal (referred to as the Duwamish Barge Off-Loading Facility), including demolition of existing warehouse buildings. Planned activities consisted of the following:

- Demolition of shop and storage buildings, and removal of all existing containers, heavy equipment, and hover craft from the site
- Placement of a modular office structure (320 sq.ft.) on the site
- Placement of truck scales along the west property line near the office
- Positioning of four 48-inch wide conveyors (330 to 500 feet long) to connect hoppers on barges to a truck loading area
- Relocate the north driveway by 100 to 150 feet to the north

Sand and gravel would be placed in the hoppers by loading equipment, and conveyors would transfer the sand and gravel over water and across the site to trucks. The sand and gravel would be transported to an offsite deposit location for use by the Port of Seattle during construction of the Third Runway project at SeaTac International Airport. The conveyors would be used during 1998 through 2001. During 1998, 325 trips per day or 33 trips per hour were predicted; between 1999 and 2002, approximately 750 trips per day or 47 trips per hour were predicted.

The permit was conditionally approved in September 1998 (City of Seattle 1998). Conditions of the permit included: revising plans to accurately show all structures to be demolished, particularly those at the south end of the site overhanging the water; developing a plan detailing pile removal and repair of wounds to the submerged land; providing a copy of the Hydraulic

Project Approval from the Department of Fisheries, which covers demolition of structures over water, pile removal, and repair of submerged land; and submitting copies of a Puget Sound Air Pollution Control Agency (PSAPCA) permit covering the proposed demolition and use (City of Seattle 1998).

Based on review of an aerial photograph of the property taken in 2000, it appears that the warehouse building in the center of the property was demolished; however the remainder of the planned development does not appear to have taken place. The office building along the south edge of the property currently remains in place.

At the time of the permit application, the upland portion of the property contained heavy equipment, large steel containers, a crane, and several hovercraft. Structures on the site at that time included:

- Shop building (9,000 sq.ft.) – center of site
- Storage building (2,150 sq.ft.) – southern part of site, partially overhanging inlet
- Fenced electric power area (10 ft. by 15 ft.) – southern part of site
- Concrete wharf (62 ft. by 102 ft.) – northeast portion of site
- Concrete ramp to water (10 ft. by 25 ft.) – northeast portion of site
- Eight multiple-pile wooden dolphins – 60 to 80 ft. offshore

The buildings at the south end of the site, which extended over water on piles, were described during the permit review as “ramshackle.” The Department of Ecology advised that any supporting piles should be removed from the water column, and recommended that the pile wound be capped to prevent oozing of PAHs (City of Seattle 1998).

A spill along the Duwamish River was reported to King County’s Environmental Tracking Database (incident ID 508633) on January 6, 2000 for this location; no information on the material or quantity spilled was available (Windward 2003).

Permit No. SO3-002471 was renewed in November 2000 (Ecology 2000); it was scheduled to expire in November 2005. In October 2001, the facility submitted a request to terminate coverage under the Industrial Stormwater General Permit. In response, Ecology (together with Seattle Public Utilities [SPU]) conducted a site inspection on October 23, 2001 (Ecology 2001b, SPU 2001). According to an internal DMC email, the inspector indicated that “this is one of the most out of compliance sites he has visited…the housekeeping is terrible and in violation of the law” (Lynden 2001). Approximately 25 barrels were present, some on top of containers, open to rainwater, and containing unknown materials. In addition, batteries, scrap metals, junk timbers/wood, paint containers, concrete batch materials, an old fuel truck, a gravel stockpile, a Knik asphalt tank, and one or more hovercraft were present on the site. The facility did not have a SWPPP.

Ecology internal notes indicate the facility was “way out of compliance” and that enforcement action, including penalties, may be necessary (Ecology 2001c). Alaska Marine Lines indicated that they were in the process of demolishing old structures and would test and dispose of the barrels and their contents (Lynden 2001).

SPU identified the following issues and required corrective actions (SPU 2001):

- A copy of the stormwater drainage map for the entire property should be submitted;
- Two catch basins were observed during the site inspection and both needed to be cleaned; all of the catch basins located on the property should be cleaned and maintained.
- Since stormwater discharges to the Duwamish Waterway, traps should be installed and maintained in the catch basins on the property.
- An easily accessible copy of the spill prevention and cleanup plan should be maintained at the site
- Open containers of dangerous and/or hazardous liquids which were observed throughout the site should be covered.
- Several oily used machinery parts were outdoors and uncovered; these should be stored inside or covered so that rainwater does not rinse oil into the storm drains.
- Oil stains were observed on the ground, indicating that oil spills have occurred in the past; in the event of a spill, cleanup should begin immediately and procedures in the spill plan should be followed.
- Spill containment and cleanup materials should be obtained if not already present.
- Employees should be educated about the spill plan and spill containment and cleanup materials.
- There were at least two batteries stored outside without cover; these must be stored under cover or be shipped offsite for disposal/recycling.
- All dumpsters and disposal containers should have lids.
- There was an excessive amount of debris, litter, and other material that had accumulated on the property. The site should be swept regularly (monthly or as needed) to remove this waste material, and the material disposed in accordance with applicable regulations. Sediment and debris should not be washed into the drainage system.

Ecology denied the facility's request to terminate their stormwater permit because "significant materials remain on-site and are exposed to stormwater" (Ecology 2001a).

DMC contracted with GeoEngineers to characterize the contents of the drums and other containers and transport them to a suitable waste handling facility (GeoEngineers 2001). Work was expected to be completed by December 2001. On January 30, 2002, a re-inspection of the site was conducted by Ecology and SPU. At that time, the containers had been closed, inventoried, and placed under a tarp. Ecology requested copies of hazardous waste manifests and/or shipping papers once these materials are disposed of. Spent lead acid batteries were still uncovered and were not collected in one place; in addition, the inspector noted that used spill pads and berms should be collected in a closed container and handled appropriately per the Washington Dangerous Waste regulations (Ecology 2002).

The EPA ID No. was reactivated in February 2002, and the facility was identified as a medium quantity generator of dangerous waste (Ecology 2006). This status was changed to small quantity generator in March 2003. In annual reports submitted in 2004, 2005, and 2006, the facility was identified as XQG, No Regulated Waste Generated (Ecology 2006).

Two Phase II Quarterly Stormwater Testing Reports were contained in the files reviewed for this project, for 3rd quarter 2003 and 3rd quarter 2004 (Lucas 2003, Lucas 2004). In 2003, there were no rainfall events during the 3rd quarter and therefore no samples were collected. In 2004, there were three storm events but not enough precipitation to collect samples. A hand-drawn facility map included in these reports identified three (or possibly four) oil/water separators that appear to be draining to a swale located on the west side of the property (Figure 6). Water in the drainage swale appears to flow to the north via a pipe located on the north side of the swale.

3.5 Environmental Investigations and Cleanups

A 12,000-gallon UST (referred to in this report at Tank 3 or T-3, and described in some references as a 10,000-gallon tank) was reportedly removed from this property in 1985. Reportedly, at the time it was removed, the tank was "split wide open with gross contamination present in the excavation" (AML 1990b). Analysis of groundwater in this area indicated the presence of benzene at 3,700 to 4,200 ug/L (AML 1990b). There was no information in the files regarding any investigations related to this tank.

A crack in the line from a 10,000-gallon UST to a pump at the #2 diesel dispensing system was repaired in January 1990 (AML 1990b). Contaminated soil was excavated (quantity unknown). The tank and product line were backfilled and covered with concrete. A sample of stockpiled soil was submitted for laboratory analysis and contained 840 mg/kg TPH (AML 1990a).

On April 29, 1990, integrity tests were performed on the two steel 10,000-gallon USTs (one diesel tank and one regular gasoline tank) associated with the fuel dispensing system at the property (Tanks T-1 and T-2); both tanks failed (B&C Equipment 1990a).

3.5.1 Soil Vapor Survey (August 1990)

In August 1990, Dames & Moore conducted a soil vapor survey for Alaska Marine Lines to evaluate the presence of organic vapors in soil which may be associated with existing and former USTs at the site (Dames & Moore 1990a). Sampling locations and results are shown in Figure 7. A total of 32 soil vapor probes were driven through the soil to a depth of 2 feet. Background soil vapor data were collected from station 001, located to the southwest of the USTs. Soil vapors were collected at depths of 2, 4, and 6 feet to evaluate variations in soil vapor concentrations with depth. Groundwater was encountered at 6 feet, therefore no samples were collected below this depth. Although results indicated that the highest concentrations were present at a depth of approximately 4 feet, the readings at all depths were generally similar. Dames & Moore decided to collect samples at the remaining sample locations at a 2-foot depth to minimize collection time.

Soil vapor readings ranged from 2.2 parts per million (ppm) to 368 ppm, suggesting that leakage of petroleum products may have occurred from the USTs or associated piping. The highest concentration was found at sample station 020, located near the southeast corner of the shop building. Dames & Moore postulated that this may be the result of localized spillage in this area (Dames & Moore 1990d). Soil vapor concentrations between 10 ppm and 273 ppm were present in a relatively large area (approximately 150 feet by 100 feet), west of the fuel pumps near the USTs and associated piping. A high reading (100 ppm) was also obtained at sampling station

022, located southeast of the USTs outside of the main 100 ppm concentration contour; Dames & Moore postulated that spillage had occurred in this area or that another unidentified source of organic vapors may be present (Dames & Moore 1990d). Two soil vapor samples were collected near the location of the UST that was removed in 1985 (Tank T-3 in Figure 1). A concentration of 100 ppm was observed at sampling station 002, to the north of the former UST. Concentrations decreased in a north-northeast direction from the former UST location. According to AML employees, a line of about five gasoline pumps were formerly located in this area (Dames & Moore 1990d). Dames & Moore did not define the northern extent of this apparent hydrocarbon plume. The extent of potentially contaminated soil or groundwater was not evaluated.

3.5.2 Soil and Groundwater Assessment (October 1990 to January 1991)

A soil and groundwater assessment was conducted by Dames & Moore between October and December 1990 (Dames & Moore 1991d, 1991c). Twenty-nine soil samples were collected from 13 soil borings. Seven groundwater monitoring wells were installed, developed, and sampled. In addition, one soil vapor extraction test well was installed, and water level surveys were performed on November 8, 1990 and January 15 and 25, 1991. Results are summarized in Tables 3 and 4; maps and data tables from the original report are presented in Appendix B1. Groundwater sampling locations are shown in Figure 2; soil sampling locations are shown in Appendix B1.

Soils were found to consist of an upper unit, 5 to 11 feet thick, of poorly sorted sand, which was generally loose to medium dense, black, fine or medium to coarse, and often contained gravel, wood chips, and pieces of concrete and brick (Dames & Moore 1991d). Below the sand was a silty or clayey fine sand unit that ranged from 1.5 to 5 feet in thickness; this was generally underlain by a silty clay or clayey silt unit up to 12 feet thick. Dames & Moore was not able to distinguish between artificial fill and natural sediments.

Groundwater was encountered at depths between 9 and 12 feet. Based on water level measurements, groundwater at the site appears to be strongly influenced by tides in the LDW. Dames & Moore was not able to calculate groundwater gradients, flow rates, or discharge to the LDW, and could not determine whether groundwater occurs under confined or unconfined conditions (Dames & Moore 1991d). It should be noted that MW-5 and MW-6 were originally intended to be located adjacent to the LDW; however, concrete was encountered at depth at these borehole locations and the wells were moved approximately 60 feet inland. In addition, an eighth monitoring well had been planned at a location west of MW-7; drilling of this well was attempted at three locations, but because concrete was encountered at depth at each of these locations, it was not possible to install this well (Dames & Moore 1991d). Thirteen soil borings were drilled, seven of which were completed as monitoring wells.

TPH was measured in soil samples at concentrations ranging from 12 to 3,600 mg/kg. The vertical depth of TPH-affected soils is at least 30 feet in two areas of the site and undefined in other areas. The lateral extent appears to exceed an area of 150 feet by 150 feet, however the lateral extent was not fully defined (Dames & Moore 1991d). Laboratory chromatographs indicated that the material was primarily oil with a relatively small component of diesel in

samples collected near the two USTs. Gasoline was not identified in the samples. Some of the highest TPH values were present in samples collected from below the water table.

Benzene, toluene, ethylbenzene, and xylenes (BTEX) were analyzed in eight of the borings; they were detected in SG-1, MW-2, and MW-3:

- Benzene: 0.01 to 0.097 mg/kg
- Toluene: 0.0023 to 0.013 mg/kg
- Ethylbenzene: not detected
- Xylenes: 0.018 mg/kg

The highest concentrations (0.097 mg/kg benzene, 0.013 mg/kg toluene, and 0.018 mg/kg xylene) were detected in the soil vapor extraction well (SG-1) at a depth of approximately 3.0 feet.

PAHs and volatile organic compounds (VOCs) were analyzed in two samples: SB-4 (8.0 to 8.5 foot depth) and SB-5 (13.0 to 13.5 foot depth). Fluoranthene (0.056 mg/kg), phenanthrene (0.067 mg/kg), and pyrene (0.070 mg/kg) were detected in boring SB-5. In addition, acetone (0.094 to 0.22 mg/kg) and methylene chloride (0.054 to 0.11 mg/kg) were detected in both borings.

In groundwater samples, TPH was detected at concentrations from 0.27 to 0.59 mg/L. BTEX compounds were detected in monitoring wells MW-3 and MW-4; benzene was detected at 4,200 ug/L in MW-4. BTEX compounds were not detected in wells MW-5, MW-6, and MW-7, which are believed to be downgradient of MW-4.

Dames & Moore postulated that the petroleum hydrocarbons in soil and groundwater are associated with historical activities performed at the site or on adjoining sites, including reported disposal of oil into the Duwamish River by Northwest Cooperage during World War II (prior to filling of the current DMC property), waste oil disposal by Laidlaw between 1978 and 1982, and backfilling of the site during its development. Because TPH is present over a wide area of the site, and because the petroleum material did not exhibit odors during drilling and was therefore assumed to be old, Dames & Moore concluded that disposal of oil in the former turning basin area by Northwest Cooperage was the most likely source of the petroleum contamination. The most likely sources of BTEX in groundwater samples collected from MW-4 was judged to be a former gasoline tank (T-3 as shown in Figure 1) and/or its associated piping (Dames & Moore 1991d).

A year of quarterly groundwater monitoring was recommended by Dames & Moore to evaluate the need for remedial action (Dames & Moore 1991d).

3.5.3 Site Assessment and UST Removal (January 1991)

On January 24, 1991, B&C Construction removed the two USTs (Dames & Moore 1991f). The pump dispensers were disassembled, and the asphalt and concrete paving covering the top of the tanks were demolished. The paving was reportedly disposed of at Coal Creek Landfill. The remaining product was pumped from the tanks, and the tanks were rinsed; soil was then excavated and the tops of the two tanks were exposed. All soil removed from the tank excavation

zone was stored on asphalt paving around the perimeter of the excavation zone. On January 25, the tanks were rendered inert with dry ice; the tanks were then removed and a visual inspection revealed minor pitting and corrosion but no cracks or holes. The tanks were disposed of by B&C Construction.

Excavated soil was visually stained from light grey to black and emitted strong petroleum odors (Dames & Moore 1991f). A petroleum sheen was present on the soil within the excavation zone at a depth of approximately 14 feet. Soil consisted of fine to medium sand within the tank excavation zone; the soil around the perimeter of the excavation consisted of 3 feet of fine to medium sand underlain by approximately 2 feet of silty sandy clay. Groundwater was not encountered during the excavation. One soil sample was collected from the bottom of the 25-foot by 35-foot by 15-foot deep excavation (Dames & Moore 1991f); the sample was analyzed for total extractable petroleum hydrocarbons (TEPH; 120 mg/kg).

All excavated soil was returned to the excavation and compacted. Filter fabric was placed over the backfill and approximately 7 vertical feet (195 cubic yards) of crushed rock was placed on top of the filter fabric (Dames & Moore 1991f).

3.5.4 Quarterly Groundwater Monitoring (1991-1992)

Dames & Moore conducted quarterly groundwater monitoring for one year, from September 1991 through August 1992 (Dames & Moore 1991i, 1992a, 1992c, 1992e). Groundwater samples were collected in September 1991, January 1992, April 1992, and August 1992; sampling results are summarized in Table 4. Samples were analyzed for TPH and BTEX compounds. Monitoring wells MW-5 and MW-6 were not sampled in September 1991 because they were covered with asphalt pavement; the wells were subsequently uncovered and were sampled during the following three sampling events (Dames & Moore 1991i).

Sampling locations, water level measurements, contour maps and data tables from the *Fourth Quarterly Sampling Event and Annual Monitoring Report* (Dames & Moore 1992e) are provided in Appendix B2.

A tidal study was conducted in August 1992 to evaluate tidal influences on groundwater. Tide level readings in the LDW, as measured from the pier extending off the DMC property into the waterway, fluctuated between 81 and 91.5 feet. Corresponding changes in water levels were observed in all of the site wells, ranging from 0.07 feet at MW-7 to 0.64 feet at MW-5. Groundwater level fluctuations displayed a sinusoidal curve consisting of two peaks that correspond to the two daily tidal cycles in the Duwamish Waterway. Tidal influences were most pronounced in wells MW-5 and MW-6, closest to the LDW. Water level in MW-7 showed very little response to tidal flux and had higher water levels than surrounding wells. This was attributed by Dames & Moore to a leaking storm sewer or water line, or a low permeability zone perching or impeding flow of groundwater in the vicinity of this well (Dames & Moore 1992e).

Well MW-7 appears to be located near a groundwater divide; groundwater to the northeast of MW-7 flows generally toward the LDW, while groundwater to the south and west appears to flow toward the Trotsky inlet to the south. All wells show mean water levels above the mean

high tide level, indicating a net flow toward the LDW, however groundwater flow directions are reversed near the LDW in response to high tides (Dames & Moore 1992e).

The average hydraulic gradient measured at the site is 0.018 to 0.047 foot per foot; average hydraulic conductivity was estimated to be 0.46 feet per day (highest at MW-4 where hydraulic conductivity was estimated at 1.20 feet per day). Assuming an effective porosity of 0.35 for fine sand, the average velocity of a particle within the aquifer was estimated to be 0.02 to 0.06 feet per day, or 7 to 22 feet per year (Dames & Moore 1992e).

Petroleum hydrocarbons have been detected in all seven groundwater monitoring wells. TPH-D ranged from 280 to 6,600 ug/L; concentrations in MW-2, MW-6, and MW-7 exceeded the MTCA groundwater cleanup levels (Table 4). TPH-G was detected in wells MW-2, MW-3, and MW-4 at 140 to 310 ug/L, however none of the detections exceeded the MTCA cleanup level. These same three wells also contained high concentrations of benzene (88 to 4,200 ug/L) that exceeded the MTCA Method A and B cleanup levels by several orders of magnitude. The highest concentrations were found in MW-4, and concentrations were relatively consistent over the groundwater monitoring period. Low levels of benzene were also detected in MW-7.

Relatively low concentrations of ethylbenzene (1.1 to 16 ug/L), toluene (3.0 to 12 ug/L), and xylenes (5.3 to 63 ug/L) were detected in wells MW-3, MW-4, and MW-7. Results indicate that while petroleum hydrocarbons and BTEX compounds are present in groundwater at the site at concentrations above regulatory levels, concentrations appear to be relatively constant and there is no evidence that these contaminants are moving rapidly toward the LDW or the Trotsky inlet (Dames & Moore 1992e).

In January 1993, Dames & Moore submitted a proposal to conduct semi-annual groundwater monitoring for one year (Dames & Moore 1993a); no results were found in the files reviewed during preparation of this report, and it is not clear whether this additional groundwater monitoring was actually conducted.

3.6 Potential for Sediment Recontamination

Potential contaminant pathways from this property to EAA-2 sediments are bank erosion, groundwater discharge, stormwater discharge, and surface runoff.

<u>Bank Erosion</u>

Widespread petroleum contamination has been documented at this property to depths of at least 30 feet. Potential sources of petroleum contamination include:

- industrial activities at this location in the 1940s through 1960s (before the property was created by placement of fill material);
- leakage from underground petroleum (gasoline and diesel) tanks; and
- more recent activities including school bus maintenance, marine cargo handling and transfer, and equipment storage and repair.

The banks of the Trotsky inlet and the LDW are mostly covered with rip-rap; however some erosion of contaminated soils could occur.

Groundwater Discharge

Contamination of groundwater with petroleum constituents, including benzene and xylenes, has been documented. The most recent groundwater monitoring data identified for this property were collected in 1992, and benzene (3,400 ug/L) and TPH-diesel (1,100 ug/L) were detected above MTCA cleanup levels at that time. While the Washington SMS do not address VOCs, no data were available for PAHs or other potential COCs with regard to sediment recontamination.

According to groundwater studies at the site, groundwater northeast of MW-7 appears to flow generally toward the LDW, while groundwater to the southwest of MW-7 flows generally toward the Trotsky inlet. Contaminants in groundwater may therefore be transported to the Trotsky inlet and/or the LDW and contribute to sediment recontamination.

In addition, at least one seep was observed to discharge from the DMC property in 2004 during the Phase 2 RI. Other seep samples in the vicinity, as well as sediments within the Trotsky inlet, contained PCBs, mercury, petroleum hydrocarbons, VOCs, and SVOCs.

Stormwater Discharge

The 2006 SWPPP for this site indicates that most of the stormwater is collected in a catch basin located in the north/center of the site and drains to an outfall to the LDW. Stormwater monitoring data between 2006 and 2008 do not indicate any violations of permit conditions. However, conflicting information was identified regarding storm drainage at the DMC property during preparation of this report, the most recent site inspection was conducted over two years ago (in May 2006), and no sampling of catch basin solids has been conducted. Discharge of contaminants to the LDW via this pathway is therefore considered a potential source of contaminants to the LDW.

Surface Runoff (Overland Flow)

Stormwater on the south and eastern portions of the property appears to flow toward the LDW and/or the Trotsky inlet via overland flow. Any contaminants, such as fuel or other vehicle maintenance chemicals or materials that may be spilled as a result of forklift accidents, would therefore be discharged directly to EAA-2 via this pathway.

4.0 Data Gaps

Data gaps and action items for the DMC property were identified in the EAA-2 Data Gaps report and SCAP. These are summarized below; additional data gaps and potential action items identified as a result of the updated information presented in the current report are presented below in italics.

4.1 Bank Erosion

Data Gaps:

No bank soil samples have been collected from the north side of the Trotsky inlet. During recent site visits, unusual deposits of material were observed in the inlet bottom near the northern bank, and significant sediment contamination in the inlet has been identified. Soil samples should be collected to assess the potential for sediment recontamination via bank erosion.

Action Items:

- Collect and analyze soil samples from the banks of the Trotsky inlet and from borings near the shoreline (Ecology).

4.2 Groundwater Discharge

Data Gaps:

Chemicals of concern may be transported to sediments in the Trotsky inlet and the LDW by contaminated groundwater at the DMC site. No recent groundwater samples have been collected; however soil and groundwater contamination above MTCA cleanup levels has been documented.

Action Items:

- Conduct groundwater sampling along the southern property boundary (near the Trotsky inlet) to assess the potential for sediment recontamination via groundwater transport (Ecology).
- *Conduct groundwater sampling along the LDW shoreline to assess the potential for sediment recontamination via groundwater transport (Ecology).*
- Based on sampling results, identify additional data gaps and determine the subsequent actions necessary to fill them (Ecology).
- Based on site characterization results, require the property owner to conduct remediation as needed to eliminate sources of contaminants to EAA-2 (Ecology).

4.3 Stormwater Discharge

Data Gaps:

The specific location of DMC's outfall could not be determined. The 2006 SWPPP for the property did not include a storm drainage map for the entire property. The most recent Ecology inspection (May 2006) indicated several issues to be resolved; a re-inspection has not been conducted to confirm whether the facility is in compliance with applicable regulations and BMPs.

Action Items:

- *Request the property owner to provide a map showing storm drainage on the entire property, including the locations of storm drains, catch basins, oil/water separators, and outfalls (Ecology).*
- If stormwater discharge to EAA-2 (*including the Trotsky inlet to the south and the LDW shoreline to the north and east*) is confirmed, assess the need for stormwater characterization (Ecology and/or SPU).
- *Conduct a re-inspection of the site to confirm that operations are in accordance with all applicable stormwater regulations and BMPs (Ecology).*
- Continue periodic inspections of this site as needed to verify that operations do not result in the release of contaminants to EAA-2 (Ecology and/or SPU).

4.4 Surface Runoff

Data Gaps:

Additional information is needed to determine whether contaminants on the ground surface could flow via surface runoff (sheet flow) to the inlet or to the LDW.

Action Items:

- *Conduct a site inspection to evaluate the potential for contaminant transport to the Trotsky inlet or the LDW via surface runoff, and identify actions needed to minimize the potential for sediment recontamination as appropriate (Ecology).*

4.5 Other Site Information

Action Items:

- EPA has issued a CERCLA 104(e) letter to the facility and property owners/operators to obtain additional information related to historic sources of contamination at this site (Complete).
- EPA and Ecology will review the responses to the CERCLA 104(e) letter submitted by Douglas Management Company on December 11 and December 21, 2006 (Complete).

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Figures

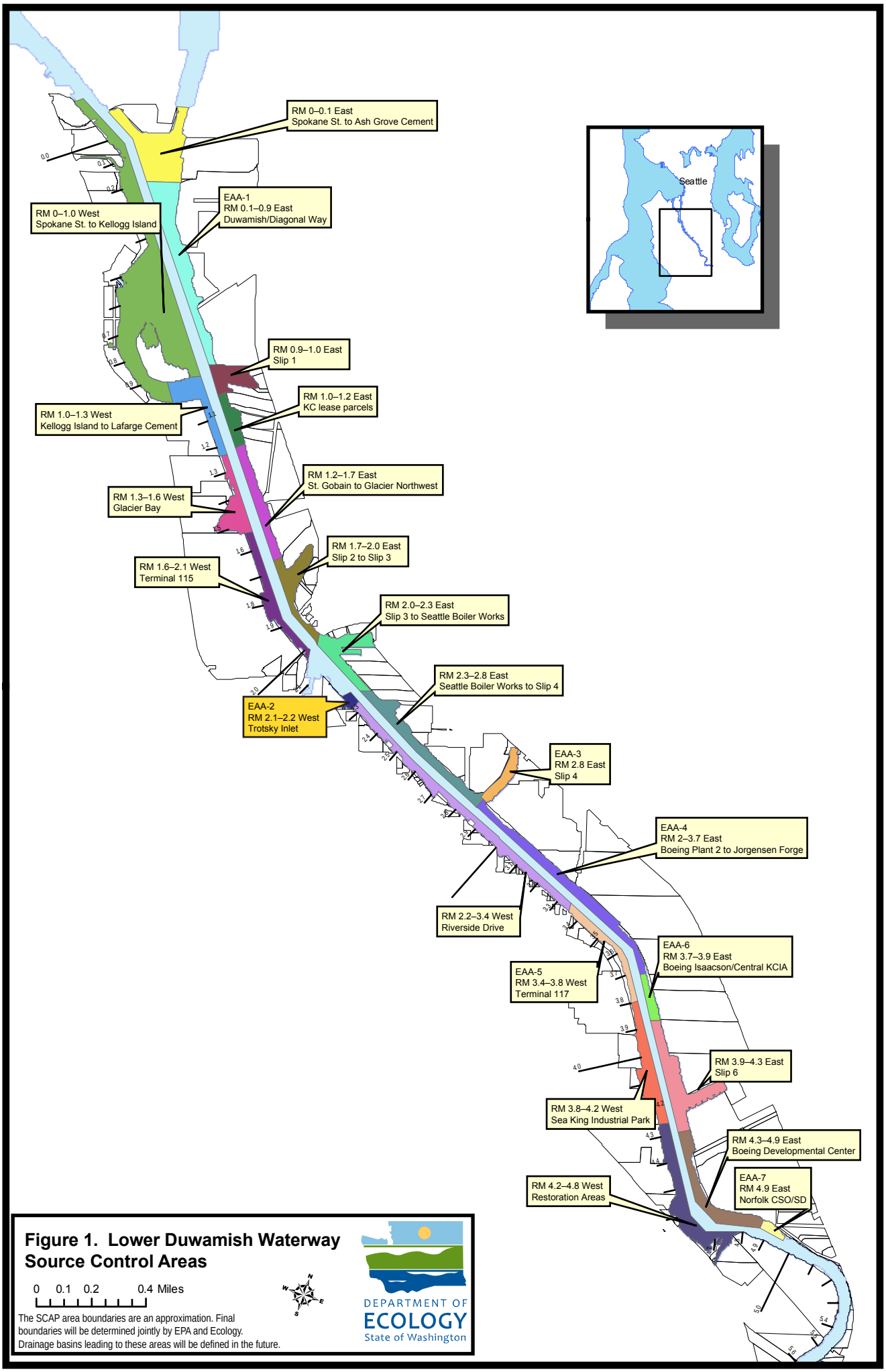
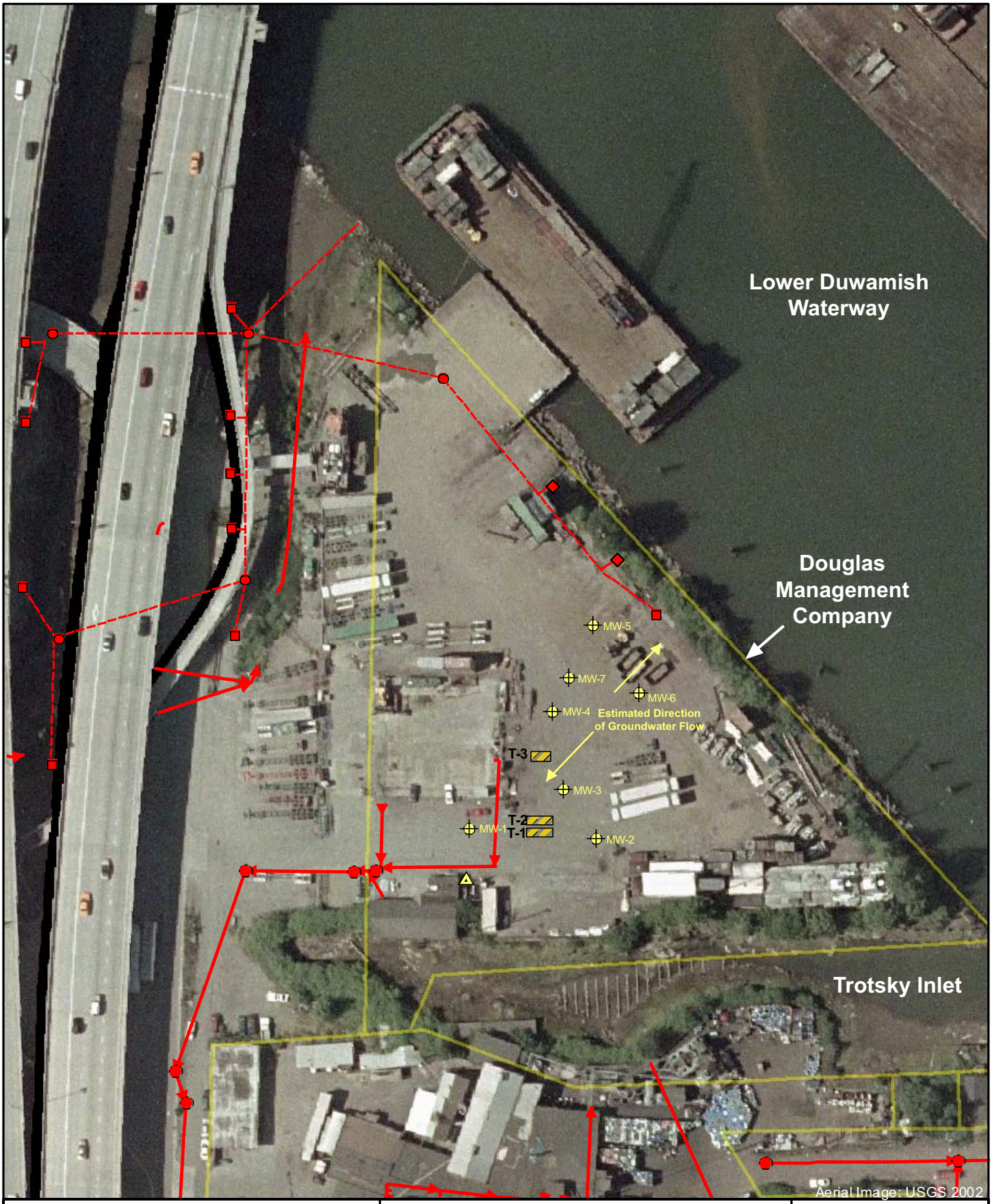


Figure 1. Lower Duwamish Waterway Source Control Areas

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



Key

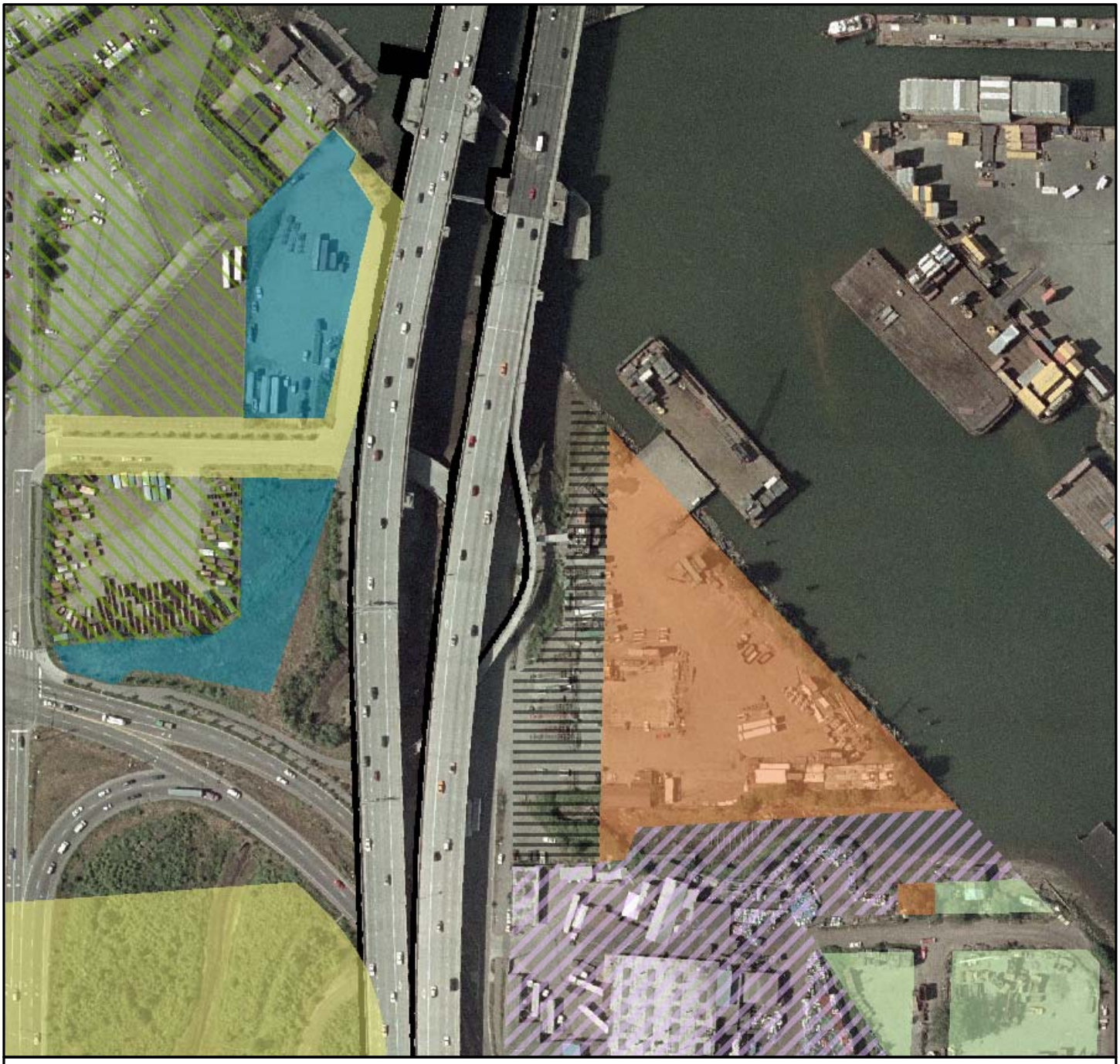
- Former Storm Drainage
- Current Drainage
- Manhole Location
- Property Boundary
- Monitoring Well
- Site Bench Mark Location
- Former UST Location

Figure 2. Douglas Management Company Property

0 25 50 100 150 200 Feet

SAIC From Science to Solutions

N



Parcel Ownership

- Douglas Management Company
- Seattle Department of Transportation
- State of Washington
- Boyer Towing
- Port of Seattle
- Trotsky, Herman & Jacqualine
- Leased by Douglas Management Company From the State of Washington

0 62.5 125 250 375 500 Feet

WA State Plane North, NAD83

N

Figure 3. Parcel Ownership in the Vicinity of DMC Property

SAIC From Science to Solutions

Legend

Surface Sediment Sample

Sample ID	
Chemical	Maximum SQS Exceedance Factor

Subsurface Sediment Sample

Sample ID	*Depth Interval*
Chemical	Maximum SQS Exceedance Factor

WA State Plane North, NAD83

N

Figure 4. DMC Property Surface and Subsurface Sediment Sampling Locations

SAIC From Science to Solutions

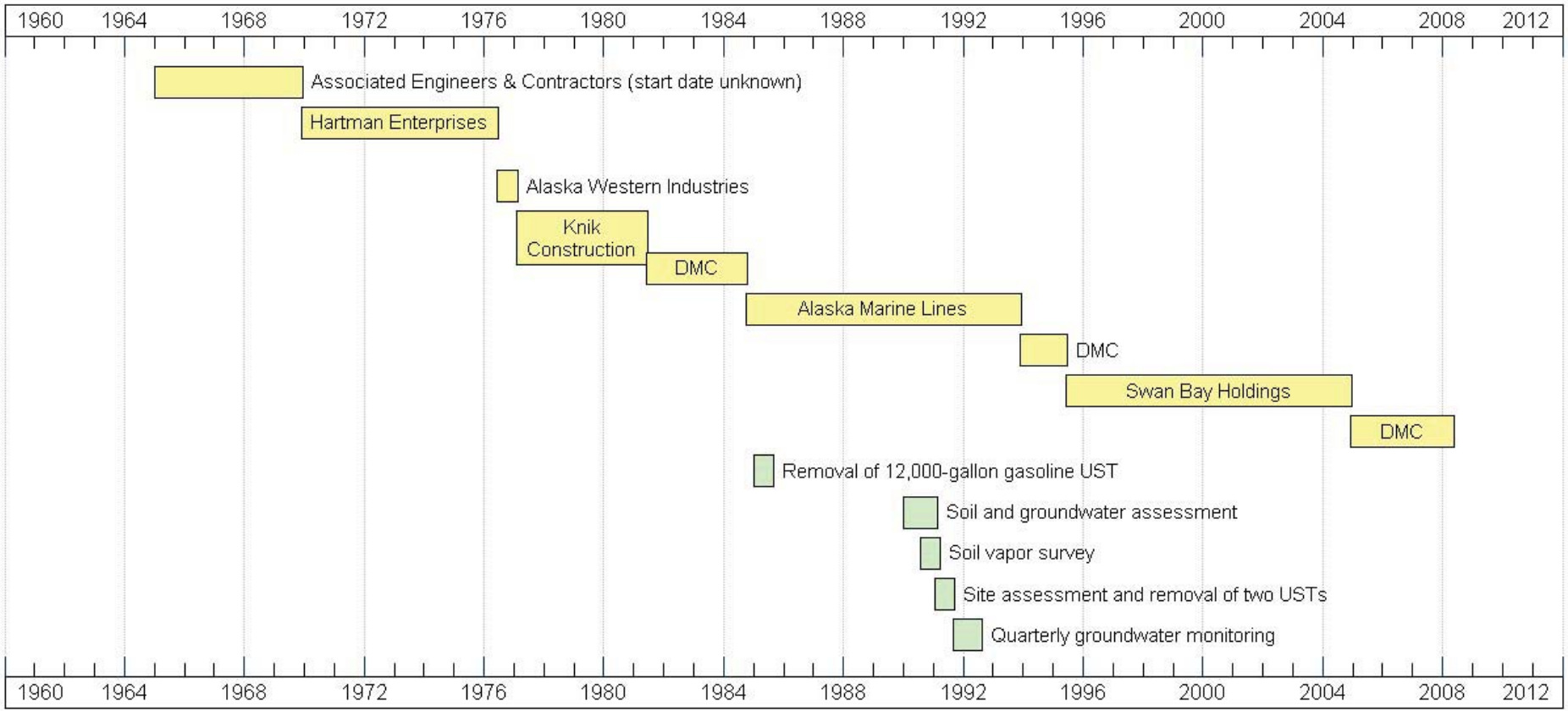


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Figure 5. Timeline of Property Ownership and Investigations/Cleanups at DMC Property

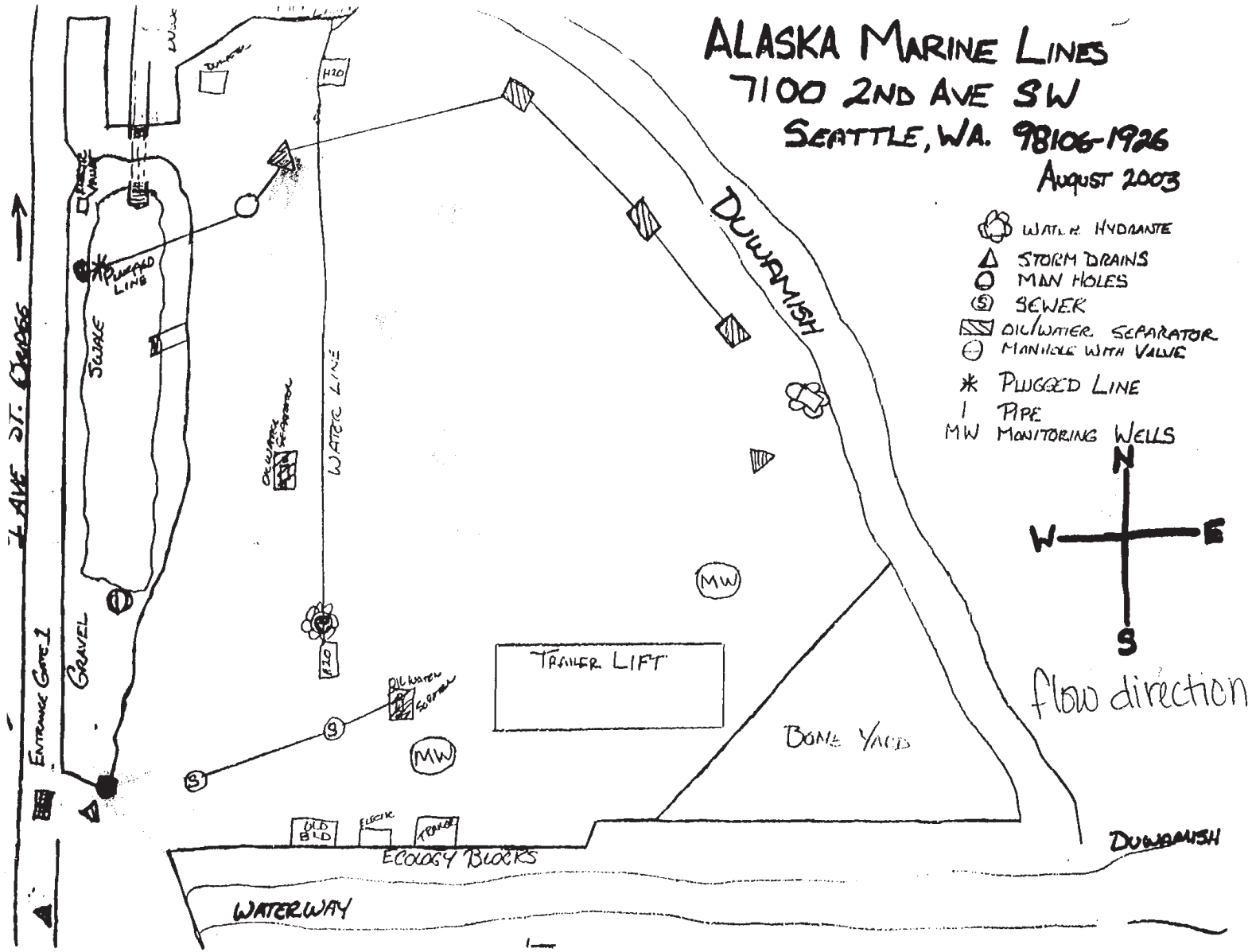

Figure 6. Storm Drainage at DMC Property, 2003

Source: Lucas 2004

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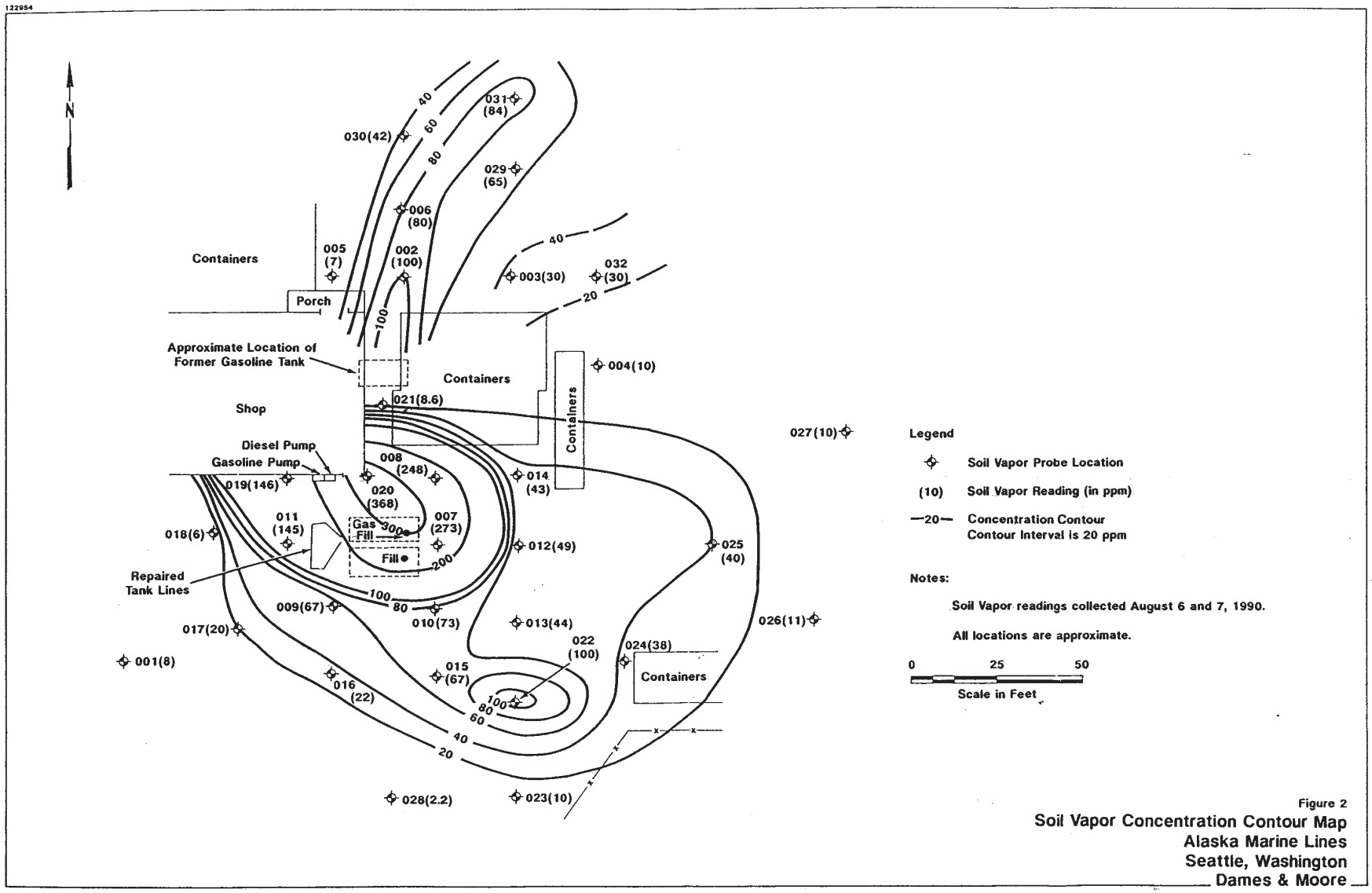

Figure 7. Soil Vapor Survey Sampling Locations and Results

Source: Dames & Moore 1990d

Tables

Table 1
Sediment Samples Collected Near DMC Property[1]

Location Name	Date Collected	Collection Depth	Event Name	Reference
Surface Sediment Samples				
WST347 (322)	10/06/97	Surface	NOAA Site Characterization	Windward 2003
WST345 (320)	10/09/97	Surface	NOAA Site Characterization	Windward 2003
WST346 (321)	10/09/97	Surface	NOAA Site Characterization	Windward 2003
DR136	08/13/98	Surface	EPA Site Inspection	Windward 2003
DR137	08/13/98	Surface	EPA Site Inspection	Windward 2003
DR156	08/13/98	Surface	EPA Site Inspection	Windward 2003
DR169	08/13/98	Surface	EPA Site Inspection	Windward 2003
LDW-SS82	03/07/05	Surface	LDW RI Phase 2 Round 2	Windward 2005
Subsurface Sediment Samples				
LDW-SC39	02/15/06	0 to 1 foot	LDW RI Phase 2 Subsurface	Windward 2007
LDW-SC39	02/15/06	1 to 2 feet	LDW RI Phase 2 Subsurface	Windward 2007
LDW-SC39	02/15/06	2 to 4 feet	LDW RI Phase 2 Subsurface	Windward 2007
LDW-SC39	02/15/06	4 to 6 feet	LDW RI Phase 2 Subsurface	Windward 2007
LDW-SC40	02/23/06	0 to 1.3 feet	LDW RI Phase 2 Subsurface	Windward 2007
LDW-SC40	02/23/06	1.3 to 2 feet	LDW RI Phase 2 Subsurface	Windward 2007
LDW-SC40	02/23/06	2 to 4 feet	LDW RI Phase 2 Subsurface	Windward 2007

1 - This table includes only sediment samples collected in the LDW along the DMC shoreline; sediment samples collected in the Trotsky inlet were presented and discussed in the EAA-2 Data Gaps report (SAIC 2007).

Table 2
Chemicals Detected Above Screening Levels in Sediment
EAA-2: LDW Near DMC Property

Sampling Event	Sample Location	Sample Depth	Chemical	Conc'n (mg/kg DW)	TOC (%)	Conc'n (mg/kg OC)	SQS	CSL	Units	SQS Exceedance Factor	CSL Exceedance Factor
Surface Sediment											
EPA Site Inspection	DR136 (702)	NA	Benzo(g,h,i)perylene	0.84	2.55	33	31	78	mg/kg OC	1.1	<1
	DR136 (702)	NA	Indeno(1,2,3-cd)pyrene	0.94	2.55	37	34	88	mg/kg OC	1.1	<1
Subsurface Sediment											
LDW RI Phase 2 Subsurface	LDW-SC39 (41941)	1 - 2	PCBs (total calc'd)	0.44	0.633	70	12	65	mg/kg OC	5.8	1.1
	LDW-SC40 (41946)	0 - 1	PCBs (total calc'd)	0.16	0.747	21	12	65	mg/kg OC	1.8	<1
	LDW-SC39 (41941)	0 - 1	PCBs (total calc'd)	0.21	1.02	20	12	65	mg/kg OC	1.7	<1
	LDW-SC39 (41941)	2 - 4	PCBs (total calc'd)	0.22	1.56	14	12	65	mg/kg OC	1.2	<1

DW - Dry weight
TOC - Total organic carbon
OC - Organic carbon normalized
SQS - Sediment Quality Standard
CSL - Cleanup Screening Level
PCB - polychlorinated biphenyl

Exceedance factors are the ratio of the detected concentrations to the CSL or SQS

Table 3
Chemicals Detected in Soil Samples
DMC Property

Source	Sample Date	Sample Location	Sample Depth (ft)	Chemical	Soil Conc'n (mg/kg DW)	MTCA Method A Cleanup Level (mg/kg)	MTCA Method B Cleanup Level (mg/kg)	MTCA Cleanup Level Exceedance Factor	Soil-to-Sediment Screening Level (Based on CSL)[a] (mg/kg)	Screening Level Exceedance Factor
Dames & Moore 1991d	12/01/90	SB-4	8.0-8.5	Acetone	0.22		8000	<1	NA	NA
Dames & Moore 1991d	12/01/90	SB-5	13.0-13.5	Acetone	0.094		8000	<1	NA	NA
Dames & Moore 1991d	10/01/90	SG-1	3.0-3.5	Benzene	0.097	0.03	18	3.2	NA	NA
Dames & Moore 1991d	10/01/90	MW-2	13.0-13.5	Benzene	0.05	0.03	18	1.7	NA	NA
Dames & Moore 1991d	10/01/90	MW-3	3.0-3.5	Benzene	0.015	0.03	18	<1	NA	NA
Dames & Moore 1991d	12/01/90	SB-5	13.0-13.5	Fluoranthene	0.056		3200	<1	24	<1
Dames & Moore 1991d	12/01/90	SB-4	8.0-8.5	Methylene chloride	0.11	0.02	130	5.5	NA	NA
Dames & Moore 1991d	12/01/90	SB-5	13.0-13.5	Methylene chloride	0.054	0.02	130	2.7	NA	NA
Dames & Moore 1991d	12/01/90	SB-5	13.0-13.5	Phenanthrene	0.067			<1	9.7	<1
Dames & Moore 1991d	12/01/90	SB-5	13.0-13.5	Pyrene	0.07		2400	<1	28	<1
Dames & Moore 1991f	01/01/91	SS-1	Bottom of excavation	TEPH	120	30[b]		4.0	NA	NA
Dames & Moore 1991d	10/01/90	SG-1	3.0-3.5	Toluene	0.013	7	6400	<1	NA	NA
Dames & Moore 1991d	10/01/90	MW-3	3.0-3.5	Toluene	0.0023	7	6400	<1	NA	NA
Dames & Moore 1991d	12/01/90	SB-5	18.0-18.5	TPH	3600	2000[c]		1.8	NA	NA
Dames & Moore 1991d	10/01/90	SG-1	3.0-3.5	TPH	2800	2000[c]		1.4	NA	NA
Dames & Moore 1991d	10/01/90	MW-1	13.0-13.5	TPH	820	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	MW-1	3.0-3.5	TPH	720	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	MW-3	3.0-3.5	TPH	550	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	MW-3	18.0-18.5	TPH	540	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	MW-1	8.0-8.5	TPH	480	2000[c]		<1	NA	NA
Dames & Moore 1991d	12/01/90	SB-4	18.0-18.5	TPH	460	2000[c]		<1	NA	NA
Dames & Moore 1991d	12/01/90	SB-4	28.0-28.5	TPH	450	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	MW-3	13.0-13.5	TPH	380	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	MW-4	3.0-3.5	TPH	360	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	MW-2	18.0-18.5	TPH	350	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	SB-2	8.0-8.5	TPH	350	2000[c]		<1	NA	NA
Dames & Moore 1991d	12/01/90	SB-5	28.0-28.5	TPH	340	2000[c]		<1	NA	NA
Dames & Moore 1991d	12/01/90	SB-4	23.0-23.5	TPH	240	2000[c]		<1	NA	NA
Dames & Moore 1991d	12/01/90	SB-5	13.0-13.5	TPH	210	2000[c]		<1	NA	NA

Table 3
Chemicals Detected in Soil Samples
DMC Property

Source	Sample Date	Sample Location	Sample Depth (ft)	Chemical	Soil Conc'n (mg/kg DW)	MTCA Method A Cleanup Level (mg/kg)	MTCA Method B Cleanup Level (mg/kg)	MTCA Cleanup Level Exceedance Factor	Soil-to-Sediment Screening Level (Based on CSL)[a] (mg/kg)	Screening Level Exceedance Factor
Dames & Moore 1991d	12/01/90	SB-4	13.0-13.5	TPH	207	2000[c]		<1	NA	NA
Dames & Moore 1991d	12/01/90	SB-4	8.0-8.5	TPH	130	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	MW-2	13.0-13.5	TPH	110	2000[c]		<1	NA	NA
Dames & Moore 1991d	12/01/90	SB-5	23.0-23.5	TPH	110	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	SB-3	3.0-3.5	TPH	99	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	SB-1	11.0-11.5	TPH	73	2000[c]		<1	NA	NA
Dames & Moore 1991d	12/01/90	SB-5	33.0-33.5	TPH	59	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	SB-2	3.0-3.5	TPH	57	2000[c]		<1	NA	NA
Dames & Moore 1991d	12/01/90	SB-4	33.0-33.5	TPH	55	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	SB-3	11.0-11.5	TPH	31	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	MW-2	3.0-3.5	TPH	25	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	SG-1	11.0-11.5	TPH	18	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	SB-1	3.0-3.5	TPH	12	2000[c]		<1	NA	NA
Dames & Moore 1991d	10/01/90	SG-1	3.0-3.5	Xylenes	0.018	9	16,000	<1	NA	NA

Table presents detected chemicals only
Yellow shaded cells are data that exceed MTCA Method A or Method B soil cleanup levels.
No samples exceeded the soil-to-sediment screening levels.
Exceedance factors are the ratio of the detected concentrations to the MTCA Cleanup Level or soil-to-sediment screening level.

a - From: SAIC 2006
b - MTCA Cleanup Level for gasoline-range petroleum hydrocarbons
c - MTCA Cleanup Level for diesel-range and residual-range petroleum hydrocarbons
MTCA - Model Toxics Cleanup Act
CSL - Cleanup Screening Level from Washington Sediment Management Standards
NA - Not available

Table 4
Groundwater Sampling Results[a]
DMC Property

Source	Sample Date	Sample Location	Chemical	Groundwater Conc'n (ug/L)	MTCA Method A Cleanup Level (ug/L)	MTCA Method B Cleanup Level (ug/L)	MTCA Cleanup Level Exceedance Factor	GW-to-Sediment Screening Level[b] (Based on CSL) (ug/L)	Screening Level Exceedance Factor
Dames & Moore 1992e	Sep-91	MW-2	Benzene	88	5	0.8	110	NA	NA
Dames & Moore 1992e	Jan-92	MW-2	Benzene	110	5	0.8	138	NA	NA
Dames & Moore 1992e	Apr-92	MW-2	Benzene	65	5	0.8	81.3	NA	NA
Dames & Moore 1992e	Aug-92	MW-2	Benzene	94	5	0.8	118	NA	NA
Dames & Moore 1991d	Dec-90	MW-3	Benzene	420	5	0.8	525	NA	NA
Dames & Moore 1992e	Sep-91	MW-3	Benzene	630	5	0.8	788	NA	NA
Dames & Moore 1992e	Jan-92	MW-3	Benzene	500	5	0.8	625	NA	NA
Dames & Moore 1992e	Apr-92	MW-3	Benzene	620	5	0.8	775	NA	NA
Dames & Moore 1992e	Aug-92	MW-3	Benzene	910	5	0.8	1138	NA	NA
Dames & Moore 1991d	Nov-90	MW-4	Benzene	4200	5	0.8	5250	NA	NA
Dames & Moore 1991d	Dec-90	MW-4	Benzene	3600	5	0.8	4500	NA	NA
Dames & Moore 1992e	Sep-91	MW-4	Benzene	2000	5	0.8	2500	NA	NA
Dames & Moore 1992e	Jan-92	MW-4	Benzene	2700	5	0.8	3375	NA	NA
Dames & Moore 1992e	Apr-92	MW-4	Benzene	1800	5	0.8	2250	NA	NA
Dames & Moore 1992e	Aug-92	MW-4	Benzene	3400	5	0.8	4250	NA	NA
Dames & Moore 1992e	Sep-91	MW-7	Benzene	3.4	5	0.8	4.3	NA	NA
Dames & Moore 1992e	Jan-92	MW-7	Benzene	1.7	5	0.8	2.1	NA	NA
Dames & Moore 1992e	Apr-92	MW-7	Benzene	1.6	5	0.8	2.0	NA	NA
Dames & Moore 1992e	Aug-92	MW-7	Benzene	1.1	5	0.8	1.4	NA	NA
Dames & Moore 1991d	Nov-90	MW-3	Ethylbenzene	1.1	700	800	<1	NA	NA
Dames & Moore 1991d	Dec-90	MW-3	Ethylbenzene	13	700	800	<1	NA	NA
Dames & Moore 1992e	Sep-91	MW-3	Ethylbenzene	16	700	800	<1	NA	NA
Dames & Moore 1992e	Jan-92	MW-3	Ethylbenzene	14	700	800	<1	NA	NA
Dames & Moore 1992e	Apr-92	MW-3	Ethylbenzene	9.1	700	800	<1	NA	NA
Dames & Moore 1992e	Aug-92	MW-3	Ethylbenzene	9.4	700	800	<1	NA	NA
Dames & Moore 1991d	Nov-90	MW-4	Ethylbenzene	2.1	700	800	<1	NA	NA
Dames & Moore 1992e	Jan-92	MW-4	Ethylbenzene	4.1	700	800	<1	NA	NA
Dames & Moore 1992e	Aug-92	MW-4	Ethylbenzene	4.6	700	800	<1	NA	NA
Dames & Moore 1991d	Dec-90	MW-3	Toluene	3.5	1000	640	<1	NA	NA

Table 4
Groundwater Sampling Results[a]
DMC Property

Source	Sample Date	Sample Location	Chemical	Groundwater Conc'n (ug/L)		MTCA Method A Cleanup Level (ug/L)	MTCA Method B Cleanup Level (ug/L)	MTCA Cleanup Level Exceedance Factor	GW-to-Sediment Screening Level[b] (Based on CSL) (ug/L)	Screening Level Exceedance Factor
Dames & Moore 1992e	Sep-91	MW-3	Toluene	3.2		1000	640	<1	NA	NA
Dames & Moore 1992e	Jan-92	MW-3	Toluene	3.8		1000	640	<1	NA	NA
Dames & Moore 1992e	Apr-92	MW-3	Toluene	3		1000	640	<1	NA	NA
Dames & Moore 1992e	Aug-92	MW-3	Toluene	3.2		1000	640	<1	NA	NA
Dames & Moore 1991d	Nov-90	MW-4	Toluene	8.3		1000	640	<1	NA	NA
Dames & Moore 1992e	Sep-91	MW-4	Toluene	12		1000	640	<1	NA	NA
Dames & Moore 1992e	Jan-92	MW-4	Toluene	11		1000	640	<1	NA	NA
Dames & Moore 1992e	Apr-92	MW-4	Toluene	6.2		1000	640	<1	NA	NA
Dames & Moore 1992e	Aug-92	MW-4	Toluene	12		1000	640	<1	NA	NA
Dames & Moore 1992e	Sep-91	MW-7	Toluene	79		1000	640	<1	NA	NA
Dames & Moore 1992e	Jan-92	MW-7	Toluene	4.2		1000	640	<1	NA	NA
Dames & Moore 1992e	Aug-92	MW-7	Toluene	22		1000	640	<1	NA	NA
Dames & Moore 1991d	Nov-90	MW-1	TPH	590		NA	NA	NA	NA	NA
Dames & Moore 1991d	Nov-90	MW-2	TPH	560		NA	NA	NA	NA	NA
Dames & Moore 1991d	Nov-90	MW-3	TPH	330		NA	NA	NA	NA	NA
Dames & Moore 1991d	Nov-90	MW-4	TPH	270		NA	NA	NA	NA	NA
Dames & Moore 1992e	Apr-92	MW-2	TPH-D	580		500	NA	1.2	NA	NA
Dames & Moore 1992e	Aug-92	MW-3	TPH-D[c]	300		500	NA	<1	NA	NA
Dames & Moore 1992e	Aug-92	MW-5	TPH-D[c]	280		500	NA	<1	NA	NA
Dames & Moore 1992e	Apr-92	MW-6	TPH-D[c]	4,200		500	NA	8.4	NA	NA
Dames & Moore 1992e	Aug-92	MW-6	TPH-D[c]	1,100		500	NA	2.2	NA	NA
Dames & Moore 1992e	Apr-92	MW-7	TPH-D[c]	6,600		500	NA	13.2	NA	NA
Dames & Moore 1992e	Aug-92	MW-7	TPH-D[c]	730		500	NA	1.5	NA	NA
Dames & Moore 1992e	Apr-92	MW-2	TPH-G[c]	140	J	800	NA	<1	NA	NA
Dames & Moore 1992e	Aug-92	MW-3	TPH-G[c]	310		800	NA	<1	NA	NA
Dames & Moore 1992e	Apr-92	MW-4	TPH-G[c]	150	J	800	NA	<1	NA	NA
Dames & Moore 1992e	Aug-92	MW-4	TPH-G[c]	220	J	800	NA	<1	NA	NA

Table 4
Groundwater Sampling Results[a]
DMC Property

Source	Sample Date	Sample Location	Chemical	Groundwater Conc'n (ug/L)	MTCA Method A Cleanup Level (ug/L)	MTCA Method B Cleanup Level (ug/L)	MTCA Cleanup Level Exceedance Factor	GW-to-Sediment Screening Level[b] (Based on CSL) (ug/L)	Screening Level Exceedance Factor
Dames & Moore 1991d	Nov-90	MW-3	Xylenes	5.3	1000	1600	<1	NA	NA
Dames & Moore 1991d	Dec-90	MW-3	Xylenes	48.4	1000	1600	<1	NA	NA
Dames & Moore 1992e	Sep-91	MW-3	Xylenes	25	1000	1600	<1	NA	NA
Dames & Moore 1992e	Jan-92	MW-3	Xylenes	17	1000	1600	<1	NA	NA
Dames & Moore 1992e	Apr-92	MW-3	Xylenes	18	1000	1600	<1	NA	NA
Dames & Moore 1992e	Aug-92	MW-3	Xylenes	15	1000	1600	<1	NA	NA
Dames & Moore 1991d	Nov-90	MW-4	Xylenes	4.2	1000	1600	<1	NA	NA
Dames & Moore 1991d	Dec-90	MW-4	Xylenes	63	1000	1600	<1	NA	NA
Dames & Moore 1992e	Sep-91	MW-4	Xylenes	19	1000	1600	<1	NA	NA
Dames & Moore 1992e	Jan-92	MW-4	Xylenes	17	1000	1600	<1	NA	NA
Dames & Moore 1992e	Apr-92	MW-4	Xylenes	5.7	1000	1600	<1	NA	NA
Dames & Moore 1992e	Aug-92	MW-4	Xylenes	19	1000	1600	<1	NA	NA

Exceedance factors are the ratio of the detected concentrations to the MTCA Cleanup Level or groundwater-to-sediment screening level.
For MTCA exceedances, exceedance factor was calculated using the lower of MTCA Method A or B cleanup levels.
Samples were analyzed for dissolved metals; MTCA cleanup levels are based on total metal concentrations.

a - Table shows detections only.
b - From SAIC 2006
c - In the opinion of the laboratory analyst, there was no chromatographic pattern match for diesel or gasoline.