Most Western Laundry Site
16th & B Streets, Hoquiam, Washington

FINAL

Remedial Investigation / Feasibility Study Report

Prepared for

DEPARTMENT OF ECOLOGY
State of Washington

Washington State Department of Ecology
Southwest Regional Office
Lacey, Washington

Prepared by

SAIC
From Science to Solutions

Science Applications International Corporation
18912 North Creek Parkway, Suite 101
Bothell, Washington

May 2010

Table of Contents

Tables

Figures

List of Acronyms

ARD	anaerobic reductive dechlorination
ARI	Analytical Resources Incorporated
bgs	below ground surface
CAS	Columbia Analytical Services
CES	Crowley Environmental Services
CFR	Code of Federal Regulations
CLARC	Cleanup Levels and Risk Calculation
cm/sec	centimeters per second
COC	contaminant of concern
CUL	cleanup level
DCE	dichloroethene
DNAPL	dense non-aqueous phase liquid
E&E	Ecology and Environment, Inc.
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
ERH	electrical resistance heating
EVO	emulsified vegetable oil
JEM	Johnson and Ettinger model
LDAB	large-diameter auger boring
LDR	Land Disposal Restrictions
mg/kg	milligrams per kilogram
MNA	monitored natural attenuation
MSDS	material safety data sheet
MSL	mean sea level
MTCA	Model Toxics Control Act
MW	monitoring well
MWL	Most Western Laundry
NAPL	non-aqueous phase liquid
O&M	operation and maintenance
ORP	oxygen reduction potential
PCE	perchloroethylene, or tetrachloroethene
PCHB	Pollution Control Hearings Board
PID	photo-ionization detector
ppm	parts per million
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RCW	Revised Code of Washington
RI/FS	remedial investigation / feasibility study
RPD	relative percent difference
SAIC	Science Applications International Corporation
SB	soil boring
TBT	tributyltin
TCA	trichloroethane

TCE	trichloroethene
TOC	total organic carbon
TPH	total petroleum hydrocarbons
µg/L	micrograms per liter
VOC	volatile organic compound
WAC	Washington Administrative Code

1.0 Introduction

This report fulfills the submittal requirements described in section 173-340-350(4) of the Washington Administrative Code (WAC) for documentation of a remedial investigation and feasibility study (RI/FS) conducted under the Model Toxics Control Act (MTCA). This RI/FS was performed according to the requirements set forth in WAC 173-340-350. The purpose of an RI/FS is to collect, develop, and evaluate sufficient information regarding a site contaminated with hazardous substances in order to select a cleanup action. Specifically, this RI/FS was conducted to investigate soil and groundwater conditions affected by past activities at the former Most Western Laundry property in Hoquiam, Washington. These activities have affected the property and an area around the property, which together comprises the “site.” This RI/FS Report has been prepared by Science Applications International Corporation (SAIC) and is being submitted to the Washington State Department of Ecology (Ecology). Ecology’s Toxics Cleanup Program is managing the RI/FS through contract with SAIC, under Contract #C0700034, and Work Assignment SAIC041.

1.1 Site Description

The former Most Western Laundry (MWL) property is a vacant lot located on the southwestern corner of B Street and 16th Street in Hoquiam, Washington, approximately 0.75 mile north of Grays Harbor along the Hoquiam River (Figure 1-1). The MWL property is located in the extreme northwestern corner of Section 12, Township 17 North, Range 10 West, at 47˚58’45” North latitude and 123˚52’45” West longitude at an elevation of approximately 18 feet above mean sea level (MSL). The property is located south, east, and north of a tight meander in the Hoquiam River; at its closest, the property is approximately 500 feet northeast of the river. The neighborhood around MWL sits on a flat surface between Beacon Hill to the east and the river. The MWL property is located within a residential area in the community of East Hoquiam; the downtown area of Hoquiam is located west of the river (Howard Edde 1986, 1987; E&E 1988).

Surface water collects in storm drains near the site and discharges to the river via an outfall at the southern end of 15th Street. The city obtains its potable water supply from three sources in rivers located a distance from the MWL site. There are no known drinking water wells in the city (Howard Edde 1987; E&E 1988).

The MWL property has been comprised of three separate contiguous lots since at least 1907. The three lots were addressed 1508 to 1512 B Street until approximately 1993, when the addresses changed to 1504 to 1508 B Street. The currently vacant property is still comprised of these three lots, with an adjacent fourth lot at 1502 B Street occupied by a single-family residence (Figure 1-2). Two additional residences and a vacant lot are located across an unpaved alley to the southwest. The MWL property is covered mostly with grass, but it also has some remnant slabs of concrete from the former laundry building in the western and southern portions of the property. The “site” is defined as the entire MWL property and the area of contamination, including portions of the adjacent streets and alley.

The laundry facility operated continuously under different names from 1907 until 1994, when the facilities were destroyed in a fire. Figure 1-3 presents features of the ground floor of the MWL building as it appeared in the 1980s and 1990s (composite map from various sources). The laundry facility at that time was two-story wood-frame construction with metal siding on the southeast and southwest walls. A loading dock and an outside storage tank were located on the southeastern side of the building, adjacent to the sidewalk along 16th Street. A gravel alley ran the length of the southwest wall, and a gravel lot existed on the northwestern side of the building. City dumpsters and other small waste containers were located along this alleyway, near a former storm sewer drain (Figure 1-3) (E&E 1988; URS 1992a).

Inside the building on the ground floor, the dry-cleaning machines were located in the southeastern corner of the facility on a thick (1 to 2.5-foot) concrete slab. The dryers, washers, and water extractors were in the western portion of the building on thinner (0.5 to 2-foot) concrete slabs. Between these was an area with a hot water tank, a boiler for steam generation, and compressed air equipment, which apparently were partly set down in a basement area. Automated ironing and folding machines were located in the eastern corner of the building, while an office, lunch breakroom, storage, and dirty receiving areas were located on the northern and western sides. There were floor drains in each section of the building, but it was unknown where they drained to. A second story existed only on the northwestern side of the building and was used for the owner's office and storage space (Figure 1-3) (Ecology 1984a; URS 1992a; Hoquiam Fire Department 1994).

1.2 Historical Operations

1.2.1 Laundry Operations at MWL Property

The laundry facility is believed to have been erected and put into operation during 1907. Prior to this date, a residential dwelling occupied the central lot, and the other two lots were vacant (Sanborn Map Company 1907). The laundry business began operations under the name Hoquiam Steam Laundry and was originally owned by Oscar Sundstrom, Joseph Sparring, and Gus Kallberg. By 1913, Sundstrom had become the sole owner of the business, and remained such until sometime between 1916 and 1923, at which time the property was sold to E.D. Milbrad. In 1924, Milbrad operated two separate laundry businesses at the property: Hoquiam Steam Laundry, which specialized in mending, and The Easy Way Laundry, which specialized in "family wash" jobs. In 1930, the business was expanded to include Prosperity Cleaners and Dyers. By 1933, Milbrad and his son, LeRoy Milbrad, had consolidated the three businesses into a single entity that was known as Hoquiam Steam Laundry and Dry Cleaners. Based on this name, it appears that the first dry-cleaning operations at the facility took place in the early 1930s. The Milbrads ran the business until 1944, when it was purchased by Horace and Dorothy Waples.

The business changed names yet again in February 1959, when it was incorporated under the name Hoquiam Steam Laundry and Dry Cleaning, Inc. The Waples continued as owners and managers of the company. In 1964, both the Hoquiam Steam Laundry and Dry Cleaning, Inc., and a business formerly known as Gloss Steam Laundry and Cleaners, Inc., located in Aberdeen (which was also owned by Horace Waples), jointly changed their names to Most Western Laundry and Dry Cleaners, Inc. The Aberdeen business property was either sold or changed names by 1967.

Beginning in 1975, Michael Bonney became the manager for MWL. Michael Bonney acquired the business in 1981 when the Waples (his parents-in-law) retired, and he continued to manage its operations until sometime between 1989 and 1993, at which time he retired and his son William Bonney and his wife Jean Bonney took over the business. The business name was changed in 1990 to Most Western Laundry, Inc. In 1994, following a devastating fire, the name was changed to Most Western Limited to reflect the fact that the laundry business was no longer operating (R.L. Polk & Company 1907 to 2005; E&E 1988; Parker, Johnson & Parker 2006; Ecology 2007).

This facility operated as an industrial and commercial laundry for more than 80 years and offered dry-cleaning services as far back as the early 1930s. The facility accepted soiled laundry from hospitals, factories, schools, and other institutional facilities on a contractual basis. Soiled laundry such as bed sheets, coveralls, and welcome mats were washed, dried, ironed, and folded in large commercial machines. Laundry was trucked in and out of the facility from/to customers in MWL-owned trucks, which often parked in gravel areas around the building on 16th Street (URS 1992a; Parker, Johnson & Parker 2006).

Historical configurations of the laundry business and residences on the property were likely very different from that of the 1980s and 1990s. In 1916, during operation of the Hoquiam Steam Laundry, an independent electric plant with a horizontal steam boiler was located in the southern corner of the building. The laundry building occupied the southern half of the three properties, with two large water tanks standing just north of the building; a residential dwelling was also located at 1508 B Street. In 1928, E.D. and Evelyn Milbrad lived on the 1510 B Street parcel, while their son, LeRoy, and his wife lived on the 1508 B Street parcel (Sanborn Map Company 1916; R.L. Polk & Company 1907 to 2005).

Between 1962 and 1964, city directories indicate that the laundry business occupied the 1510 and 1512 B Street addresses, with a residence of some form occupying the 1510½ B Street address that was owned and occupied by various workers at the laundry. This 1510½ B Street address changed to 1508 B Street in 1965 and continued to serve as a residence for laundry workers until approximately 1970, at which time the listing changed to “vacant.” From approximately 1975 to 1988, the 1508 address was used as MWL storage, with the laundry facilities occupying numbers 1510 and 1512.

In 1978, MWL terminated the family laundering portion of the business and began doing only industrial dry-cleaning services with the installation of a new dry-cleaning unit using perchloroethylene (PCE, also called tetrachloroethene). It is not known when PCE actually began to be used at the facility. Following regulatory violations and a penalty (see Section 1.3), the dry-cleaning operations were discontinued in December 1984. MWL continued commercial and industrial laundry operations, but not dry cleaning, until a fire completely destroyed the building on June 26, 1994. Since then, no laundry business has been conducted on the property and the site remains vacant. Mr. William F. (Bill) Bonney, son of Michael and Jean Bonney, was the most recently registered agent for Most Western Limited; this arrangement terminated in 2009, when the business dissolved. In December 2009, Grays Harbor County auctioned the abandoned property to the highest bidder (R.L. Polk & Company 1907 to 2005; Ecology 1984a; MWL 1985; Hoquiam Fire Department 1994; SAIC 2010).

1.2.2 Waste Management Practices at MWL

Hazardous waste generated at MWL mostly consisted of dry-cleaning agents. The earlier history of types of cleaning solvents used at the MWL facility is not known (see Section 4.2). The primary cleaning solvent used for dry cleaning in recent decades was PCE. Trucks would deliver new PCE solvent, which was stored outside in an above-ground tank near the southern corner of the building along 16th Street (Figure 1-3). The solvent was pumped from this storage tank, through the outside wall and into the dry-cleaning machine. The scoop that was used to clean waste from the dry-cleaning machine was also stored outside next to the tank, along with various other open waste containers (such as 30-gallon drums and 5-gallon buckets) used to store PCE wastes along the sidewalk near the corner of the building.

A 1981 inspection by the City of Hoquiam found sludges heavily staining the soil near a sanitary sewer cleanout port along the alley. A 1984 Ecology site inspection found that the storage tank was leaking PCE liquid and the open waste containers had leaked or overflowed with PCE sludge onto the soil surface. Stains on the ground suggested a history of spills in the area, with contamination leading to a storm drain along 16th Street less than 20 feet away. Washing of equipment in this area apparently spread PCE wastes across a gravel strip and into the storm drain (Ecology 1984a).

As part of the dry-cleaning circuit, MWL operated two distillers that recycled used PCE for reuse in the laundry. The dry-cleaning unit operated 6 hours per day, 5 days per week, and generated approximately 72 to 100 pounds per month of PCE sludge (5,000 pounds from 1978 to 1984). Sludges from the dry cleaner were generally cleaned out each day. In addition, the dry-cleaning unit was shut down and cleaned out every 3 to 6 months. The recycled PCE sludge was stored in the open waste containers next to the storage tank, and sludge was disposed of in two unlined dumpsters located outside the southwestern corner of the building, along the alley (see Figure 1-2).

The laundry owner at that time claimed he received permission from the City of Hoquiam to use the dumpsters for PCE disposal. The city garbage collectors would pick up the dumpster and empty it at the Hoquiam Sanitary Landfill. At the time of Ecology's first site inspection in 1984, the dumpsters were open, unlabeled, unsecured, and overflowing. There were also stains on the ground in the alley and sludge in the dumpsters. Reportedly, for years PCE waste was commonly carried from the MWL building and dumped in/around one or two sewer cleanout ports along the alley (Figure 1-2) (Ecology 1984a, 1985a; MWL 1987; SAIC 2007a).

Until the 1984 Ecology inspection, hazardous waste generated onsite was not sent to a permitted hazardous waste treatment, storage, or disposal facility. Waste management at this facility included disposal in the Hoquiam Sanitary Landfill by city dumpster, but employees at MWL stated that sludge was also disposed of by pouring it on the ground onsite, or down the storm drain, which leads directly to the Hoquiam River, approximately 500 feet southwest of the site. Discharges through leaks or spills to the sanitary sewer and to the Aberdeen Sewage Treatment Plant were also documented and strong odors were noticeable in the pump station (Ecology 1984a,b, 1985a; MWL 1987).

In addition to PCE, a review of the MWL Material Safety Data Sheets (MSDS) on file (dated 1981) reveals only two other identified hazardous chemicals that could persist in the environment: tributyltin (TBT) and an aromatic petroleum solvent known as Liqua-Break. TBT was used at MWL in a mildewcide known as "Mildupruf," which contains bis-tributyltin-oxide (U.S. EPA Files 1981). It is not known where on the property these chemicals were used or disposed of.

1.2.3 History of Nearby Businesses

Land use in the immediate vicinity of the MWL facility is primarily residential. Only one other business was identified as being present in the immediate vicinity of the MWL facility. A private repair shop and trucking facility operated across the street from the MWL property at 207 16^{th} Street, starting sometime between 1941 and 1958. The business was opened by James W. Horne under the name Jim Horne Trucking Garage. James Horne operated the business (intermittently?) until 1975, at which time his widow, Hyacinthe Horne, and son, James L. Horne, took over the operations. The business changed names to Jim Horne Trucking in 1980, but closed the next year. In 1989, James L. Horne reopened the business as a log hauling company under the name Jim Horne Trucking Inc. It closed again in 1993 and the property remained vacant until 1998, when it was bought by another individual for use as a residence.

1.3 Regulatory History

Following is a chronological history of the site inspections, investigations, and regulatory actions that have been conducted at the MWL site. Detailed results of site investigations, sample analyses, and remedial actions are discussed in Sections 1.4 and 1.5.

- *City of Hoquiam Public Works Site Inspection, July 17, 1981.* The City of Hoquiam Public Works conducted a site inspection on July 17, 1981, and gathered evidence of PCE sludge spills near the cleanout port of the sanitary sewer in the alleyway. Samples and a photograph of the cleanout port were provided to Ecology (Ecology 1984b).
- *Ecology Site Inspection, September 26, 1984.* In response to citizen complaints of alleged "midnight" dumping into the sewer, Ecology conducted a site inspection of the laundry facility in September 1984, which uncovered numerous violations of Washington's Dangerous Waste Regulations (WAC 173-303), as discussed below (Ecology 1984a,b,c). These violations included illegally disposing of dangerous waste (PCE sludge) in dumpsters and by spilling on the ground; dumping PCE sludge down a storm drain that leads to the Hoquiam River; storing PCE sludge in unlabeled, unsecured, open containers; and failing to comply with notification, documentation, and planning requirements imposed on generators of dangerous waste. Several samples were collected by Ecology for analysis.
- *Ecology Order No. DE 84-622, October 12, 1984.* Based on the site inspection in September 1984, Ecology issued Order No. DE 84-622 to Mr. Bonney, requiring MWL to comply with Washington's Dangerous Waste Regulations (Ecology 1984d). MWL was required to immediately: (1) cease prohibited disposal of wastes, (2) complete and submit a notification form, (3) begin proper use and management of waste containers, and (4) cease dumping, draining, or otherwise discharging dangerous waste to the ground or waters of the state. In addition the business was required to comply with other measures, such as reporting past

waste disposal quantities and practices, commencing record keeping, properly disposing of all dangerous waste sludge, and submitting a training plan and contingency plan in case of emergencies.

- *Ecology Site Inspection, October 30, 1984.* Ecology conducted a follow-up site inspection in response to an employee complaint (Ecology 1984e). Ecology found that MWL was still not in compliance with WAC 173-303, and was in violation of Chapters 90.48 and 70.105 RCW. Ongoing violations included PCE leaks; spills running into a storm drain; a dangerous waste drum that was unlabeled, unmarked, and open; disposal of new PCE sludge in the dumpster; and lack of protective clothing, including gloves. A sample of the new sludge in the dumpster was taken for analysis (Ecology 1984h).
- *Ecology Sampling Effort, 1984 – 1985.* Ecology collected multiple samples as part of a receiving environment survey in the Hoquiam River and the vicinity of the MWL site (Ecology 1985b).
- *Ecology Order No. DE 84-687, November 26, 1984.* As a result of violations, Ecology issued a $10,000 penalty under Order No. DE 84-687.
    - *January 4, 1985.* Following this penalty, MWL discontinued the dry-cleaning portion of their operations (MWL 1985).
    - *July 26, 1985.* After an appeal and hearing before the Pollution Control Hearings Board (PCHB) on July 26, 1985, Ecology lowered the penalty to $5,000 (MWL 1984a,b; PCHB 1985).
- *Ecology Order No. DE 85-370, May 22, 1985.* Due to concerns that contaminated groundwater and stormwater runoff could enter the Hoquiam River and impact the aquatic ecosystem, Ecology issued Order No. DE-370, which required MWL to determine the extent of onsite soil and groundwater contamination (Ecology 1985a).
- *Ecology Consent Order No. DE-86-S149, April 27, 1987.* Ecology issued Final Consent Order No. DE 86-S149, requiring MWL to begin sampling within 10 days. At MWL's request, the consent order was amended to require sampling to begin by August 15, 1987. Although MWL completed some investigative and remedial work on the site, as described in Sections 1.4 and 1.5, MWL never fully complied with the Consent Order (Ecology 1987a,b, 2007).
- *Howard Edde Investigation Report, October 1987.* Howard Edde was contracted to provide sampling and analysis of soil and groundwater at the MWL site. The investigation report was submitted to Ecology in October 1987 (Howard Edde 1987).
- *Ecology Notice of Requirements to MWL, April 4, 1988.* After reviewing the analytical data and recommendations from Howard Edde's Investigation Report, Ecology sent MWL a notice outlining specific removal and remedial action requirements and cleanup standards for contaminated soil. Ecology required the installation of groundwater monitoring wells, as well as further sampling around the dumpster with a hand auger to better determine the extent of contamination in that area (Ecology 1988).
- *CES Remedial Cleanup, July 1988.* After conducting further sampling in the dumpster area in June 1988, MWL contracted Crowley Environmental Services, Inc. (CES) in July 1988 to provide removal/remedial services in accordance with Ecology's remedial action requirements. The summary report was submitted on August 12, 1988 (CES 1988).

- *E&E Screening Site Inspection, December 1988.* Ecology and Environment, Inc. (E&E) completed a Screening Site Inspection of the MWL site for the Environmental Protection Agency (EPA) Region 10. The site inspection evaluated actual or potential environmental or public health hazards at the site relative to other sites across the nation (E&E 1988).
- *Ecology Site Hazard Assessment Ranking, August 22, 1991.* Ecology completed a Site Hazard Assessment for MWL and gave the site a ranking of 1, with 1 representing the highest relative risk and 5 the lowest relative risk (Ecology 1991).
- *URS Site Inspection, November 4, 1992.* URS Consultants performed a site inspection for EPA Region 10 to determine the impact or potential impact of any hazardous substances that may be released to the environment from the facility. URS submitted their site inspection report on November 18, 1992 (URS 1992a,b).
- *Ecology Agreed Order No. DE 4074, February 7, 2007.* Ecology issued Agreed Order No. DE 4074 requiring MWL to grant Ecology access to the property for investigation and remediation of hazardous substances on the property. The order also required MWL to provide Ecology with information.
- *SAIC Remedial Investigation/Feasibility Study, 2006–2010.* Ecology contracted SAIC to conduct this RI/FS beginning in September 2006 and continuing intermittently until the present date. This RI/FS Report is a result of this study.

1.4 Pre-RI/FS Environmental Investigations

Environmental investigations performed prior to this RI/FS, and related to contamination originating at MWL, are discussed below. Since the first documented inspection at MWL in July 1981, various agencies, consultants, and contractors have conducted a number of separate sampling events and other environmental activities on the site. The following text summarizes these events. The analytical laboratory results for these historical activities are included in tables within Appendix A. As a screening tool, these tables compare results to current regulatory cleanup levels, which are discussed in more detail in Section 4.1. The following discussion does not reference cleanup levels, but highlights the sample results with concentrations that are significantly elevated above cleanup levels.

The sampling locations for a number of samples discussed below are unknown, and some samples were located downstream from the site (such as storm drains and sanitary sewer lines). These studies are all more than 20 years old and the data are not of the quality needed for an RI/FS. Thus, much of the following information is summarized here as background information, but is not included in later sections of this report.

Department of Ecology MWL Site Inspections and Sample Collection, September to October 1984.

- A bioassay was performed on rainbow trout using a black viscous material (apparently dry-cleaning sludge) collected on September 26, 1984, from a garbage can on 16th Street outside of the MWL building. The 96-hour test demonstrated 100% fish mortality (Ecology 1984g).
- In an effort to evaluate MWL contamination concerns affecting the Hoquiam sanitary sewer system, three samples were collected for laboratory analysis of volatile organic compounds

(VOCs) on September 27, 1984. Samples included a dark spill material (Ecology sample 39558), a liquid sample collected from the treatment plant head works (39559), and a liquid sample taken from the Riverside pump station west well (39560). PCE was detected only in one sample (39560) at a concentration of 40 micrograms per liter (µg/L, which is equivalent to parts per billion) (Ecology 1984f).

- Samples were collected from four locations near the MWL building on October 3, 1984. A storm drain sample (409029) was collected from the drain adjacent to MWL, and a sample (409032) was collected from the dumpster located along the alley behind MWL. A sample of lint-soils (409030) and a sample of soil (409031) were both collected within 5 feet of the building near the western corner. PCE was detected in all samples at elevated concentrations (210 to 65,000 milligrams per kilogram [mg/kg], which is equivalent to parts per million). Additionally, trichloroethene (TCE) in one sample (409031) had an elevated concentration (180 mg/kg) (Ecology 1984g; Howard Edde 1986).
- Two storm drain liquid samples were collected from the 15^{th} Street/Riverside outfall along the river, which discharges stormwater from the neighborhood near MWL, on October 9, 1984. One sample (419007) contained elevated concentrations of PCE and TCE (36 µg/L and 13 µg/L, respectively). Elevated concentrations were also detected in both samples for trans-1,2-dichloroethene (DCE) (950 µg/L and 310 µg/L) (Ecology 1984g).

Department of Ecology Follow-up Site Inspection and Sludge Sample Collection, October 30, 1984

- One dry-cleaning sludge sample (449036) was collected from inside a dumpster during an Ecology site inspection at MWL on October 30, 1984. Notes on the report indicate the sludge had been freshly disposed of. The PCE concentration was significantly elevated (1,000,000 µg/L) (Ecology 1984h).

Department of Ecology Hoquiam River Outfall Sampling, December 1984.

- A water sample (519008) was collected by Ecology at the Hoquiam River storm drain outfall on December 17, 1984. The sample showed low detections of PCE and TCE (Ecology 1985c; E&E 1988).

Department of Ecology Analysis of Hoquiam Sanitary Sewer, May 1985

- Two samples were collected by Ecology on May 9, 1985, for VOC analysis. One sample (199044) was collected from the Riverside pump station and the other sample (199045) was collected from the 28^{th} Street pump station. Relatively low levels of PCE, DCE, TCE, and vinyl chloride were detected in sample 199044 (6 µg/L PCE), and lower concentrations of PCE and DCE were detected in sample 199045 (1 µg/L PCE) (Ecology 1985d).

Department of Ecology Consent Order No. DE 86-S149 Associated Environmental Investigation, April 1987

- In compliance with Ecology's Consent Order No. DE 86-S149, Howard Edde, Inc. began performing an environmental investigation of soil and water at MWL on August 24, 1987 (Howard Edde 1987).

The following samples were collected as part of this effort, and these results are partly incorporated into the RI/FS Report (shown in Figure 1-3, results in Appendix A):

- Two surface soil samples (S1, S2) from 0 to 3 inches below ground surface (bgs) were collected from the southwestern side of the property.
- Two background soil samples (B1, B2) were collected from the northern side of the property, from 0 to 6 inches bgs.
- A total of 37 soil samples in 12 borings (BH-1 through BH-12) were collected from various locations throughout the southwestern and southern sides of the property at depth intervals of 1, 3, and 5 feet bgs.

Samples from borings BH-1, BH-3, BH-4, BH-5, BH-9, S1, S2, B1, and B2 did not contain concentrations above the laboratory detection limits. Elevated concentrations of PCE in soil were identified in BH-2 at all three depths (up to 2.1 mg/kg), in BH-6 at 1 foot bgs (0.14 mg/kg), in BH-8 at 1 foot bgs (0.083 mg/kg), in BH-10 at all three depths (up to 9,400 mg/kg), in BH-11 at all three depths (up to 4,800 mg/kg), and in BH-12 at all three depths (up to 3.2 mg/kg). TCE concentrations were elevated in all samples from BH-10 (up to 31 mg/kg), BH-11 (up to 88 mg/kg), and BH-12 (up to 0.44 mg/kg). Vinyl chloride concentrations were elevated in BH-2 at 3 and 5 feet (up to 12 mg/kg), and in BH-12 at all three depths (up to 6.6 mg/kg). A strong odor resembling gasoline was also observed while sampling borings BH-11 and BH-12.

- One groundwater sample was collected in boring BH-11 at 5 feet bgs (11-C).

PCE, TCE, and vinyl chloride concentrations were significantly elevated in this groundwater sample, which was probably turbid with soil (210,000; 6,400; 2,200 µg/L respectively).

Additional Department of Ecology MWL Sludge and Soil Sample Collection, October 1986 to June 1988.

- Three “sludge” samples were collected on October 21, 1986. One sample (437862) was collected from the “drain nearest MWL,” another sample (437863) was collected from a “drain across street from MWL,” and a third sample (437864) consisted of sludge from behind the MWL building. The first two samples are likely sediments from storm drain catch basins. Elevated concentrations of PCE (3.6 mg/kg) and TCE (0.44 mg/kg) were identified in sample 437862 (Ecology 1986).
- Soil samples were collected at ground surface (809711) and 4 feet bgs (809712) on June 16, 1988. Hand-written notes on the laboratory report indicate samples were likely collected from the dumpster area at MWL. Sample 809711 had an elevated concentration of PCE (0.50 mg/kg) (AT AM Test Inc. 1988).

1.5 Previous Remedial Actions

A single environmental remedial action was performed prior to this RI. This involved a small soil excavation, as outlined in Figure 1-3.

An excavation in the southern portion of the property, near BH-10 and BH-11, began July 19, 1988, to remove contaminated soil, as previously identified in response to the Ecology Consent Order No. DE 86-S149. Field screening was used to determine the extent of the excavation, and contaminated soil was disposed of at Chem Securities facility in Arlington, Oregon. Laboratory analysis of soil on the four walls indicates that the western sidewall had a concentration of 3,600 mg/kg PCE. The other four walls had concentrations ranging from 19 to 200 mg/kg PCE. The excavation floor was dug to groundwater, approximately 4 feet bgs, and laboratory results indicated the PCE concentration in soil at that depth was 820 mg/kg. However, additional excavation was not possible due to existing building foundations and the potential compromise to structural integrity; therefore, contaminated soil was left in place. All related backfill material was provided by the MWL owner and no surface finish was completed over the excavated location. Dimensions of the final excavation were not available.

Site activities at this time also included installation of three 2-inch diameter stainless steel monitoring wells (at BH-1, BH-6, and BH-10) to depths of 6 to 7 feet bgs using a backhoe. The newly installed monitoring wells were never sampled (CES 1988; E&E 1988). During the 1992 site inspection, wells BH-1 and BH-10 were identified but BH-6 could not be located (URS 1992a). Note that during RI field activities, these three wells were explored for but never identified. It is presumed that the well vaults have become covered by compacted soil.

1.6 Potential Contaminants of Concern

Previous investigations have identified various contaminants in the site soil and groundwater, mainly focusing on chlorinated solvents such as PCE. Petroleum hydrocarbons have also been previously identified via field indicators in soil samples. Sample results from soil, groundwater, dry-cleaning sludge, storm drain water and sediment, and sewer water samples have all shown elevated detections of chlorinated VOCs. As discussed further in Section 4 of this report, the chlorinated VOCs that are considered to be contaminants of concern (COCs), based on exceedances of regulatory standards, include: PCE, TCE, 1,2-DCE, vinyl chloride, methylene chloride (also known as dichloromethane), and 1,2-dichloropropane. In addition, petroleum hydrocarbons found on the site include gasoline-range, diesel-range, and heavy oil-range hydrocarbons. These hydrocarbons also result in the following individual COCs: benzene, naphthalene, and 1,4-dichlorobenzene.

Although PCE is the only documented chemical (of the COCs) released on the MWL property, PCE is known to naturally degrade to other chlorinated chemicals, including TCE, DCE, and vinyl chloride (see Section 4.4). Methylene chloride and a variety of petroleum hydrocarbons were also heavily used in the dry-cleaning process over the years and were likely released at the MWL site. The main area of contamination for both chlorinated VOCs and petroleum hydrocarbons is centered near the southern corner of the building in the dry-cleaning area of the facility. In addition, petroleum hydrocarbons may have originated from vehicle leaks in areas around the facility or along 16th Street.

2.0 RI Investigation Methods

The field investigations for the MWL RI/FS were performed in accordance with the *Remedial Investigation Sampling and Analysis Plan* (SAIC 2007b), in addition to a few scope changes described in contract amendment work plans for the RI/FS between June 2007 and September 2009. These documents specified the type of samples, sample collection methods, sample locations, analytical methods to be used, and quality assurance measures to be implemented. The following sections summarize the elements of the field investigations, sampling, and analyses that were conducted. Samples collected during 2007 were submitted for analysis to Columbia Analytical Services (CAS) in Kelso, Washington. Samples collected during 2009 were submitted for analysis to Analytical Resources Incorporated (ARI) in Tukwila, Washington. Table 2-1 lists the soil borings and monitoring wells installed, in addition to sample numbers and analyses performed for soil, groundwater, and surface water.

2.1 Field Event of Early April 2007

The initial RI field investigation was undertaken by SAIC between April 2 and 5, 2007. This field effort focused on broad characterization of the MWL property, primarily soil contamination, but also including an initial evaluation of groundwater quality and flow direction. The investigation included 49 exploratory soil borings, SB-1 to SB-49 (boring logs are included in Appendix B). Seven borings were advanced using a hand auger to depths between 1 and 12 feet bgs, while 41 borings were advanced using a direct-push rig ("geoprobe") to depths between 5 and 40 feet bgs. A total of 80 soil samples were collected from these borings (hand auger or geoprobe core), either within the vadose zone or below the water table. Soil samples to be analyzed for volatile constituents (throughout this RI) were collected using the Method 5035 technique with methanol and sodium bisulfate preservatives. Analyses included not only VOCs, but also petroleum hydrocarbons and tin/tributyltin for selected samples (Table 2-1). Samples were selected for chemical analysis based on the presence of hydrocarbon or solvent odor, sheen, visual appearance, photo-ionization detector (PID) measurements, location, and depth. Samples to be analyzed for tin were collected at selected locations across the property.

Samples suspected of containing petroleum hydrocarbons were tested in the lab with an initial screening analysis using the hydrocarbon identification (HCID) method. Any samples with results showing detections were then analyzed using the NWTPH-Gx or Dx (gasoline- or diesel-range) methodology (Table 2-1). Samples that were analyzed for total tin were reanalyzed for tributyltin only if the total tin concentration in each sample exceeded a cleanup level of 2.3 mg/kg (discussed further in Section 4).

Six groundwater samples were also collected from geoprobe borings using a temporary PVC screen and a low-flow peristaltic pump. Analyses are listed in Table 2-1. In addition, four geoprobe borings located near the corners of the property (SB-2 through SB-5) were kept open with PVC pipes for about three days, in order to act as temporary piezometers. During this time, water levels in these borings were measured and pipe elevations were surveyed. This was done to determine the initial groundwater flow direction prior to well installation and to evaluate any tidal effects from the nearby Hoquiam River. These borings and all onsite geoprobe borings were formally decommissioned by backfilling with bentonite.

2.2 Field Event of Late April 2007

In late April 2007, five additional soil borings (SB-50 to SB-54) were advanced on the property along 16th Street and in the alley between the property and the vacant lot. The borings were advanced to depths between 3 and 8 feet bgs using a hand auger. The hand auger sampling was necessary due to the presence of subsurface utilities in this area of contamination.

In addition, five groundwater monitoring wells (MW-1 to MW-5) were installed on the property. The five wells were installed using a hollow-stem auger drill rig, and soil samples were also collected in these borings. The bottoms of the well screens were set between 7 and 8 feet bgs for wells MW-1 through MW-4. In well MW-5, the decision was made to set a deeper well toward the middle of the property, and the bottom of the well screen was set at 33 feet bgs. The tops of the well casing and adjacent ground level were surveyed relative to an arbitrary site datum, and groundwater levels were measured (survey elevation summaries are included in Appendix B).

From these ten borings, 13 soil samples were collected (hand auger or split-spoon sampler) and analyzed as presented in Table 2-1.

2.3 Field Event of May 2007

Monitoring wells MW-1 through MW-5 were sampled in May 2007. Five groundwater samples and one duplicate sample were collected and analyzed as presented in Table 2-1. Water levels were also measured in all wells.

2.4 Field Event of Mid-June 2007

Data showing contaminant distribution from the previous field events indicated that additional sampling and well installation were required in a broader area within and adjacent to the MWL property. Soil contamination in the form of both chlorinated VOCs and petroleum hydrocarbons were identified as likely extending under a portion of 16th Street, and groundwater VOC contamination likely extended across B Street. Prior to this phase of work beginning, water levels were also measured in the existing five wells.

In mid-June 2007, 13 soil borings (SB-55 to SB-67) were advanced and four groundwater monitoring wells (MW-6 to MW-9) were installed. Six soil borings were advanced to depths between 4.5 and 8 feet bgs using a hand auger. Four of these hand borings were advanced adjacent to 16th Street, and two borings were on the residential property immediately northwest of the MWL property. Seven soil borings were advanced to depths between 10.5 and 23 feet bgs using a hollow-stem auger drill rig. These borings were advanced on the former laundry property, with the exception of boring SB-57, which was within 16th Street. Four groundwater monitoring wells were installed using a hollow-stem auger. The bottoms of the well screens were set between 8 and 13 feet bgs. Two of these wells (MW-8 and MW-9) were installed within or across B Street, downgradient of the property boundary. Altogether, 31 soil samples were collected (hand auger or split-spoon sampler) and analyzed as presented in Table 2-1.

A single surface water sample was also collected at the regional storm drain outfall on the Hoquiam River at 15th Street, during low tide. The sample was analyzed for VOCs (Table 2-1).

2.5 Field Event of Late June 2007

One soil boring, SB-68, was hand-augered at the site in late June 2007. The soil boring was advanced to 4.5 feet bgs in the alley south of the MWL property, to fill a data gap. The one soil sample was analyzed as presented in Table 2-1.

Groundwater monitoring was performed during this field event. Groundwater samples were collected from all nine wells and analyzed as presented in Table 2-1. Elevations of wells were surveyed, and water levels in all wells were measured.

2.6 Field Event of October 2009

This field effort focused on delineating petroleum contamination under and across 16th Street adjacent to the MWL property. Seven soil borings were advanced and one monitoring well was installed in October 2009. The soil borings (SB-69 through SB-75) were advanced to depths between 8 and 16 feet bgs using a geoprobe rig. Well MW-10 (1-inch diameter well pipe) was installed southeast of 16th Street using the geoprobe rig. The bottom of the well screen was set at 7.5 feet bgs. Altogether, 10 soil samples were collected and analyzed as presented in Table 2-1.

Groundwater monitoring was also performed on all ten wells. Groundwater samples were collected and analyzed as presented in Table 2-1. Elevations of wells were surveyed, and water levels in all wells were measured.

2.7 Field Quality Assurance Samples

Quality assurance (QA) samples for the RI included field duplicate samples and trip blanks. Field duplicates or “split” samples were collected during the field activities on soil and groundwater, at a planned frequency of at least 5 percent (one field duplicate for every 20 environmental samples). Duplicates could not always be collected as planned due to limited recovery of soil volumes, particularly from a geoprobe core, or due to very slow yield in a groundwater well. Trip blanks were submitted in each cooler chest shipped with samples of groundwater and/or soil that were being analyzed for volatile constituents. The late April 2007 soil sample shipments did not include a trip blank due to a shortage of supplies from the analytical laboratory.

3.0 Physical Setting of Site

3.1 Site Geologic Setting

The site resides in the Hoquiam River flood plain upstream of Grays Harbor, which is located approximately 4,000 feet to the south. The regional geology consists of Tertiary bedrock (Eocene and Miocene) that has undergone a period of deformation marked by northwest-trending folds and faults. Overlying the bedrock are Quaternary alluvium deposits that consist of silt, organic silt, sand, and gravel. In the vicinity of the site, these Quaternary layers appear to represent floodplain, marsh, and channel deposits.

The local site geology is defined by a number of environmental borings that have been completed at the site, in addition to surface exposures and a regional geologic map. The site geology is represented in three cross-sections, with their locations shown in Figure 3-1 and sections presented as Figures 3-2, 3-3, and 3-4.

Five major distinct lithologic units have been identified onsite, which are labeled from top to bottom: unit A, unit B, unit C, unit D, and unit E. Subsurface lithologies at the site include: an upper fill unit (unit A) consisting of sand, silt, gravel, and anthropogenic material that is 1 to 9 feet thick; an alluvium unit (unit B) consisting of silt with sand and gravel that is 2 to 6 feet thick; a marshy alluvium unit (unit C) consisting of organic-rich silt that is 6 to 12 feet thick; an alluvium unit (unit D) consisting of silt with some sand and gravel that is 7 to 24 feet thick; and a siltstone/sandstone bedrock unit (unit E) that has surface depths of approximately 20 to 40 feet at the site.

3.1.1 Lithologic Unit A

Unit A consists entirely of fill material that is laterally and vertically varied. This unit can be identified by construction debris, foundation/slab material, and fill material associated with the former laundry facility, utilities, sidewalks, and roads. This fill material may extend to 8 feet bgs where sewer utilities are present. The fill unit consists of the following two main types.

1. The construction/foundation material and road base fill is not continuous and consists of concrete, asphalt, bricks, and silty, sandy, crushed rock material. Concrete is found on the property beneath portions of the former footprint of the facility and sidewalk areas. The concrete thickness ranges from 0.5 to 2 feet. Layers of red brick are present beneath the concrete and range up to a maximum of 8 feet in thickness (Figures 3-2 and 3-3).

2. Underlying and lateral to the construction/foundation material and road base fill is typically brown, loose, silty sand fill or sandy silt fill with some gravel. The silty sand or sandy silt material is more widespread than the construction/foundation and road base fill and is up to 7 feet thick.

3.1.2 Lithologic Unit B

Unit B contains two distinct lithologies: (1) silt with sand and gravel; and (2) silty, sandy gravel or gravelly silt.

1. The silt lithology is composed of brown to dark brown, soft to firm silt with 0 to 20 percent very fine to fine sand and 0 to 15 percent fine gravel (usually sand and gravel are each approximately 5 to 10 percent). In some locations, it is possible that the silt lithology may be fill material. This lithology is present throughout the site, up to 6 feet thick, occasionally laminated, and was deposited directly above unit C.

2. The gravel lithology is composed of gray to dark gray or brownish gray, dense, silty, sandy, fine gravel or gravelly silt. This gravel lithology is interbedded within the silt layer and is only present in the southern portion of the site, underlying 16th Street (Figures 3-2 and 3-3). The gravel layer is up to 3 feet thick and thins to the northwest.

Unit B likely consists of alluvial floodplain deposits from the Hoquiam River, which meanders around the site. The silt lithology (No. 1) may have been deposited in an overbank floodplain environment, and the gravel lithology (No. 2) may represent channel or levee deposits. It is possible that some of the unit is fill or disturbed native material.

3.1.3 Lithologic Unit C

Unit C contains two distinct lithologies: (1) organic-rich silt, and (2) gravelly silt.

1. The organic-rich silt lithology is composed of greenish-black, soft to stiff, organic-rich silt with abundant woody and peat material and little to no sand and gravel. The low to medium plasticity of the silt suggests that up to a moderate amount of clay is present. This silt lithology is present throughout the site and is up to more than 15 feet thick. The organic-rich silt thins to the east and south toward Beacon Hill and thickens to the west and north toward the river. It was deposited directly above unit D.

2. The gravelly silt lithology is composed of greenish-black to black, gravelly silt with 30 percent gravel and 10 percent coarse sand. The gravelly silt lithology is approximately 2 feet thick and was only identified at SB-12 in the eastern portion of the former laundry property (Figure 3-4).

Unit C is assumed to be related to the meandering Hoquiam River, which could have created an oxbow or other marshy environment where the organic-rich silt layer was deposited. The gravelly silt layer was deposited in a higher energy alluvial environment, such as a channel or levee. The contact between unit C and unit D is fairly flat across the site, at 12 to 16 feet bgs.

It should be noted that soils at this site tend to be naturally high in total organic carbon (TOC), especially unit C, due to abundant plant debris. Two soil samples were collected and analyzed for TOC (results listed in Appendix D, Table D-2). Correcting for concentrations of organic contaminants in each sample, the natural TOC content of these two samples is as follows:

- Boring SB-70 at 4 feet bgs: lithologic unit B gravel layer, 2.13 percent TOC
- Boring SB-75 at 6.5 feet bgs: lithologic unit C sand/silt layer, 1.03 percent TOC

3.1.4 Lithologic Unit D

This unit contains three distinct lithologies: (1) silt, (2) sandy silt, and (3) gravelly silt.

1. The silt lithology is composed of greenish-black, firm to stiff silt with low plasticity, occasional sand and gravel up to 10 percent, and local thin, interbedded, organic-rich silt layers. Some of the silt is relatively coarse-grained and approaches very fine sand size. This lithology is present throughout the site up to more than 24 feet thick; it is thicker toward the north and northwest and thins to the south and southeast. The silt lithology was deposited directly above unit E in the northern and western portions of the site.

2. The sandy silt lithology consists of greenish-black, firm to stiff, sandy silt/silty sand with 12 to 40 percent sand and occasional gravel up to 30 percent. The sandy silt layer is interbedded in the upper half of the silt lithology (No. 1). This sand-rich silt layer is mainly present in the eastern and southeastern portions of the site and thins out toward the center of the former laundry property.

3. The gravelly silt lithology is composed of greenish-gray to black, hard, gravelly silt, with gravel up to 2 inches in diameter and local sand up to 40 percent. This gravelly silt lithology was only identified in the eastern and southern portions of the site and was deposited beneath the silt lithology (No. 1) and directly above unit E. The gravelly silt layer is up to 2 feet in thickness and thins to the north and northwest.

Unit D appears to consist of Quaternary floodplain deposits associated with the Hoquiam River. This unit thickens toward the river to the north and northwest and thins to the east and southeast toward Beacon Hill.

3.1.5 Lithologic Unit E

This bedrock unit is composed of siltstone and very fine-grained sandstone. The bedrock is present at a depth of 19 feet bgs on the eastern side of 16th Street, and approximately 38 feet bgs in the northern portion of the site (Figure 3-3). Unit E corresponds to the late Miocene Montesano Formation (Rau 1986). The bedrock appears to slope gradually toward the north across the site. The Montesano Formation consists of two members: an upper member composed predominantly of siltstone but also with very fine-grained sandstone, and a lower member of medium- to coarse-grained sandstone. Although unit E at the site appears similar to the upper member, it is depicted as being within the lower member, which is present on Beacon Hill (Rau 1986).

3.2 Site Hydrogeologic Setting

The site resides on a flat terrace-like peninsula that is surrounded on three sides (north, west, and south) by the tidally influenced Hoquiam River. Based on the topography near the site, groundwater is generally expected to be recharged from the area of Beacon Hill, located east and southeast of the MWL property, and migrate to the west or northwest across the site, eventually discharging to the river.

Groundwater at the site occurs principally in two water-bearing zones: a shallow water-table aquifer and a deeper aquifer zone above bedrock. Nine monitoring wells at the site are screened within the shallow aquifer, and only one well (MW-5) is screened in the deeper aquifer zone. Three geologic cross-sections also show the measured range of groundwater elevations between April 2007 and October 2009 (Figures 3-2 to 3-4).

3.2.1 Shallow Aquifer Zone

The water table defining the top of this shallow aquifer zone is present largely within lithologic units A and B, which includes a significant amount of fill material. In a few locations, the water table is present where unit C is relatively shallow. The variable lithology and the moderate compaction of units A and B result in aquifer materials that are expected to have relatively low to moderate permeabilities. In the area southeast of the MWL property, under 16th Street at 4 feet bgs, a silty gravel lens acts as a preferential pathway for petroleum contamination (as described in Section 4) (Figures 3-2 and 3-3).

The lower part of this shallow aquifer zone extends into unit C, which contains organic-rich silt and minor clay, and is mostly firm to stiff. This lithology is expected to have a generally low permeability, but some of the organic-rich material contains void spaces that provide a greater permeability and hydraulic pathways. With depth, this silt is expected to be more compacted and act more like an aquitard than an aquifer.

The water table in this aquifer is very close to the surface, with measurements ranging from approximately 1.5 to 6 feet bgs. The water level data (Table 3-1) show a noticeable seasonal variation. Measurements in piezometers made over three days in April 2007 revealed no significant tidal influence in groundwater on the MWL property (after stabilization, water levels varied by only 0.02 foot). This is likely due to the distance from the river and the fine-grained nature of the soils, which together attenuate the tidal influence.

Water levels were measured in all onsite wells on several occasions during the RI. Water levels were allowed to stabilize after opening well caps, prior to measurements. Water depths were subtracted from surveyed top-of-casing elevations to determine relative groundwater elevations (Table 3-1). Four representative water-table contour maps are provided, showing the change in groundwater flow direction at different times, in 2007 and 2009.

Figure 3-5 presents the water table on May 2, 2007, showing a flow direction toward the northeast and east, with an average horizontal hydraulic gradient of 0.012. The deep well (MW-5) is not contoured in these four figures and is discussed below for the deep aquifer zone. Figure 3-6 presents the water table on June 8, 2007, showing a flow direction toward the north-northeast, with an average hydraulic gradient of 0.0055.

Figure 3-7 presents the water table on June 27, 2007, after installation of wells MW-6 to MW-9. The flow pattern varies across the site, flowing in a direction between northwest and northeast, with an average hydraulic gradient of approximately 0.0080. The more westerly flow path is influenced heavily by the unexpectedly low groundwater elevation in well MW-1. In addition, well MW-9 has an unusually low groundwater elevation in both this figure and the 2009 data (Figure 3-8). The groundwater elevation in MW-9 could not be contoured in either figure, and this may be due to the differing lithology (thicker fill) in the screen zone (Figure 3-4). This well is screened in a sand-rich aquifer zone, whereas all other onsite wells are screened in silt-rich aquifer zones. In some situations, it is recognized that potentiometric surfaces may be locally shifted up or down by sandy zones within a silt-rich aquifer (Fetter 2001).

Figure 3-8 presents the water table on October 22, 2009, after installation of MW-10. This is the most complete and presumably most representative round of measurements. Flow directions on this date range from northeast (similar to May 2007) to north, with an average hydraulic gradient of 0.012.

In summary, the groundwater flow direction varies primarily from northerly to northeasterly, with an overall average hydraulic gradient of approximately 0.010. This flow direction is unexpected due to the local topography of a steep hill to the east of the site, which certainly influences shallow groundwater flow. However, the repeated flow direction of north to northeast in spring, summer, and fall seasons indicates that this is a stable flow direction.

Groundwater yield in this aquifer is relatively low, as expected from the silt-rich lithology. During groundwater sampling, low-flow purging rates needed to be maintained at a rate of approximately 0.1 liter per minute in order to keep the water level from dropping too rapidly (Table 3-2). At this low pumping rate, total drawdown for about 0.5 hour ranged from 0.08 to 0.70 foot for all but one well. MW-10 (a 1-inch diameter well) could only be purged at 0.03 liter per minute and it produced a drawdown of 2.05 feet after 15 minutes, which represents the lowest yield of all wells.

This aquifer consists largely of silt, with some sand, organic material, and lesser gravel and clay. Based on literature values, a typical sandy silt or silty fine-sand aquifer has a hydraulic conductivity of between 10^{-4} and 10^{-3} centimeters per second (cm/sec) (Fetter 2001). By applying this conductivity range, with an average gradient of 0.010 and a typical effective porosity of 0.25, then a range of groundwater flow rates can be calculated. This calculation yields groundwater flow rates ranging from 130 to 1,300 cm per year (4 to 40 feet per year). At this range of rates, groundwater would take between 3 and 30 years to migrate downgradient from the area of MW-7 to the off-property area of MW-9.

Water quality parameters for groundwater sample purging is shown in Table 3-2. Characteristics for this shallow aquifer vary significantly, which may be partly a function of localized biodegradation activities. Based on oxygen reduction potential (ORP) and dissolved oxygen concentrations, the aquifer water ranges from moderately reducing to moderately oxidizing. Groundwater is also relatively acidic.

3.2.2 Deep Aquifer Zone

The deep aquifer zone is present within lithologic unit D, which includes silt with local sand layers and a thin gravelly layer at the base. This aquifer zone may merge with the shallow aquifer, especially where the deeper zone is sandy. Only one well, MW-5, is screened in this deeper zone (Figure 3-3). The portion of this aquifer without sand or gravel is fine-grained, firm to stiff, and expected to have relatively low permeabilities, intermediate between an aquifer and aquitard. Some of the sand-rich zones should have moderate permeabilities. The base of this aquifer is the top surface of the bedrock (unit E), which is described as dense and dry.

The potentiometric surface in this aquifer zone, in well MW-5, ranges from 4.3 to 5.4 feet bgs. Like the shallow aquifer, the water level data (Table 3-1) show a noticeable seasonal variation. Water levels for MW-5 are presented but not contoured in Figures 3-5 to 3-8. By comparison to the contoured elevation of the water table near MW-5, the potentiometric surface in MW-5 ranges from 1.0 to 2.5 feet lower in elevation. This indicates a strong downward vertical gradient from the shallow to the deeper aquifer. The horizontal groundwater flow direction of this deeper zone is unknown, but it may follow the northward slope of the bedrock surface, and almost certainly the groundwater discharges to the Hoquiam River.

Groundwater yield in this aquifer is relatively low, as expected from the silt-rich lithology. During groundwater sampling at MW-5, low-flow purging rates needed to be maintained at a rate of 0.1 liter per minute in order to keep the water level from dropping too rapidly (Table 3-2). At this low pumping rate, total drawdown for 25 minutes was 0.78 foot, which represents the lowest yield of all wells except MW-10.

Water quality parameters for groundwater during sample purging of MW-5 is shown in Table 3-2. Characteristics for this deep aquifer are significantly different than the shallow aquifer, with a lower temperature and ORP, and higher pH and conductivity than any other well.

4.0 Nature and Distribution of Contamination

This chapter summarizes and interprets data related to environmental contamination and potential receptors at the Most Western Laundry site. In this report, the term "contaminant" is used in the sense defined in the Model Toxics Control Act: "*Contaminant* means any hazardous substance that does not occur naturally or occurs at greater than natural background levels" [WAC 173-340-200]. Thus a contaminant does not imply that the substance is above a regulatory standard or is hazardous to a receptor, but merely that it is impacting some environmental media beyond natural levels.

The discussion in this chapter involves potential contamination within four environmental media: soil, vapor/air, groundwater, and surface water. Contaminants include two broad classes of chemicals: chlorinated solvents (or VOCs) and petroleum hydrocarbon constituents.

4.1 Cleanup Levels and Contaminants of Concern

In discussions below, it is necessary to compare or screen contaminant concentrations to regulatory standards referred to as cleanup levels. Under MTCA [WAC 173-340-200], a *cleanup level* means: "the concentration of a hazardous substance in soil, water, air, or sediment that is determined to be protective of human health and the environment under specified exposure conditions." Cleanup levels, in combination with points of compliance, typically define the area or volume of soil, water, air, or sediment at a site that must be cleaned up. MTCA further specifies that the first step in determining cleanup levels is to identify the potentially contaminated media, the current and potential pathways of exposure, the receptors, and the land and resource uses. The potentially contaminated media are discussed below in Sections 4.4 through 4.7. The current and potential pathways of exposure, potential receptors, and the potential land and resource uses are discussed in Section 4.8.

Throughout the remainder of this document, reference will be made to the MTCA Method A and Method B cleanup levels (CULs). These MTCA CULs are used initially for screening purposes in this RI/FS to determine COCs for the site. The full application of MTCA regarding these CULs for hazardous substances will be explained in greater detail in Section 5.

Method A cleanup levels refer to the standard formula values listed in the state MTCA regulation that are applicable as cleanup criteria at relatively simple sites [WAC 173-340-704]. The Method A cleanup levels are utilized as well-known benchmarks for comparison purposes for soil and groundwater [WAC 173-340-900, Tables 720-1, 740-1]. Most of the contaminants (hazardous substances) requiring cleanup at the MWL site are included in the Method A list, including source VOCs (PCE and methylene chloride) and petroleum hydrocarbon ranges. However, a few of the natural breakdown products of chlorinated VOCs at the site are not included in the Method A list of hazardous substances. Thus, for screening purposes the Method B cleanup levels [WAC 173-340-704] will be applied only to these few additional contaminants. Use of Method A cleanup levels for hazardous substances at MWL are inclusive enough that physical cleanup of hazardous substances using Method A cleanup levels would also remove those onsite hazardous substances for which only MTCA Method B CULs are available. MTCA

Method B CULs are listed in Ecology's Cleanup Levels and Risk Calculation, or CLARC, database. Further discussion of cleanup standards is included in Section 5.

The contaminants of concern for the MWL site are defined as those hazardous substances identified as exceeding Method A/B CULs (as described above) at least one time in the RI. This screening process for COCs is documented in tables within Appendix D. The COC list is not identical between soil and groundwater, due to differences in exceedances between media. The following table lists the COCs that have MTCA Method A cleanup levels; all others are shown under the Method B column. Unless stated, the cleanup levels apply to both soil and groundwater for each hazardous substance. Table 4-1 summarizes the number of exceedances that were reported for the chemicals listed below.

MWL Contaminants of Concern	
Method A Cleanup Levels	**Method B Cleanup Levels (those without Method A CULs)**
Tetrachloroethene (PCE)	cis-1,2-Dichloroethene
Trichloroethene (TCE)	trans-1,2-Dichloroethene (exceedances in groundwater only)
Vinyl chloride (CUL only for groundwater)	Vinyl chloride (soil)
Methylene chloride	1,2-Dichloropropane (one exceedance in groundwater only)
Benzene	1,4-Dichlorobenzene (one exceedance in soil only)
Naphthalene (one exceedance in soil only)	
TPH-gasoline range	
TPH-diesel range	
TPH-heavy oil range	

It should be noted that an additional groundwater cleanup level is introduced in Section 4.5 below, which is used to further screen COCs. This results from new Ecology guidance on protection of the vapor intrusion pathway by calculation of protective groundwater levels.

4.2 Characteristics of Site Contaminants

Two broad classes of compounds have been identified as COCs on the MWL site: chlorinated VOCs (also referred to as chlorinated solvents) and petroleum hydrocarbons. Prior to discussion of the nature and extent of site contaminants later in this chapter, the following broad summary of these chemicals and their potential historical uses is provided.

4.2.1 Chlorinated Volatile Organic Compounds

The only documented contaminant to be released on the MWL property was PCE in the form of sludge and liquid. PCE was used for an unspecified number of years at the MWL facility, apparently ending in December 1984. More generally, PCE was first used as a dry-cleaning solvent in the United States in 1934 and was the leading chlorinated solvent for this purpose by

1948, overtaking carbon tetrachloride. Both new and reclaimed PCE typically includes some impurities, such as 1,1,1-trichloroethane (TCA) and TCE (SCRD 2009).

PCE breaks down into other chlorinated VOCs through a natural microbial process known as biodegradation. The main component of this process is referred to as reductive chlorination because each step of the process involves a removal of one atom of chlorine from the compound (Figure 4-1). As a result, PCE naturally breaks down to its daughter product, TCE, which in turns breaks down into cis-1,2-DCE and much lesser amounts of trans-1,2-DCE and 1,1-DCE. These three compounds then break down into vinyl chloride, which if carried to completion would break down into non-toxic final products. The steps leading from PCE to DCE are best facilitated in anaerobic conditions; the steps from DCE to final products are best facilitated under aerobic conditions.

Figure 4-1 presents this pathway and other breakdown pathways. To place these compounds into perspective for the MWL site, this figure also lists the number of detections in the RI sample results and number of cleanup level exceedances identified for these results (discussed more fully in Sections 4.4 to 4.7). For example, PCE and vinyl chloride have the largest numbers of detections and exceedances in groundwater samples, while PCE and methylene chloride have the largest numbers in soil samples.

Methylene chloride (dichloromethane) is also very commonly detected on the MWL site. As discussed below in Section 4.4, its occurrence and distribution in soil is very similar to PCE and its daughter products. Yet methylene chloride is a breakdown product of carbon tetrachloride (not detected at MWL) and chloroform (detected at low concentrations in only a few samples). Thus, methylene chloride was likely disposed of with the PCE waste material onsite. According to SCRD (2009), methylene chloride has been commonly used in the dry-cleaning industry as pre-cleaning/spotting agents prior to dry cleaning, as carrying agents for stain-repellents and water-repellents, and in detergent mixture test kits. Other solvents used for these purposes include PCE, TCE, TCA, and chloroform. Considering the distribution and high number of detections of methylene chloride at the MWL site, it is likely that this chemical was used for one or more of these purposes and released to the environment. Pre-cleaning/spotting agents were applied to the fabric prior to dry cleaning, and this would have resulted in methylene chloride being mixed directly with the PCE liquid and sludge. Although no MSDS forms for methylene chloride were identified in the MWL files, it is very likely that it was used in the past at the facility. Methylene chloride breaks down to methyl chloride (chloromethane), which was also detected a few times at MWL (Figure 4-1).

The potential use of TCA at the MWL facility may account for the detections of this chemical and its daughter products (1,1-DCA, chloroethane, and 1,1-DCE) in samples. The origin of 1,2-dichloropropane in groundwater at the MWL site is uncertain.

4.2.2 Petroleum Hydrocarbons

Petroleum hydrocarbon constituents have also been identified at the MWL site, in an area near the southern portion of the former building (discussed more fully in Sections 4.4 to 4.6). This corresponds approximately to the area of most significant chlorinated VOC contamination, but it also extends out under 16^{th} Street. The strong correlation between the petroleum hydrocarbon and the VOC plumes in soil suggests that petroleum hydrocarbon contamination in the southern portion of the MWL property is likely related to the historical dry-cleaning operations. As discussed below, petroleum hydrocarbon solvents were historically used in dry-cleaning, although their use at the former MWL has not been confirmed. Petroleum hydrocarbons identified as COCs on the site include gasoline-range, diesel-range, and heavy oil-range hydrocarbons, plus benzene, naphthalene, and 1,4-dichlorobenzene. Benzene is clearly associated with the gasoline-range hydrocarbons, while the diesel- and heavy oil-range hydrocarbons appear to be associated.

According to SCRD (2009), a variety of petroleum hydrocarbons were also heavily used in the dry-cleaning process over the years. Beginning in the late 1920s, Stoddard Solvent (a petroleum distillate) replaced white gasoline as the preferred dry-cleaning solvent in the United States, and remained as such until the late 1950s. Stoddard Solvent is a mixture of C_5 to C_{12} petroleum hydrocarbons, and some formulations contained benzene. Dry-cleaning operations began at the MWL site in the early 1930s; therefore, it is very likely that Stoddard Solvent was used in operations at this facility.

Mineral spirits also form a common impurity in reclaimed dry-cleaning PCE. Some fabric softeners are added to the dry-cleaning process, including petroleum naphtha solvents. Petroleum solvents are also used as pre-cleaning/spotting agents in dry cleaning. Petroleum solvents and/or petroleum naphtha are commonly used as carrying agents in garment waterproofing, liquid sizing, stain repellents, and water repellents in the dry-cleaning process (SCRD 2009). One MSDS form in the MWL file is labeled Liqua-Break, which consists of aromatic petroleum solvent. This and other petroleum-based liquids may have been released to the environment and could be detected in broad-range petroleum hydrocarbon laboratory analyses; some of these liquids may contain benzene or other aromatic compounds.

In addition, trucks and other vehicles have parked around the MWL building for years, which may have resulted in petroleum hydrocarbons leaking from vehicles near the facility or along 16th Street.

4.3 Data Quality Assessment

Analytical procedures were carried out in accordance with the requirements of WAC 173-340-830, and the SAP for the task. All 2007 laboratory analyses were performed by CAS in Kelso, Washington. All 2009 laboratory analyses were performed by ARI in Tukwila, Washington. CAS and ARI are accredited by the state of Washington under WAC 173-50 for the analytical methods performed for this project. The analyses were carried out in accordance with the methods listed in the RI SAP. All analytical results, as qualified by the laboratory, were judged to be acceptable for use in the RI/FS. For the purpose of the RI, data qualified with “J” and “Q” flags were accepted as quantifiable detected values. These results did not exceed MTCA CULs. The analytical data used in this investigation have not been validated by a third party and false positives may be present on some low level detections. Generally, results that are close to the method detection limit may have a greater margin of error (i.e., the results may be slightly higher, slightly lower, or be false positives). The completeness of analyses submitted to the laboratory was 100 percent.

As expected, a small percentage of the reporting limits for the RI sample data were elevated above the MTCA cleanup levels due to laboratory dilution, chemical interference, or insufficient sample volume. Dilution also caused some samples to have surrogate recovery values outside the standard quality control (QC) limits. Further information on laboratory QA/QC concerns are recorded in the analytical reports (Appendix C).

Field duplicate samples were collected on four different soil samples and three different groundwater samples during the RI. The relative percent difference (RPD) between the samples and duplicates is summarized in Table 4-2, which shows reasonably good comparison between most sample results and their duplicate results. Out of 407 sample-analysis duplicate pairs, a total of 194 of these exceeded the RPD standard of 20 percent; 160 of these 194 exceedances are for soil, which is expected to show high variability due to natural variations in this environmental medium. For the soil analysis duplicate pairs, where the analyte was detected in both the sample and the duplicate, the range of RPD values and average RPD are large; however, the agreement between the samples is good as to whether an analyte is present or not (Table 4-2). Direct-push drilling technology was used to advance more than half of the soil borings at the site. Due to the low volume of soil that is recovered in small-diameter direct-push samplers, soil samples were collected over a large sample interval to ensure that a sufficient volume of soil was collected for laboratory analysis. Thus, soil analysis duplicate pairs were not necessarily composed of homogeneous materials. The differences in analytical results between the soil analysis duplicate pairs may be attributed to the heterogeneous nature and vertical variations of soil. Additional duplicate samples were not collected due to the low volume of soil that is recovered in direct-push samplers.

Trip blanks were submitted with each cooler that contained soil or groundwater samples for analysis by volatile methods (EPA Method 8260 and NWTPH-Gx). VOCs were detected in only one trip blank, which was submitted with the soil and groundwater samples collected on June 27, 2007. PCE was detected in the trip blank at a concentration of 0.18 microgram per liter (µg/L, Appendix C). This low level of potential cross-contamination is not of concern in this RI because (for comparison) the MTCA Method A cleanup level is 5 µg/L.

4.4 Nature and Distribution of Soil Contaminants

The list of soil samples collected and analyses performed for the RI are presented in Table 2-1. The full analytical reports from the laboratory are included in Appendix C. Summaries of analytical results for all soil samples collected during the RI investigation are summarized in Tables D-1 and D-2 of Appendix D. Analytical results for all chemicals (COCs) in soil exceeding MTCA Method A or B CULs are presented in Table 4-3. A contouring of total chlorinated VOCs (summation of the six most prevalent VOCs) is presented in Figure 4-2. Figure 4-3 presents outlines and data for exceedances of cleanup levels for individual compounds (PCE, TCE, vinyl chloride, and cis-1,2-DCE). Similarly, Figure 4-4 presents exceedances for methylene chloride, and Figure 4-5 for petroleum hydrocarbon constituents (including benzene).

From these results, it is noted that chlorinated VOCs have been identified in a wide area throughout the western and southern portions of the site and into 16th Street, while petroleum hydrocarbon constituents are localized to the former dry cleaning area in the southern portion of the building and extending southeast to 16th Street. Table 4-4 presents information on the interpreted depths of contamination in each boring. This information was used to create Figure 4-6, which presents the depths of the top and bottom of contamination exceeding cleanup levels, and which contours the deeper portion of the contaminated zone. Figures 4-7 through 4-9 present cross-section views showing the combined area of all MTCA exceedances. In general, contaminants at the site extend deeper than 10 feet bgs only in the southern portion of the property near the locations of the former dry-cleaning area, the PCE tank and container storage areas, and the eastern sewer cleanout port. This general area will hereafter be referred to as the southern portion of the property, although impacts extend off-property. Beneath this primary source area, soil contamination extends down through units C and D to the bedrock surface. Overall, soil contamination at the site extends more than the length of the MWL property, extends downward to a maximum of approximately 25 feet bgs, and is present within both aquifer zones. The most contaminated area of the site appears to be around boring SB-26 between 7 and 21 feet bgs (Figure 4-9) at the southern portion of the property.

The following two sections discuss the nature and distribution of chlorinated VOCs and petroleum hydrocarbons in soil at the MWL site. Note that although selected soil samples were analyzed for tin and TBT, none of the detections exceeded the corresponding Method B cleanup levels (see Table D-2 in Appendix D), and therefore these chemicals are not considered as COCs.

4.4.1 Chlorinated Volatile Organic Compounds

Most of the MTCA CUL exceedances at the site are for PCE, methylene chloride, TCE, and vinyl chloride, with a few exceedances for cis-1,2-DCE (Table 4-1). The greatest density and concentrations of the exceedances are observed in the southern portion of the property (Figure 4-3). A solvent sheen was noticed on a number of soil samples within the more heavily contaminated areas.

PCE is the most widespread contaminant at the site. The highest PCE concentrations reported were 8,300 and 8,200 mg/kg in boring SB-26 at 10 and 17 feet bgs, respectively. This boring was located in the PCE tank and container storage area. PCE concentrations exceeding the MTCA Method A CUL were detected in all samples collected from boring SB-26, down to 23 feet bgs, just above bedrock (Tables 4-3 and 4-4). Contamination in this “hot spot” area appears to extend down to the bedrock surface.

PCE exceedances are present in the top 3 feet of soil near the southwestern property boundary along the alley (Figures 4-3 and 4-6). Isolated PCE exceedances were present at boring SB-32 (located just east of the dryer area) and at boring SB-45 (located within the dirty receiving area). PCE contamination extended to approximately 5 feet bgs at SB-32. In boring SB-45, PCE contamination was identified at the CUL (5 mg/kg) at a depth of 3 feet bgs, along with an exceedance of methylene chloride (Tables 4-3 and 4-4). This contamination is estimated to extend from 2 to 5 feet bgs and is underlain by uncontaminated soil down to 12 feet bgs. The 12-foot sample showed PCE contamination, estimated to extend from about 12 to 13 feet, at a concentration just above the CUL (0.064 mg/kg), and other substances were non-detected or below the CULs. This slight exceedance at this depth does not appear to extend laterally and is considered to represent de minimis contamination in this RI/FS.

Concentrations of TCE, cis-1,2-DCE, and vinyl chloride exceeding MTCA CULs are less widespread at the site compared to PCE exceedances. Figure 4-3 depicts this relationship, which suggests that biodegradation of PCE to its daughter products is occurring mostly in areas with higher concentrations. As with PCE, the highest concentrations and greatest density of TCE exceedances are observed in the southern portion of the property. Additionally, a single TCE exceedance is present at the northwestern property line (SB-3) and vinyl chloride exceedances were observed in the dumpster area (SB-56 and BH-2). The highest TCE concentration observed was 560 mg/kg at boring SB-63 in the 3.5 feet bgs sample, located beside the sewer cleanout near the southern corner of the building. The TCE concentration in the 5 feet bgs sample from boring SB-63 also exceeded the MTCA Method A CUL.

The highest concentrations of cis-1,2-DCE (1,700 mg/kg) and vinyl chloride (70 mg/kg) were reported in boring MW-7 at 9 feet bgs, in the southern portion of the dry-cleaning area. In the 12-foot sample from MW-7, vinyl chloride exceeded the MTCA Method B CUL, while cis-1,2-DCE did not exceed the CUL. As shown on Figure 4-3, TCE and vinyl chloride exceedances extend farther north along 16th Street than PCE exceedances. Shallow TCE exceedances were present along the alley (Table 4-3 and Figure 4-6). No vinyl chloride exceedances were observed shallower than 3 feet bgs and no cis-1,2-DCE exceedances were observed shallower than 9 feet bgs (Table 4-3). This suggests that more complete biodegradation is happening at depth on the site.

Methylene chloride concentrations exceeding cleanup levels were observed in two areas of the site, the southern and western portions of the property (Figure 4-4). As with PCE and its daughter products, the greatest density of exceedances and highest concentrations of methylene chloride were observed in the southern portion of the property. The highest methylene chloride concentration reported was 13 mg/kg in SB-26 at 10 feet bgs, similar to PCE. Concentrations of methylene chloride exceeding the MTCA Method A CUL were reported in all samples collected from SB-26 although concentrations decreased with depth below 10 feet bgs. Methylene chloride exceedances were present in shallow soil (above 3 feet bgs) near the southern corner of the property.

In the western exceedance area, the highest concentration of methylene chloride reported was 0.062 mg/kg in boring SB-3 at 4 feet bgs. The other methylene chloride exceedances in this area were identified between 3 and 4 feet bgs (Figures 4-4 and 4-6).

4.4.2 Petroleum Hydrocarbon Constituents

Petroleum hydrocarbon contamination is generally localized in the southern portion of the site, extending north of the dry-cleaning area. Petroleum hydrocarbon constituents may be present in this area due to the historical use of these chemicals in dry-cleaning operations (Section 4.2). Gasoline-range hydrocarbons and benzene are the most widespread petroleum contaminants, with a smaller area of heavy oil-range and diesel-range hydrocarbons, all generally located in the southern portion of the property (Figure 4-5).

Concentrations of gasoline-range hydrocarbons and benzene exceeding the MTCA Method A CULs are present in the southeastern portion of the dry-cleaning area and extending eastward under 16th Street. These two constituents are spatially well correlated and clearly related. It is not known what the specific material is composed of (e.g., gasoline fuel or Stoddard Solvent). The heavy oil-range hydrocarbon contamination plume and the small diesel-range hydrocarbon plume are oriented roughly perpendicular to the gasoline-range and benzene plumes. Concentrations of benzene exceeding the MTCA Method A CUL were observed as deep as 12 feet bgs (boring MW-7, Table 4-3). Exceedances of gasoline- and heavy oil-range hydrocarbons were observed as deep as 9 feet bgs (MW-7 and SB-11 respectively, Table 4-3). The petroleum contamination under 16th Street appears to preferentially follow a gravelly layer at about 4 to 5 feet bgs. The petroleum hydrocarbon plumes are approximately collocated with the chlorinated VOC plumes, implying a similar source area and possibly a similar disposal mechanism. An exception to this collocation includes a portion of the heavy oil-range hydrocarbon plume that extends northwest from boring SB-46 to beyond SB-11.

Another exception to the collocated petroleum and solvent plumes includes two apparently isolated areas of gasoline-range hydrocarbon contamination under 16th Street (Figure 4-5). The latter areas of gasoline contamination (SB-57 and SB-74) appear to be disconnected to the main plume of gasoline/benzene. This separation is determined by the upgradient location under the street, the lack of gasoline detections in intervening borings (SB-69, SB-70, SB-73), and different ratios of detected petroleum constituents between borings. Soil collected at boring MW-10, located across 16th Street from the dry-cleaning area (Figure 2-1), showed no exceedances of any hazardous substances. An offsite source, such as the former Jim Horne trucking facility east of MW-10, does not appear to have contributed to the MWL site contamination or the two small areas under the street. The presence of gasoline contamination in these two small areas may be attributed to leaking from vehicular traffic on 16th Street. In this RI/FS, these two isolated gasoline zones under 16th Street are not considered to form part of the site and are not addressed as part of the remedial action.

An isolated benzene exceedance was present at SB-56 at 4 feet bgs, located near the western corner of the former MWL building. Concentrations of naphthalene and 1,4-dichlorobenzene (petroleum constituents) exceeding MTCA CULs were also reported in the sample. The presence of petroleum contaminants at this location may be attributed to leaks from vehicles that parked on the gravel surface at the dirty receiving area to offload laundry.

4.5 Groundwater to Indoor Air Modeling

A new draft guidance document from Ecology requires that the vapor pathway be evaluated during remedial investigations to determine the potential risk of vapor intrusion from the subsurface to current or future building occupants on the contaminated site (Ecology 2009). This evaluation of indoor air quality applies whenever volatile hazardous substances (such as gasoline or solvents) are present in the subsurface at the site. These conditions apply to the MWL site, and Ecology expects subsurface media cleanup levels to be protective of indoor air quality. The guidance provides a means to determine groundwater but not soil cleanup levels protective of vapor intrusion.

Groundwater analytical data may be evaluated to determine if VOC concentrations pose a potentially unacceptable threat to indoor air quality, via vapor intrusion, for current and future site buildings. The first step in the evaluation is to compare site VOC concentrations in groundwater to generic groundwater screening levels protective of the vapor intrusion pathway that were developed by Ecology (2009). If site groundwater VOC concentrations exceed these screening levels, then there is a potential for risk. The minimum and maximum groundwater concentrations of benzene, PCE, TCE, and vinyl chloride for all samples from wells MW-1, MW-3, MW-6, MW-7, and MW-8 (Table 4-5) were compared to the screening levels. The results from these wells were used because they provide the best estimate of potential indoor air conditions in residential buildings at the principal source area on the property (MW-3 and MW-7) and near adjacent downgradient properties (MW-1, MW-6 and MW-8). Additionally, these chemicals are COCs that are present in groundwater above the MTCA Method A CUL (Table 4-1). Benzene, PCE, TCE, and vinyl chloride concentrations exceeded the screening levels in two or more of these five wells (Table 4-5).

Since VOCs are present in groundwater at concentrations exceeding the Ecology screening levels, an estimate of the maximum indoor air concentration, via vapor intrusion, was calculated using the Johnson and Ettinger Model (JEM). According to Ecology (2009), for cases where vapor sampling points are not installed on the site, the acceptable process to evaluate vapor intrusion is to model the pathway from groundwater to soil vapor to indoor air using the standard model of Johnson and Ettinger (1991). This model has also been adapted and updated by the U.S. EPA (2004). Consequently, the JEM was employed in this RI to estimate the equivalent indoor air concentrations for a residence, based on volatilization from underlying groundwater. The JEM uses a large number of input parameters, including sampling depth, soil types and depths, groundwater concentration, building dimensions, exposure information, and air exchange rate. The JEM assumes that the house is a slab-on-grade construction or has a subgrade basement, which maximizes the vapor intrusion conditions. The JEM model is not intended for houses with crawl spaces (like the existing houses on properties adjacent to MWL) and is not as useful for locations with a very shallow water table—both of which make the JEM not optimal for evaluating vapor intrusion at MWL. Houses with ventilated crawl spaces are less vulnerable to vapor intrusion than houses with slab-on-grade. It is assumed that any new house constructed on the MWL property will be slab-on-grade, and the model will be utilized for this site, recognizing that any model is an approximation of the real conditions. The input parameters used for the MWL modeling are presented in Appendix E.

In order to evaluate a range of results, the vapor intrusion model was performed using the minimum and maximum groundwater concentrations of benzene, PCE, TCE, and vinyl chloride. The resulting maximum indoor air concentrations calculated using the JEM were compared to MTCA Method B indoor air CULs. The predicted indoor air concentrations for benzene, PCE, TCE and vinyl chloride exceed the CULs in two or more wells (Table 4-5).

Current VOC concentrations in groundwater and predicted indoor air concentrations exceed screening levels for the protection of the vapor intrusion pathway. The two-step process described in Ecology’s draft guidance for evaluating soil vapor intrusion (Ecology 2009) was used to calculate groundwater concentrations that are protective of the Method B indoor air CULs. If the predicted minimum and maximum groundwater-to-vapor intrusion concentrations were not equal, the lower concentration was selected as the potential site-specific CUL in order to be more protective.

Based on model results, the most protective groundwater CUL concentrations were identified for wells MW-6 through MW-8. Therefore, the results for methylene chloride, cis-1,2-DCE, trans-

1,2-DCE, and 1,2-dichloropropane (the remaining groundwater COCs) from wells MW-6 through MW-8 were used to model site-specific groundwater CULs using the same process that was used for benzene, PCE, TCE, and vinyl chloride (Table 4-5). The maximum cis-1,2-DCE concentration from well MW-3 was also modeled as it exceeded the Ecology groundwater screening level value.

The resultant site-specific groundwater concentrations calculated to be protective of the vapor intrusion pathway for all COCs are essentially modified Method B CULs. As a final step, these site-specific groundwater concentrations were compared to the MTCA Method A groundwater CULs and found to be relatively close in value to the Method A levels. The lower of these two values for each COC was selected as the site-specific groundwater CUL in order to provide the most conservative risk protection in the FS. The site-specific groundwater CULs are listed at the bottom of Table 4-5. The concentrations of VOCs in groundwater, discussed in the following section, are compared to these final groundwater CULs. Through this process, trans-1,2-DCE and 1,2-dichloropropane were screened out as groundwater COCs at MWL. However, it is noted that any cleanup activities at the MWL site should be successful at remediating these chemicals in environmental media. Additional information on how these site-specific CULs will be applied at the MWL site is provided in Section 5.

4.6 Nature and Distribution of Groundwater Contaminants

The list of groundwater samples collected and analyses performed for the RI are presented in Table 2-1. Analytical results for all chemicals in groundwater exceeding MTCA Method A CULs or site-specific vapor intrusion CULs are presented in Table 4-6. Full analytical reports from the laboratory are included in Appendix C. A summary of all groundwater data from the RI compared to screening level CULs is provided in Appendix D (Table D-3). Groundwater monitoring analytical results from April and May 2007, June 2007, and October 2009 are shown on Figures 4-10 through 4-12. Groundwater flow in the shallow aquifer is generally toward the north and northeast (Figures 3-5 to 3-8).

Groundwater samples from April 2007 were collected from six soil borings using a geoprobe with a temporary well screen. These groundwater samples were somewhat turbid and unfiltered; thus these samples may not represent true aquifer conditions. The analytical results were used primarily as a screening tool to determine the placement of groundwater monitoring wells.

4.6.1 Chlorinated Volatile Organic Compounds

Concentrations of chlorinated VOCs exceeding the appropriate CULs have been reported from samples in all of the wells at the site except MW-5 (deep) and MW-10 (shallow cross-gradient). The greatest concentrations are observed in well MW-7, which is located within the former dry-cleaning area. This is considered the primary source area for site contaminants. Downgradient from the source area, concentrations of all chlorinated VOCs decrease and the ratio between PCE and vinyl chloride tends to increase. This indicates that natural biodegradation of the chlorinated VOCs, from parent to daughter products, is occurring in the dissolved phase plume.

Dense non-aqueous phase liquid (DNAPL) was not identified in any site wells, although the wells were not specifically targeted for accumulating DNAPL. A sheen was noticed on the purged water from well MW-7, both in bailers and pumped, during the two sampling events.

At the primary source area, PCE concentrations up to 97,000 µg/L, TCE concentrations up to 23,000 µg/L, cis-1,2-DCE concentrations up to 73,000 µg/L, and vinyl chloride concentrations up to 10,000 µg/L have been reported in well MW-7. Methylene chloride concentrations up to 100 µg/L (exceeding the CUL) have been reported in well MW-7. This is the only area of the site where methylene chloride concentrations exceed the CUL.

Immediately downgradient of well MW-7, at well MW-3, much lower concentrations of these contaminants are observed. The maximum concentrations reported for well MW-3 of PCE, TCE, cis-1,2-DCE, and vinyl chloride are 15, 2.1, 1600, and 820 µg/L, respectively. These concentrations exceed the CULs; however, the high concentrations of daughter products are evidence that natural biodegradation is occurring. The average concentration ratio of PCE to vinyl chloride at well MW-7 is 26:1, whereas a short distance downgradient at well MW-3 the average ratio is 1:1 (using all RI samples and averaging field duplicates).

A secondary source area appears to be present near or upgradient of well MW-4. PCE, TCE, and cis-1,2-DCE concentrations at this well tend to be greater than the concentrations observed at the other wells except MW-7. Concentrations of PCE up to 460 µg/L, TCE up to 540 µg/L, cis-1,2-DCE up to 920 µg/L, and vinyl chloride only up to 160 µg/L have been reported in well MW-4. The average ratio of PCE to vinyl chloride for MW-4 is 174:1, which implies proximity to a source area.

In the downgradient wells, only PCE, TCE, and vinyl chloride concentrations have exceeded the CULs. PCE concentrations up to 54 µg/L have been reported in well MW-8; however, this result was reported during the first sampling event and was the only exceedance reported for this well. The PCE concentration reported for well MW-8 during the subsequent sampling event was only 0.4 µg/L. TCE and vinyl chloride concentrations of 1.6 and 0.22 µg/L, exceeding the CULs, were reported during the initial sampling event at well MW-8, but were nondetectable in the following sampling event. Similar results were observed in well MW-9, where the initial PCE concentration exceeded the CUL, but PCE was nondetectable during the following sampling event. TCE and vinyl chloride have not been detected at well MW-9. Vinyl chloride concentrations up to 2.9 µg/L, exceeding the CUL, have been reported in well MW-1; no other VOCs exceeding the CULs have been reported for this well.

Well MW-6 is cross-gradient to upgradient of well MW-4. At MW-6, PCE, TCE, and vinyl chloride concentrations have exceeded the CULs; however, the reported concentrations are much lower than those reported for well MW-4 (Table 4-6). PCE and TCE concentrations were identified below the CULs in well MW-10 during October 2009, which is the only sample collected from this well.

Vinyl chloride has been detected once in deep well MW-5 at a concentration below the CUL. This detection appears to be spurious because no other VOCs were detected in this well in any sampling events. Although contaminants may be present in the deep aquifer zone, concentrations near MW-5 are below CULs and mostly below laboratory detection limits. Well

MW-5 is approximately downgradient from the source area, with respect to the shallow aquifer and to the slope of the bedrock surface at the base of the deep aquifer (Figure 4-8). A deep well was not placed closer to the primary source area in order to avoid downward cross-contamination.

4.6.2 Petroleum Hydrocarbon Constituents

Petroleum hydrocarbon contamination above the MTCA Method A CULs appears to be limited to the southern portion of the property in and near the dry-cleaning area. Petroleum hydrocarbons have been analyzed and detected only in wells MW-3, MW-5, MW-7, and MW-10 and in geoprobe groundwater samples SB-5 and SB-46 (Table 4-6). In April 2007, concentrations of diesel- and heavy oil-range hydrocarbons in the geoprobe samples exceeded CULs, with concentrations as high as 40,000 µg/L for diesel (SB-46) and 54,000 µg/L for heavy oil (SB-5). During geoprobing and sampling of SB-46, dark brown viscous oil coated the downhole tools. Well MW-3 was installed downgradient of borings SB-5 and SB-46. During October 2009, diesel and heavy oil concentrations in MW-3 exceeded the CULs, though at much lower concentrations than the geoprobe samples. In MW-3, the highest diesel concentration was 3,900 µg/L and the highest heavy oil concentration was 1,400 µg/L. In well MW-7 samples, gasoline-range hydrocarbon concentrations up to 55,000 µg/L have been reported, with relatively low exceedances of diesel and heavy oil concentrations (Figure 4-12).

Low concentrations of benzene were detected in all of the geoprobe groundwater samples and in samples from wells MW-2, MW-3, MW-4, and MW-6. The only result that exceeded the CUL is in the June 2007 sample from MW-3. However, results for well MW-7 all showed elevated detection limits; due to the high gasoline-range concentration in this well, benzene is also likely present in concentrations exceeding the CUL. Benzene contamination above the CUL does not appear to extend off-property downgradient of MW-3 (Figure 4-11).

Well MW-10 across the street contained diesel-range hydrocarbons at a concentration below the CUL. This well is located adjacent to what appears to be an underground storage tank on the former Jim Horne Trucking property.

4.7 Nature and Distribution of Surface Water Contaminants

One surface water sample was collected during the RI (2007) from the regional storm drain outfall on the Hoquiam River at 15^{th} Street along Riverside Avenue. Detections of cis-1,2-DCE and vinyl chloride were identified in the sample. Concentrations were below the MTCA Method B surface water CULs and below other federal standards for marine waters (the river at this location undergoes significant tidal influence and water is brackish to marine; the outfall pipe is covered at medium-height tides) (Table 4-6). Pre-RI analytical results for outfall samples (1984) also showed detections of PCE, TCE, and trans-1,2-DCE at higher concentrations, which exceed the present criteria (Appendix A, Table A-4). Groundwater from a downgradient portion of the MWL site appears to be entering the storm drain system, which is largely below the water table, and discharging at the outfall along the river.

4.8 Conceptual Site Model

In order to more fully understand the relationships between contaminants, affected environmental media, exposure pathways, and human and ecological receptors, a conceptual site model has been developed for the MWL site. MTCA defines a *conceptual site model* as "a conceptual understanding of a site that identifies potential or suspected sources of hazardous substances, types and concentrations of hazardous substances, potentially contaminated media, and actual and potential exposure pathways and receptors." These components will be discussed in the sections below in presenting the site model, followed by the terrestrial ecological evaluation.

4.8.1 Current and Potential Land Uses

The former Most Western Laundry property is currently a vacant unfenced lot. Approximately 75 percent of the lot is covered with grass and/or soil. Concrete subflooring from the laundry building covers approximately 25 percent of the lot in the southern corner and along the western edge of the property. Concrete thickness ranges from 0.5 to 2 feet thick. Soil fill has been spread over some of the concrete by neighbors and has allowed for grass growth over the concrete in some locations. Immediate neighbors maintain the property periodically by mowing the grass. Neighborhood residents use the lot for recreational activities, such as walking dogs and playing sports. The latter includes football, baseball, and Frisbee® games, which are sometimes played with bare feet. Neighbors occasionally use the property to park vehicles.

The property is located within the Hoquiam city limits. Most Western Laundry and the former Jim Horne Trucking business, located on the eastern side of 16th Street, were the only commercial businesses that historically operated within the immediate neighborhood. The Hoquiam Shipyard is located two blocks to the west, bordering the Hoquiam River. The Most Western Laundry lot currently has a county-designated land use as "all other residential not elsewhere coded – bare land platted." Current zoning for the surrounding neighborhood is classified as general residential (R-2). R-2 zoning consists of a variety of single and multifamily dwelling types with compatible neighborhood-related uses and structures (Hoquiam Municipal Code 10.03.020). Single family homes are located within the immediate vicinity of the MWL property. Multi-family units are located a few blocks away to the south along the river. Given the long-standing residential nature of the surrounding neighborhood, it is unlikely that the area would be rezoned or redeveloped. Therefore, any future land use of the MWL property is most likely to be limited to private residences or small commercial.

4.8.2 Potential Sources of Contamination

Soil and groundwater contamination is concentrated primarily in the southern corner and southwestern side of the property and extends onto city property under the alley and 16th Street. No adjacent or local residences are located within areas of known contamination. The areas of soil contamination related to the MWL property do not extend to nearby residential properties (Figures 4-3 through 4-6); however, groundwater contamination exceeding MTCA CULs may potentially extend under properties to the north and northwest of the MWL property.

Site contamination originated from the dry cleaning operations associated with the former Most Western Laundry. The primary COCs at the site are chlorinated VOCs: PCE, its daughter products, and methylene chloride; and petroleum hydrocarbon constituents. Improper disposal practices for waste PCE sludge contributed to groundwater and soil contamination via direct surface spills, which possibly entered floor drains and sumps in the building. Additional site contamination likely occurred from improperly stored, unsecured, leaking, and overflowing containers of PCE (Ecology 1984c, 1985a; MWL 1987). Petroleum hydrocarbon contamination may have originated from a number of sources including the historical use of petroleum products in dry-cleaning operations or from vehicles used on the property, in the alley, and along 16th Street.

4.8.3 Exposure Pathways and Potential Receptors

The core of the site conceptual model is represented by a flow-diagram depicting the site as it relates to exposure pathways and potential receptors (Figure 4-13). MTCA [WAC 173-340-200] defines an *exposure pathway* as: "the path a hazardous substance takes or could take from a source to an exposed organism. An exposure pathway describes the mechanism by which an individual or population is exposed or has the potential to be exposed to hazardous substances at or originating from a site." Contaminated media at the Most Western Laundry site includes soil and groundwater that are of concern (Sections 4.4 and 4.5). Surface water is considered a potential pathway but is not currently of regulatory concern (Section 4.6). The soil vapor pathway to indoor air is also of concern (Section 4.7).

In Figure 4-13, four general types of exposure pathways or their components are recognized. *Risk or regulatory concern* exposure pathways are those routes that: (a) are known or likely to be currently transporting VOC and petroleum contaminants to or within a certain medium (such as direct contact with soil for recreational users); or (b) may transport contaminants in the future, but do not currently (such as incidental contact with soil for future construction workers). *Not currently of risk or regulatory concern* are exposure pathways that have shown a regulatory or risk concern in the past but not currently; future sampling may again show concern (such as low-level volatiles reaching surface water). *Eliminated* exposure pathways are those that are not possible at any time, based on physical evidence or site usage or the terrestrial ecological evaluation, and are therefore considered closed pathways (such as ingestion of groundwater from water wells). *Unsure* pathways are those for which additional information is needed to determine if a risk of exposure is present (inhalation of outdoor dust).

Soil

Soil as an environmental medium relates to a number of potential exposure pathways, to other media, and to receptors. These include: soil ingestion or dermal contact, inhalation of dust emissions, and soil to vapor to indoor air. A summary of the potential soil exposure pathways at the site is presented in the following table.

Potential Soil Exposure Pathways	
Potential Soil Exposure Pathway/Scenario	***Applicability***
Ingestion/Dermal Contact	**Risk to Current and Future Residents, Future Workers, and Current Recreational Users.** Soil contamination is present near ground surface (less than 6 inches) and at deeper depths (as deep as 25 feet bgs). Because shallow contaminated soil is present, it may be incidentally encountered (contacted or ingested) during site redevelopment, utility construction activities, or less likely during recreational uses (current users are separated from contamination by pavement, grass and fill/topsoil).
Soil to Dust Emissions (Outdoor Air)	**Unsure of Risk to Current and Future Residents and Future Workers.** Neighbors mow the grass on the MWL property, which may result in accidental ingestion of soil if dust is generated. Dust may be generated during construction activities if soil is excavated and moved, or during future residential activities such as gardening.
Soil to Vapor (Indoor Air)	**Risk to Current and Future Residents.** Chemicals present in soil may volatilize and intrude into nearby residences. Vapor intrusion modeling (Section 4.5) shows that unacceptable levels of excess risk may be present from VOCs on and near the property (although existing adjacent houses have ventilated crawl spaces, which are protective and not accounted for in the model).

The ingestion and dermal contact exposure pathways are considered to be open pathways. Neighbors have expressed concern that children often engage in sports and other recreational activities on the MWL property. Members of the community mow the grass on the MWL property, which may generate dust that could be accidentally inhaled or ingested. Due to lack of significant exposure, recreational and other temporary users of the property would not be likely to experience an unacceptable risk.

If the property were developed (prior to remediation), construction workers would be exposed to contaminated soil as it is excavated and moved. Future residents on the MWL property could come into contact with contaminated soil via ingestion or dermal contact during their daily activities such as mowing, gardening, or other recreational activities. City workers may come in contact with contaminated soil through maintenance or replacement of underground utilities along 16th Street or the alley.

Further research regarding possible dust emissions and the associated potential volatilization, including indoor air concerns, is necessary to evaluate these transport mechanisms as possible hazards. However, future residents at the MWL property are likely to be exposed to an unacceptable level of excess risk from VOCs if a house were constructed over the southern portion of the property prior to thorough remediation.

Groundwater

Groundwater as an environmental medium relates to a number of potential exposure pathways, to other media, and to receptors. These include: drinking water ingestion or household contact, incidental exposure (construction scenario), groundwater to surface water, and groundwater to vapor and indoor/outdoor air. A summary of the potential groundwater exposure pathways at the site is presented in the following table.

Potential Groundwater Exposure Pathways	
Potential Groundwater Exposure Pathway/Scenario	***Applicability***
Drinking Water Ingestion/Inhalation	**Eliminated.** Groundwater at the site is not a likely source of potable or non-potable water because the City of Hoquiam will not permit well construction and the aquifer is low-yielding.
Dermal Contact	**Risk to Future Residents and Workers.** Groundwater is relatively shallow, ranging from 1.5 to 6 feet bgs. Because static groundwater may be encountered at shallow depths, contaminated groundwater may be incidentally encountered (contacted or inhaled) during site redevelopment or utility construction activities.
Groundwater to Surface Water	**Not Currently of Risk or Regulatory Concern**. Storm drain lines under the alley transport water to the Hoquiam River through an outfall located near the intersection of 15th Street and Riverside Avenue. Groundwater may be infiltrating storm drain lines via cracks or breaks in the pipes, which are located below the water table. Historical outfall sample concentrations were significantly higher than in 2007. Historical seep samples along the river show no detections of COCs.
Groundwater to Vapor (Indoor Air)	**Risk to Future Residents (Indoor Air).** Chemicals in soil may leach into groundwater and dissolved chemicals may volatilize and intrude into nearby residences. Vapor intrusion modeling (Section 4.5) shows that unacceptable levels of excess risk may be present from VOCs on and near the property (although existing adjacent houses have ventilated crawl spaces, which are protective and not accounted for in the model).

Groundwater ingestion has been eliminated as an exposure pathway to local residents. The Hoquiam City Ordinances require all new and existing utility users to tie into city utilities, including water mains (Hoquiam Municipal Code 8.12.105, 8.12.110), and drinking wells are not permissible within the city limits. The Ecology Well Log Database confirms no existing water wells within ¼ mile of the site. Furthermore, given the shallow, silty, low-yield nature of the aquifer, close to a tidal river, it is highly unlikely that a well driller would ever install a water well in this aquifer.

The dermal contact with groundwater and groundwater to indoor or outdoor air exposure pathways are considered open pathways. If the MWL property is developed or utilities under the alley or 16th Street require repairs, future workers may be exposed via dermal contact, given the shallow nature of groundwater. If a residential building is constructed on the property prior to thorough remediation, future residents may be exposed to contaminated indoor vapors or may be exposed to contaminated groundwater via dermal contact while gardening or digging on the property. Lastly, recreational use of the property is not expected to cause exposure to contaminated groundwater.

4.8.4 Terrestrial Ecological Evaluation

In addition to evaluation of human health risks, MTCA requires that a terrestrial ecological evaluation be completed following the release of hazardous substances to soil in order to determine the potential impacts to terrestrial organisms at a site [WAC 173-340-7490], unless certain exclusion criteria are met. MTCA states that one of the following actions be taken:

- Documentation of an exclusion from any further terrestrial ecological evaluation using the criteria in WAC 173-340-7491,
- Completion of a simplified terrestrial ecological evaluation as specified in WAC 173-340-7492, or
- Completion of a site-specific terrestrial ecological evaluation as specified in WAC 173-340-7493.

A site may be excluded from the requirement for a terrestrial ecological evaluation if <u>any</u> of the following criteria are met at the site:

- All soil contaminated with hazardous substances is, or will be, located below the point of compliance established under WAC 173-340-7490(4).
- All soil contaminated with hazardous substances is, or will be, covered by buildings, paved roads, pavement, or other physical barriers that will prevent plants or wildlife from being exposed to the soil contamination.
- There is less than 0.25 acre of contiguous undeveloped land on or within 500 feet of any area of the site contaminated with chlorinated dioxins or furans, polychlorinated biphenyls (PCB) mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, pentachlorobenzene.
- There is less than 1.5 acres of contiguous undeveloped land on the site or within 500 feet of any area of the site and the contamination at the site does not include any of the contaminants listed in the preceding bullet.

The Most Western Laundry site does not meet any of these criteria for initial exclusion of the terrestrial ecological evaluation, and there is more than 1.5 contiguous acres of undeveloped land within 500 feet of the site. MTCA defines "contiguous undeveloped land" as an area of land that is not divided into smaller areas by highways, extensive paving, or structures that are likely to reduce the potential use of the overall area by wildlife. The forested steep hillside to the east of the MWL site forms a contiguous zone of undeveloped land approximately 2.5 acres in size, within 500 feet of the site. Therefore, impacts to terrestrial organisms at the site may be a potential concern and a simplified ecological evaluation is required [WAC 173-340-7492].

In order to identify if the simplified ecological evaluation can be ended, Table 749-1 has been utilized [WAC 173-340-7492(2)(a)(ii)]. The following are results of this exposure analysis procedure, using the numbering system in the table:

1. Acres undeveloped land within 500 feet = 9 points
2. Former commercial property = 3 points
3. Site habitat, low = 3 points
4. Undeveloped land to attract wildlife, yes = 1 point
5. No listed bioaccumulative soil contaminants = 4 points
6. Sum of numbers 2 through 5, above = 11 points

Because number 6 is greater than number 1, the simplified terrestrial ecological evaluation can be ended at this point. Thus, land use at the site and surrounding area makes substantial wildlife exposure unlikely. Furthermore, most of the soil contamination on the site is under thick concrete blocks, sidewalk, asphalt, or road surfaces. A large majority of the chemical classes of terrestrial concern (gasoline and diesel range organics, per Table 749-2) are covered by pavement. Habitat and forage areas for wildlife from the undeveloped forested land is unlikely due to the location of the property within an active residential neighborhood surrounded by roadways, the maintenance/mowing of the grass on the property, and the common presence of humans and vehicles on or adjacent to the site.

5.0 Cleanup Standards

Cleanup standards in MTCA are defined for each hazardous substance present in each environmental medium and for each pathway through which humans and/or the environment may be exposed [WAC 173-340-700(4)]. Each cleanup standard addresses the cleanup levels for hazardous substances, the appropriate point of compliance where these levels must be met, and other applicable regulatory requirements [WAC 173-340-700(3)]. Under MTCA, a point of compliance specific to each medium and exposure pathway must be established, and it marks the regulatory location (such as depth) where cleanup levels shall be attained. Potential exposure pathways and corresponding points of compliance for each impacted medium are discussed below in Section 5.3. Cleanup standards are essentially equivalent to remedial action objectives in the federal terminology.

Three sets of cleanup levels are used in this report: MTCA Method A (for soil and groundwater), Method B (for soil), and vapor protection levels (for groundwater, which is essentially a modified Method B cleanup level). In this report, Method A is the primary cleanup level utilized. According to MTCA [WAC 173-340-700(5)(a) and 173-340-704(1)], Method A is appropriate to establish cleanup levels for a site where hazardous substances are relatively few and one or both of the following criteria are met: the site is undergoing a routine cleanup action (see Section 5.1), and numerical standards are available through MTCA or other laws for the indicator hazardous substances in the media being cleaned up (see Section 5.2). At the MWL site, the number of primary hazardous substances is relatively few, being limited primarily to two chlorinated solvents (PCE and methylene chloride) and their breakdown products, as well as petroleum constituents.

5.1 Routine Cleanup Action

In order to determine if the remedial cleanup action (and cleanup alternatives listed in the Feasibility Study) fulfills the requirements of a "routine cleanup action" as defined in MTCA [WAC 173-340-200], the following three criteria must be met:

- Cleanup standards for each hazardous substance addressed by the cleanup are obvious and undisputed, and allow for an adequate margin of safety for protection of human health and the environment.
- The cleanup action involves an obvious and limited choice among cleanup alternatives and uses an alternative that is reliable, has proven capable of accomplishing cleanup standards, and with which Ecology has experience.
- The cleanup action does not require preparation of an environmental impact statement, and the site qualifies for an exclusion from conducting a simplified or site-specific terrestrial ecological evaluation or if the simplified evaluation can be ended.

These three criteria will be briefly evaluated. The cleanup levels for each hazardous substance are listed in the MTCA regulation or in Ecology's CLARC database or can be calculated according to MTCA and other Ecology guidance, and these standards are protective of human health and the environment. The range of cleanup action alternatives evaluated in the Feasibility Study involves limited and reliable technologies that have been proven successful at cleaning up numerous sites contaminated with chlorinated VOCs and petroleum hydrocarbons. The cleanup action at the site will not require preparation of an environmental impact statement, and the simplified terrestrial evaluation can be ended (Section 4.8.4). Accordingly, the remedial cleanup action at the MWL site fulfills the requirements of a routine cleanup action under MTCA.

5.2 Numerical Standards

MTCA provides media-specific numerical cleanup levels (Methods A or B) for most hazardous substances detected at the site and for all contaminants of concern, or indicator hazardous substances (WAC 173-340-900 and CLARC database), thus fulfilling the requirement of WAC 173-340-704(1)(b). Indicator hazardous substances are defined as a subset of hazardous substances present at a site for monitoring and analysis during any phase of remedial action for the purpose of characterizing the site or establishing cleanup requirements for that site [WAC 173-340-200]. They are those hazardous substances that remain after eliminating from consideration those substances that contribute a small percentage of the overall threat to human health and the environment [WAC 173-340-703 and 173-340-708(2)]. These numerical table values are not site-specific but are determined to be protective for most situations within the media and pathway of concern. The vapor protection levels for groundwater are site-specific and are based on modeling the pathway from groundwater to soil vapor to indoor air.

In the list of COCs for soil and groundwater at the MWL site (Section 4.1), most of these hazardous substances have cleanup levels promulgated under Method A. These include the primary chlorinated VOCs (PCE and methylene chloride) as well as two breakdown products (TCE and vinyl chloride, the latter only for groundwater), plus three petroleum hydrocarbon ranges (gas, diesel, heavy oil), benzene, and naphthalene. Method B cleanup levels (but not Method A) are promulgated for the two 1,2-DCE isomers, vinyl chloride for soil, 1,2-dichloropropane, and 1,4-dichlorobenzene. In the RI, the latter two compounds each have only a single identified exceedance, and trans-1,2-DCE and 1,2-dichloropropane have been screened from the groundwater COC list for the FS (see Sections 4.5 and 4.6). It should be pointed out that for remediation of site soil, use of Method A CULs alone is recognized as being sufficient to also remediate other collocated hazardous substances that do not have Method A CULs.

Site-specific cleanup levels for all groundwater COCs at MWL have also been calculated in order to be protective of potential vapors emanating from groundwater and intruding to indoor air (see Section 5.3.2). The resultant full list of cleanup levels for COCs in soil and groundwater at the MWL site are included in Table 5-1; underlined values in this table are those applied in the FS Report.

In summary, Method A is appropriate as the primary method to establish cleanup levels for the MWL site because hazardous substances are relatively few, the site is undergoing a routine cleanup action, and/or numerical cleanup standards are available for the indicator hazardous substances in the media being remediated. Method A CULs are supplemented by Method B CULs for some substances in soil and by the site-specific groundwater CULs (modified Method B) that are protective of indoor air concentrations.

5.3 Point of Compliance and Extent of Cleanup Actions

The following sections include an evaluation that applies cleanup actions and points of compliance to the various environmental media and exposure pathways. This evaluation will aid in understanding the necessary extent and location of cleanup actions. A *point of compliance* is defined as the point or points where cleanup levels established in accordance with MTCA shall be attained [WAC 173-340-200].

5.3.1 Soil

Soil contamination at the MWL site is significant, extending more than the length of the property and vertically to a maximum of approximately 25 feet bgs. Because the former MWL property could be redeveloped for residential usage, soil cleanup levels must be protective of residential or unrestricted land use within the point of compliance. The following four pathway/media interactions are explained below.

Protection of Direct Contact or Incidental Ingestion

The point of compliance for protection of human exposure via direct dermal contact or incidental ingestion and ecological receptors for soil is defined as being from the surface to a depth of 15 feet bgs throughout the contaminated area [WAC 173-340-740(6)(d)]. All of the identified COCs in site soils have exceeded appropriate cleanup levels at depths of less than 15 feet bgs, although four of these COCs also show exceedances at depths greater than 15 feet bgs (PCE, TCE, vinyl chloride, and methylene chloride in SB-26 and SB-62). For sake of this exposure pathway, remediation of contaminated soil to 15 feet bgs is sufficient. This depth corresponds approximately to the contact between lithologic units C and D, and between the shallow and deep aquifer zones.

Some COCs have MTCA CUL exceedances in the surficial 0.5 foot of soil (0 to 6 inches bgs). Currently, the majority of the area of soil impacted by COCs at the site is covered by pavement, including concrete slabs, sidewalk, and street. This significantly limits the potential for contact by receptors. Potential direct contact or inhalation exposures at the site include future worker interactions with excavated or exposed soil during construction, such as might occur if the property were redeveloped or during utility work, as well as future residential activities such as digging and gardening. It is unlikely that current recreational use of the property would lead to exposure levels of concern, due to pavement, grass cover, and uncontaminated topsoil or fill covering most or all contaminated soil. MTCA Method A soil cleanup levels are considered to be protective of all these potential exposure scenarios down to the point of compliance.

Protection of Groundwater

Soil sample exceedances of MTCA Method A cleanup levels at depths above and below the water table are numerous at the site (water table ranges from 1.5 to 6 feet bgs). These soil contaminants leach (dissolve) into groundwater and adversely impact water quality in both aquifer zones. In order to minimize soil contamination from leaching to groundwater, soil concentrations would need to be reduced to levels protective of groundwater quality. Although it is unlikely that there is a drinking water pathway exposure in this area, groundwater and soil may emanate vapors and be a concern for vapor intrusion (see below). Therefore, site soils would need to be remediated throughout the area and thickness of soil contamination, in order to reduce groundwater concentrations to acceptable levels. MTCA Method A soil cleanup levels are stringent enough that they are expected to provide protection of groundwater (see Section 5.3.2). Remediation of contaminated soils from the surface to only 15 feet bgs (as in the previous pathway) would leave deeper soil contaminants that could continue to leach to the deep aquifer zone and perhaps also to the shallow aquifer. Therefore, to protect groundwater, soil remediation will need to consider all contaminated site soils with concentrations exceeding MTCA Method A.

The ultimate measure of protection of groundwater will consist of a demonstration that groundwater cleanup levels at the site have been achieved (as opposed to a demonstration that MTCA Method A soil cleanup levels have been fully attained). The point of compliance for groundwater is discussed in Section 5.3.2.

Protection from Vapors

Soil contaminants may volatilize into outdoor or indoor air, and soil may form dust emissions during future construction work or residential activities. Similar to direct contact, the point of compliance for soil in terms of dust emissions or outdoor air would be from the surface to 15 feet bgs throughout the contaminated area. However, to be protective of vapor intrusion to indoor air of a future house on or near the property, it is recognized that contaminated soil at depths greater than 15 feet bgs could potentially impact residential occupants. The Ecology (2009) guidance excludes a means to calculate soil cleanup levels for vapor protection based on soil concentrations. Thus, a MTCA Method A cleanup level throughout the site without a depth limitation is considered to be protective of all pathways and is applied as a cleanup level in the FS Report. Both soil and groundwater (Section 5.3.2) would require remediation to reduce the vapor intrusion risk and ensure future protectiveness of human health.

Protection of Ecological Receptors

As discussed under the terrestrial ecological evaluation section (Section 4.8.4), impacts to ecological organisms are not considered to be a concern at the MWL site. Land use at the site and the surrounding area makes substantial wildlife exposure unlikely. However, soil remediation to Method A cleanup levels would be protective of any ecological receptors that may visit the site.

5.3.2 Groundwater

Groundwater contamination is evident in shallow aquifer wells and is likely present close to the soil source area in the deep aquifer zone, although the deep well (MW-5) is uncontaminated. Three pathway/media interactions are explained below, in addition to the possible presence of non-aqueous phase liquid.

Drinking Water Ingestion/Contact

The shallow and deep aquifer zones are not currently used and are not likely to be used as a future drinking water source. The City of Hoquiam does not permit the installation of water wells, and the aquifer is fine-grained, low-yielding, and shallow. It is unlikely that a well driller would install any water well in these aquifer zones. Thus, there is no current or expected future human health risk due to ingestion of groundwater. However, future workers or residents could come in contact with groundwater, resulting in direct contact or inhalation exposure to emanating vapors (see below).

Although the drinking water pathway is unlikely, the application of MTCA Method A groundwater CULs will provide protection for future workers and residents. The standard point of compliance for protection of groundwater is throughout the site. The point of compliance for the MWL site would consist of long-term attainment of Method A groundwater CULs in each of the existing or new monitoring wells following site remediation. Deep groundwater at well MW-5 is currently uncontaminated but the deep aquifer zone is likely contaminated closer to the primary source area a short distance to the south. Feasible remediation of deep contaminated soil is expected to eventually remedy any groundwater contamination in this aquifer.

Groundwater to Surface Water

Groundwater from the site appears to be discharging with admixed surface water at the storm drain outfall along the Hoquiam River. Outfall concentrations from 2007 are below appropriate surface water standards, although they were above present standards in samples from 1984. The surface water at the outfall appears to be saline or brackish and the discharge pipe is covered during high tide. At current concentrations, groundwater discharging from the storm drain system does not require cleanup actions or monitoring.

Groundwater to Indoor Air

To evaluate the groundwater to vapor pathway, a quantitative evaluation of the potential vapor intrusion risk to building occupants was performed. Model results indicate there is a potential incremental risk to building occupants on or near the property from vapors emanating from contaminated groundwater at the site (although ventilated crawl spaces in existing houses significantly minimize this risk). Vapors can be released from groundwater at any depth.

The application of MTCA Method A groundwater CULs in combination with the site-specific vapor intrusion levels for groundwater will ensure protectiveness of future building occupants. The point of compliance would be long-term attainment of these groundwater CULs in each of the site monitoring wells following remediation.

Non-Aqueous Phase Liquid

MTCA requires that in addition to meeting standard cleanup levels, petroleum hydrocarbon concentrations in groundwater must comply with the limitation on non-aqueous phase liquid (NAPL). Specifically, the cleanup level may not allow a concentration that would result in NAPL being present in or on the groundwater [WAC 173-340-720(7)(d)]. This may be determined by physical observation of groundwater to demonstrate the lack of a film, sheen, discoloration, sludge, or emulsion. For any cleanup action at the site, the groundwater cleanup level for NAPL will be met by consistent attainment of lack of visible observation in the groundwater of all site wells. The only locations where NAPL has been identified at the site is at geoprobe boring SB-46 and hand auger SB-55 in the form of dark brown, viscous petroleum hydrocarbons; these are both located within the heavy oil contaminant plume. In addition, visible petroleum or solvent sheen was recognized in a number of RI samples (Table 4-4).

6.0 Screening of Alternative Components

A "cleanup action alternative" is defined as one or more treatment technology, containment action, removal action, engineered control, institutional control, or other type of remedial action that, individually or in combination, achieves a cleanup action at a site [WAC 173-340-200]. For purposes of this FS, a "cleanup action component" (or "alternative component") is considered to address a specific media/exposure pathway. The media/exposure pathway cleanup action components are then assembled into cleanup action alternatives (Section 7), which address the site-wide cleanup requirements.

In this section, alternative components are identified and screened for their applicability in addressing site contamination and achieving remedial objectives (meeting cleanup standards). The various components have been screened to narrow the list of technologies and other measures that should be considered for more detailed evaluation in the FS. MTCA provides for an initial screening step based on the ability of the component to meet the minimum MTCA requirements and also based on its feasibility. According to WAC 173-340-350(8), a cleanup alternative or its components may be screened from further consideration if either of the following conditions applies:

- The component does not meet minimum threshold requirements [WAC 173-340-360(2)(a)], including components in which costs are clearly disproportionate; more specifically:
    - The component is not protective of human health and the environment, or
    - The component does not comply with the cleanup standards, or
    - The component does not comply with applicable state or federal laws, or
    - The component does not provide for compliance monitoring.
- The component is not technically feasible.

MTCA also requires that cleanup alternatives (or their components) meeting threshold requirements also fulfill the following requirements [WAC 173-340-360(2)(b)]:

- Use permanent solutions to the extent practicable,
- Provide for reasonable restoration time frames, and
- Consider public concerns.

Further screening has been performed to select the most appropriate alternative components among those determined to meet the above requirements. This evaluation is based on three criteria: effectiveness, implementability, and relative cost (with cost generally being a secondary consideration). Specifically, these criteria consider the following factors:

- *Effectiveness.* This criterion includes technical effectiveness of the process to achieve the remediation goals (cleanup standards). Performance with respect to the specific chemicals of concern was evaluated, as well as other site-specific factors, such as depth of contamination and chemical complexity.

- *Implementability.* This criterion includes technical and administrative factors that affect the ability to implement the process. This included items such as site constraints, availability of the technology, required expertise to design, install, and operate the component, and probable community concerns and permit issues.
- *Relative cost.* This criterion includes relative capital and operating costs based on engineering judgment. Relative costs were considered to help select components to be carried forward into the analysis of alternatives. Cost alone was not used to reject component types.

The identification and screening evaluation for site cleanup alternative components is presented in Table 6-1. This table lists components that are retained and the rationale for eliminating components from further consideration. The environmental media considered include pathways related to soil and groundwater. The soil vapor/indoor air pathway is not directly considered because this is addressed through components aimed at remediating soil and groundwater. Surface water is not considered because this pathway has not been identified as of regulatory concern, and it will also be addressed indirectly through groundwater remediation.

The retained alternative components in Table 6-1 include the following technologies and other measures:

- Deed restrictions
- Groundwater monitoring
- Deep and shallow soil excavation (different technologies)
- Excavation dewatering
- Biostimulation and bioaugmentation
- In-situ chemical oxidation (only for localized polishing)
- Electrical resistance heating
- Monitored natural attenuation
- Activated carbon filtration

The following alternative components in Table 6-1 were rejected for the reasons described:

- *No action.* The site has concentrations of chlorinated VOCs that present significant risk to future residents and construction workers; taking no action is not protective enough.
- *Physical access controls.* Although this may be effective in preventing neighbors and trespassers from accessing the property, it is not protective in terms of long-term future land use scenarios.
- *Subsurface vapor barrier*. Although a barrier would protect some routes of exposure, it is not protective by itself in terms of future land use scenarios; it is difficult to implement and maintain; may be useful protection for future buildings to close vapor exposure pathway.
- *Soil vapor extraction.* The vadose zone at MWL is very thin and soils are highly heterogeneous and commonly fine-grained, creating a low radius of influence and short-circuiting to surface; these factors would render this component ineffective.

- *Air sparging.* Soils at MWL are silty and organic-rich, with a permeability too low for effective sparging, resulting in preferential pathways, unreliable distribution, and a low radius of influence; same problems (as above) exist with the soil vapor extraction component of this option.

In this screening evaluation, the alternative component technologies were selected based in part on the need to remediate contaminated soil under two difficult conditions. These include the need to remediate localized deep soil, as deep as 25 feet bgs, with shallow groundwater at the site; and the need to remediate soil under city easements with subsurface utilities present. These two factors drive a significant number of aspects in the alternative development presented in Section 7.

7.0 Development of Alternatives

Based on the environmental media requiring cleanup actions and the screening of cleanup action components, remedial action alternatives have been developed that address the presence of contaminants in soil and groundwater at the MWL site. The following section discusses each alternative with a focus on the rationale for the actions and components that have been selected. The proposed alternatives are analyzed in Section 8 in accordance with evaluation required in MTCA.

A range of cleanup action alternatives was developed by assembling appropriate cleanup alternative components from those identified and selected in Section 6. Each alternative includes components that are expected to be capable of accomplishing the cleanup levels established for a particular exposure pathway and contaminants as identified in Section 5. Selection of a specific cleanup action component for detailed evaluation in the FS does not preclude later consideration of similar components that are represented by the selected component. Similar cleanup action components that can achieve the same cleanup levels could be re-evaluated for cost effectiveness during the final design phase.

The alternatives developed for the MWL site provide a variety of cleanup action components capable of protecting the environment and human health as required by MTCA [WAC 173-340-360(2)]. MTCA specifies that each alternative meet the following threshold requirements:

- Protect human health and the environment.
- Comply with cleanup standards.
- Comply with applicable state and federal laws.
- Provide for compliance monitoring.

For media with contaminants exceeding cleanup levels, identifying the exposure route rather than just the acceptable contaminant levels is important because protectiveness can be achieved by preventing exposures (e.g., by containment or institutional controls) as well as by cleanup. Although MTCA strongly reflects a preference for permanent remedial actions, less permanent solutions may be accepted if controls are put into place to ensure that the solution is protective of human and ecological receptors.

MTCA requires that a feasibility study include at least one “permanent cleanup action alternative” that is used “to serve as a baseline against which other alternatives shall be evaluated for the purpose of determining whether the cleanup action selected is permanent to the maximum extent practicable” [WAC 173-340-350(8)(c)(ii)]. MTCA defines a permanent cleanup action to be one in which the cleanup standards of WAC 173-340-700 through 173-340-760 can be met without any further action being required at the site, with the exception of the disposal of any treatment residue.

The available data from the RI are sufficient for development of rational alternatives that address the potential problem at the MWL site and which form a sound basis for selection of a preferred remedy. However, additional data may need to be collected for certain remedial actions to be implemented. This may include a pilot test or bench-scale test prior to implementation. It has been assumed that any additional data needs would be filled during the design phase for the selected alternative, and the design would be modified or refined as new data become available.

One of the underlying aspects in developing the remedial alternatives for the MWL site is that removal or treatment of source material (contaminated soil) will eventually produce a beneficial effect on groundwater quality. Alternatives may be developed that address only soil or that address both soil and groundwater directly. The more thoroughly the soil is remediated, the less a cleanup action needs to rely on active or passive groundwater remediation. Passive groundwater cleanup, which relies on naturally occurring processes to degrade hazardous substances, is referred to as monitored natural attenuation (MNA). Natural attenuation may be a relatively slow process, but it can also be supplemented or stimulated by more active measures. All three alternatives developed in this FS are capable of remediating soil and groundwater to acceptable levels, with reasonably short restoration time frames. Another key aspect of developing the remedial alternatives is the balance between completeness of a remedial action in attaining cleanup levels and the risk to the public from performing that action. The range of alternatives described below allows for the evaluation and selection of an alternative based on these factors, as performed in Section 8.

The three alternatives that have been developed for this site are summarized in Table 7-1 and described in detail in the following sections. The approximate area and depths of soil contamination to be remediated are shown in Figure 7-1. All figures in Section 7 list the estimated depth range of contamination at each location, including the approximate depth of the base of contamination when it is extrapolated beyond the bottom of the boring. Note that two localized contaminant zones (SB-57 and SB-74) underlying 16th Street, based on gasoline-range hydrocarbon exceedances, are not addressed in the three alternatives. These two upgradient locations are believed to be unrelated to petroleum contamination and operations at the former MWL site. This determination is based on the presence and ratios of hazardous substances and the lack of CUL exceedances in samples collected between these two locations and the main plume (Section 4.4.2). Remediation of these two small areas would also cause undue traffic concerns, affect subsurface utilities, and likely pose a greater risk to human health and safety.

7.1 Alternative 1—Complete Soil Removal and Disposal, Biostimulation and MNA

This alternative would reduce and control exposures to contaminants by the following response actions:

- Excavate all identified contaminated soil.
- Regrade and restore site.
- Dispose of and/or treat excavated soil offsite.
- Use biostimulation treatment of specific groundwater contaminated areas.
- Implement environmental monitoring, including biostimulation-enhanced attenuation of groundwater contamination.

This remedial alternative would achieve source removal by excavating (including large-diameter augering) all identified contaminated soil, as feasible, and transporting it for offsite disposal.

Because virtually all contaminated soil would be removed from the site, institutional controls would not be required to control direct contact and ingestion exposures to soil contaminants by future human receptors. Institutional controls for groundwater exposure may be required until complete restoration is achieved. The areal extent of the remedial actions is shown on Figure 7-2. The main features of Alternative 1 are described below.

7.1.1 Excavate All Identified Contaminated Soil

The main intent of this alternative is to prevent direct contact and ingestion exposures to humans and terrestrial receptors by removing all contaminated soil that poses a potential risk at MWL. In addition, although soil to vapor was not modeled in the RI, this alternative would significantly reduce the vapor intrusion potential at the site. These objectives would be accomplished by excavation and offsite disposal of all soil, as feasible, exceeding remediation levels within the standard points of compliance described in Section 5.

Approximately 160 cubic yards of concrete would be removed prior to beginning the soil excavation. Concrete is present in four slabs on the property, covering an area of 3,700 square feet and ranging in thickness from 0.5 to 2.5 feet thick (see Figures 4-7 to 4-9). In addition, some uncontaminated brick debris is locally present beneath the concrete and would be removed. The brick debris is estimated to comprise a total of about 25 cubic yards. The concrete and brick material would be recycled or disposed of at a local demolition or municipal landfill. Wells MW-3 and MW-7 would be decommissioned prior to any removal of concrete or soil.

Detailed contaminant distribution maps are presented in Figures 4-2 through 4-6, and data are compiled in Tables 4-3 and 4-4. The RI sampling results will assist in determining the location and extent of the contaminated soil to be removed, which totals approximately 1,000 cubic yards. Soil contamination deeper than 10 feet bgs is present near the southern corner of the property, including along subsurface utilities in the alley and 16^{th} Street. Due to these conditions, soil removal in this alternative would be accomplished using three methods: (1) large-diameter auger borings (LDABs) would be advanced in the southern “hot spot” portion of the property where soil contamination is known to extend deeper than 10 feet bgs (see Figure 7-2); (2) contaminated soil would be removed from near utilities using a combination of methods; the natural gas line would likely need to be rerouted and the water main either rerouted or supported during work; and (3) conventional excavation methods would be used to remove remaining soil contamination present at depths less than 10 feet bgs.

In the southern portion of the property, approximately 28 LDABs would be advanced to remove contaminated soil to bedrock or until essentially all soil exceeding MTCA cleanup levels has been removed, as feasible. The LDABs would be advanced with a 5.5-foot-diameter auger while driving casing; the borings would overlap slightly to minimize gaps. All borings would be advanced to at least the estimated bottom depth of contamination, which is between 10 and 25 feet bgs and extending to bedrock in the central area. The calculated volume of this deep “hot spot” is approximately 450 cubic yards (inside the 10-foot contour outline in Figure 7-2). The data from the RI will be used as a guide to determine depth of contamination in areas where LDABs do not extend as deep as bedrock. These data will be supplemented in the field by examining soil for visual indications of contamination from the deepest material extracted by the augers, and by collecting soil samples from this material to be analyzed for COCs by an onsite mobile laboratory (these samples are recognized as being disturbed). By sampling the bottom soil on the auger after advancing to varying depths in the boring, an estimate of the extent of soil contamination can be made. If field indicators and laboratory analysis indicate that contamination is present above MTCA CULs, the drilling and soil removal would continue until MTCA CULs are achieved, as feasible. During LDAB activity, augering would conservatively extend a short distance below the depths determined or estimated in the RI. To fill remnant gaps between LDABs, 17 additional borings would be installed using a 3-foot-diameter auger advanced to the same depth as the adjacent LDABs, but without the need for driving casing.

When each 5.5-foot-diameter LDAB is completed, the casing would be removed while the boring is backfilled with a lean mix of controlled density fill (CDF). Using CDF as backfill should provide adequate shoring during the adjacent conventional excavation operations, which would extend to anticipated maximum depths of 10 feet bgs. During backfilling, any groundwater in the boring would be expelled and captured for treatment, as described below.

Based on the cross-sections (Figures 4-7 to 4-9), contaminated soil is present around the natural gas and water supply lines located in the asphalt easement along 16th Street, and around the natural gas line in the alley south of the property. Soil contamination near the sewer and storm drain lines is expected to be shallower than these deeper utilities. Contaminated soil near the utilities would be excavated using a vacuum truck with an air-knife (compressed air), hand tools, and cautious removal with standard excavation tools to avoid damaging any utility lines. This work will require coordination with the City and with Cascade Natural Gas to ensure protection, bracing, or rerouting of utility lines. The 2-inch steel natural gas line in the alley, and ¾-inch steel line crossing 16th Street, apparently feeds only a single residence. The water main along 16th Street is an 8-inch cast-iron line. Coordination with the City of Hoquiam will take place to obtain any permits required to block vehicle and pedestrian traffic. An approved traffic-control plan will be required to safely re-route pedestrian and vehicle traffic.

The remaining area of contaminated soil (less than 10 feet bgs) would be removed using standard excavation methods. Soil would be segregated so that contaminated and uncontaminated (overburden) soil would be placed in distinct areas on the property; only minimal volumes of clean overburden soils are anticipated at the site. In addition, as described in Section 7.1.3, soil requiring treatment prior to disposal would also be segregated. Samples will be submitted to the mobile onsite lab to define areas of contamination, in combination with results from the RI. Shoring would be installed where necessary to stabilize the sides of the excavation and provide safe working conditions. OSHA Level C personal protective equipment may be needed for some portion of the work, depending on measured vapor concentrations and atmospheric conditions. Vapor suppression foam and perhaps other engineered controls would be applied where necessary to minimize the volatilization of hazardous substances and reduce nuisance odors. This is expected principally in the soil stockpiles created by the LDABs and also perhaps in the excavation pit in areas not actively being worked.

As reported in Section 3, the depth to the water table during the RI ranged from 1.5 to 6 feet bgs. In the latter half of summer, average water depth at the site is expected to be approximately 4 feet bgs. Excavation activities performed at depths below the water table will require dewatering. A total water volume of up to 200,000 gallons may be generated during dewatering. This is a worst-case estimated volume based upon groundwater filling the open full-depth excavation to the water-table level. Extracted water would be stored in large tanks onsite, where the water would be retained for an adequate amount of time for solids to settle. After settling, water would be pumped through a sand filter for particulate removal and granular activated carbon for volatile contaminant removal, and then discharged to the City sanitary sewer through one of the cleanout ports onsite. Permission for temporary discharge of this treated water will be requested from the City.

Similar to LDAB activities, the RI sampling results along with additional samples collected during excavation activities will be used to estimate the lateral and vertical extent of soil exceeding cleanup levels. Additional sampling and onsite analysis with a mobile laboratory will be required during excavation to ensure that all contaminated soil above the CULs is removed, as feasible. Soil will also be field screened to ensure that excavation continues until complete removal of contaminated soil is achieved. Sidewall and bottom soil samples will be collected at approximately 20-foot lateral intervals to confirm that the remedial objectives have been achieved.

Because of the iterative nature of the excavation and sampling scheme described above, and the anticipated distribution irregularity of contaminated soil, it is difficult to accurately estimate the depths and volumes of soil requiring excavation. For purposes of the FS, it is assumed that the excavation is defined by exceedances detected during RI sampling, which resulted in a total volume of approximately 1,000 cubic yards to a maximum depth of 25 feet. One of the difficulties in standard excavation and with LDABs is the uncertainty of complete removal of contaminants. Due to irregular distribution of subsurface contaminants, some material may be missed or may be too difficult to follow (e.g., stringers extending a distance under the street). Sampling side walls of LDABs is also difficult, and partial-depth and bottom samples will be collected for defining extent.

Outside of the deep “hot spot” that would be removed via LDABs, the bottom of contaminated soil is expected to be less than 10 feet bgs, averaging approximately 6 feet bgs. If the additional sampling during conventional soil excavation activities indicates that deeper removal is necessary in isolated locations, shoring may be required. Because the requirement for deeper excavation in these areas is impossible to predict based on current information, these shoring costs are not included in the FS.

7.1.2 Regrade and Restore Site

In the “hot spot” area where soil is contaminated to depths greater than 10 feet bgs, backfilling would take place with CDF up to about 2 feet bgs. In the areas where standard excavation is performed to maximum depths of about 10 feet, backfilling and regrading would be required. The excavation pit would be backfilled with material compatible with construction of a future residence on the property. Compaction would be performed and topsoil placed in the upper 2 feet to promote good vegetative growth. Backfill and compaction for the alley and under the street easement would be performed according to city directives. Excavated areas would be restored to approximate pre-remediation surface elevations. Concrete sidewalks, street asphalt, and other surfaces would be restored with like materials.

7.1.3 Offsite Thermal Desorption and Disposal of Excavated Soil

Implementation of the remedial actions of Alternative 1 would result in excavation and offsite disposal of contaminated soil that is classified as hazardous waste (or dangerous waste in the State regulations). This soil contaminated with dry-cleaning waste is considered hazardous due to the presence of chlorinated solvents, and is a listed waste under EPA hazardous waste categories F001 and F002 as spent halogenated solvents from degreasing and general uses (40 CFR 268.31, or in the State Dangerous Waste regulations under WAC 173-303-9904). As such, this contaminated soil can only be disposed of within a hazardous waste landfill (EPA Subtitle C landfill). Federal land disposal regulations require that soil classified as a hazardous waste be treated to established levels before being placed in a land-based unit. The waste soil at MWL can be accepted at a Subtitle C landfill without treatment if concentrations meet the treatment standards in EPA's Land Disposal Restrictions (LDR) (40 CFR 268.40). A specific exception is made for soil waste, as opposed to other media, allowing contaminated soil to be landfilled without treatment at total concentrations up to 10 times the LDR universal treatment standards (40 CFR 268.49).

Table 7-2 presents the applicable LDR treatment standards and the exceedances for MWL samples. Review of soil contaminant levels throughout the site indicates approximately 30 percent of the soil will require treatment prior to disposal in a Subtitle C landfill. This amounts to an estimated 300 cubic yards (in place) and includes much of the southern "hot spot" soils, corresponding approximately to the 100 mg/kg contour outline (in plan view) for total chlorinated VOCs in Figure 4-2.

The material from the MWL site excavation would be managed by transferring the soil to trucks that will transport it for offsite disposal at the Subtitle C regulated facility in Arlington, Oregon. Excavated soil at MWL that exceeds treatment standards will be first segregated in the field (using samples submitted to the mobile onsite lab as well as RI data) and similarly transported to the Arlington solid waste facility for treatment by organic vapor recovery via thermal desorption, followed by disposal at the Arlington Subtitle C landfill.

The highway transportation route from Hoquiam to Arlington is approximately 275 miles. Due to about 20-percent expansion of soil during excavation and loading, the estimated total volume of site soil to be transported is approximately 1,200 cubic yards. Using an 18-cubic yard haul truck would entail about 67 round trips to transport soil, totaling 37,000 miles.

7.1.4 Biostimulation Treatment

Areas of contaminated groundwater outside the excavation area would undergo treatment by biostimulation. This process involves the addition of a carbon source (emulsified vegetable oil or EVO) to serve as an electron donor to stimulate the anaerobic reductive dechlorination (ARD) of the solvent contaminants PCE and TCE. The process would involve the installation of temporary 1-inch injection wells or single-use drive points, and injecting a dilute EVO solution of specific volume into each well or drive point. Once in the subsurface, this material would promote generation of anaerobic conditions that are expected to lead to enhanced degradation of PCE and TCE to daughter products cis-1,2-DCE, vinyl chloride, and eventually to ethene by ARD. The temporary wells are intended to remain in place for continued use to reinject EVO, to inject microbial bioaugment as necessary (bioaugmentation), and for potential monitoring use. These temporary wells would only be abandoned after the biostimulation treatment is complete.

In-situ treatment by biostimulation would be implemented at the following locations (see Figure 7-2): (1) 11 injection wells in the immediate vicinity of MW-6; (2) 8 injection wells in the immediate vicinity of MW-4; (3) 17 injection wells immediately downgradient of the deep "hot spot" in the southern portion of the property; and (4) 29 injection wells in a line immediately upgradient of wells MW-1 and MW-2, near the northern property boundary along B Street. Injection wells and injection drive points would be placed in staggered rows with a 10-foot spacing. This spacing would be modified in the remedial action design stage if further hydraulic injection testing is performed to determine achievable and sustainable injection rates.

The injection of EVO is accomplished by diluting the emulsified formulation 50 percent with water, injecting this solution under low pressure, and then chasing with a specific volume of water to attain a certain distribution of the material at each injection location. The specific volume of injectant solution and water chase, along with the concentration of EVO to be injected, would be determined from site-specific data in the design stage. Once injected, the vegetable oil droplets in the formulation adsorb to the soil matrix, and from there the EVO is broken down into further carbon sources (volatile fatty acids) that drive the ARD of the solvent contaminants in the groundwater.

Performance monitoring of the biostimulation process would be initiated after the injections are complete. A new shallow monitoring well would be installed near existing well MW-5 for the purpose of biostimulation performance monitoring. Details of performance monitoring for biostimulation are presented in Section 7.1.5.

If performance monitoring suggests a stall in the degradation process at cis-1,2-DCE or vinyl chloride, then bioaugmentation injection would be considered. Bioaugmentation involves the injection of a specific microbial consortium into the groundwater to ensure that the correct bacteria (*Dehalococcoides* species) are present for complete sequential degradation of all solvent contaminants by ARD, particularly vinyl chloride. Bioaugmentation injection would be performed only if the groundwater is consistently anaerobic, because the bacteria of interest are strict anaerobes. The volume of bioaugment solution to be injected is usually only 1 quart to 1 gallon per injection location. If performance monitoring indicates that the carbon source is depleted, based upon the TOC results, before the contaminant degradation is complete, and this incomplete nature is not attributable to the stall of cis-1,2-DCE or vinyl chloride described above, then additional EVO injections may be necessary.

The time estimated to reach CULs in groundwater, under both natural attenuation conditions and through the use of biostimulation, was determined by estimating first-order decay rates for individual solvent contaminants based upon upgradient and downgradient well pair data from June 2007 and October 2009 using BIOCHLOR software. Only well pairs away from the source area, and in direct upgradient-downgradient configuration based upon the potentiometric surface for the sampling event, were used in this analysis. The resultant first-order decay rates were then used to estimate the time duration necessary for concentrations to decay from current levels to the CUL. These times, for worst-case contaminant levels expected to remain after excavation activities are complete, assuming only natural attenuation, are presented in Table 7-3 under

"MNA Conditions." Both PCE and TCE at well MW-4 appear to require approximately 14 years until those contaminant levels will decay to below their respective CULs in groundwater.

By using biostimulation as proposed for Alternative 1, the restoration time frame for groundwater is significantly shorter. The time duration to achieve the groundwater CULs was estimated by increasing the first-order decay rates calculated for the MNA process by five-fold, to represent the enhancement effect of the EVO injection. The groundwater restoration time frame obtained by this approach is presented in Table 7-3 under "Biostimulation Conditions." Calculations yield durations of approximately 3 years time expected for PCE and TCE at well MW-4 to attain CULs under the biostimulation condition. During this time interval, it may be necessary to use institutional controls, such as a deed restriction, to limit the use or interaction with groundwater until monitoring is completed and CULs have been attained.

7.1.5 Environmental Monitoring

Under MTCA, compliance monitoring is required for all cleanup actions (WAC 173-340-410). Three categories of compliance monitoring are defined under MTCA:

- Protection monitoring to confirm that human health and the environment are protected during construction and operation of the cleanup action.
- Performance monitoring to confirm that the cleanup action has attained cleanup standards or remedial objectives.
- Confirmational monitoring to confirm the long-term effectiveness of the cleanup action after remedial objectives have been attained. Cleanup actions consisting of onsite disposal, isolation, or containment will require long-term monitoring until the residual hazardous substance no longer exceeds cleanup levels.

Protection monitoring would take place during remediation primarily using air monitoring in the breathing zone. Performance monitoring would take place during remediation as discussed above to determine that soil has been removed to cleanup levels, as feasible.

Confirmational monitoring would include a groundwater sampling program to monitor for and evaluate the natural attenuation and biostimulation process. This program would monitor for trends in contaminant concentrations, confirm that attenuation is taking place, determine the anticipated time frame for meeting cleanup levels, determine the potential for offsite migration, determine whether cleanup standards are met, and assess whether additional actions may be warranted.

Components of groundwater monitoring include a number of actions that apply to monitoring for COCs, MNA, and biostimulation. Two new groundwater monitoring wells would be installed following the remedial action. This is to replace those wells that are expected to be removed during remediation (MW-3 and MW-7). Groundwater would be sampled from all site wells to determine if water quality improves or degrades over time. Groundwater samples would be analyzed for the site COCs and for selected MNA parameters (sulfate, nitrate, methane, ethane, ethene, and field parameters such as DO, ORP, and ferrous iron). Sampling would be performed once in all wells prior to commencement of remediation to further establish a baseline. Following completion of the remedial action, groundwater monitoring would be conducted quarterly for 3 years (or until CULs are achieved), to evaluate the effectiveness of the action. For costing purposes, 3 total years of monitoring with 13 sampling rounds is assumed in Alternative 1.

Monitoring of groundwater in areas of biostimulation would include TOC, volatile fatty acids (VFA), and periodically (annually) the bacteriological parameters qPCR (quantitative polymerase chain reaction) and PLFA (phospholipid fatty acids), in addition to the COC and MNA parameters specified above. These bacteriological analyses provide qualitative and quantitative information about the microbial culture that is present at the sampling locations. These bacteriological sampling parameters should be collected at only one well per injection area.

7.2 Alternative 2—Significant Soil Removal and Disposal, Biostimulation and MNA

This alternative would reduce and control exposures to contaminants by the following response actions:

- Excavate most contaminated soil, except saturated zone soils in alley and street easement and near utilities.
- Regrade and restore site.
- Dispose of and/or treat excavated soil offsite.
- Use biostimulation treatment of specific groundwater and remnant contaminated soil areas.
- Implement environmental monitoring, including biostimulation-enhanced attenuation of groundwater contamination.

This alternative is similar to Alternative 1, with two primary differences. First, for the areas of soil contamination located in the alley and the 16th Street easement, excavation would proceed only to the water table, and would not disturb the subsurface utilities in these areas. As a result, contaminant source material in these two areas would be left in place. Second, biostimulation would be expanded to treat the saturated zone soils and groundwater in these areas (alley and easement). This expanded biostimulation is expected to compensate for the contaminated soil left in place and retain a restoration time frame that is roughly similar to that for Alternative 1. Implementation of environmental monitoring and possible groundwater institutional controls would be similar to Alternative 1. The location of these remedial actions is shown on Figure 7-3. The following sections explain those features that differ from Alternative 1.

7.2.1 Excavate Majority of Contaminated Soil

As stated above, soil in the area of the alley and in the easement of 16th Street would only be excavated to the water table (Figure 7-3). However, soil in proximity and below the natural gas and water supply utilities (even if above the water table) would not be excavated to avoid interaction and disturbance. These vadose zone soils are being excavated because no other alternative components are able to suitably remediate contaminants above the groundwater. Excavating only to the water table and avoiding utilities will minimize many of the logistical and safety difficulties involved in Alternative 1. In addition, the area of LDABs would also be slightly decreased to eliminate augering in the area of utilities. The calculated volume of soil to be removed in the "hot spot" is approximately 400 cubic yards. The natural gas and water supply lines would not need to be rerouted or supported in Alternative 2. The remaining source area soils and groundwater would instead be treated through biostimulation treatment.

Excavation dewatering, soil disposal/treatment, backfilling, and regrading/restoring the site for Alternative 2 would be performed similar to Alternative 1, but in somewhat smaller quantities. Approximately 850 total cubic yards of soil (instead of 1,000) will be removed in Alternative 2, amounting to about 57 round trips between Hoquiam and Arlington for a total of 31,000 miles.

7.2.2 Biostimulation Treatment

Areas of contaminated groundwater outside the excavation boundary and areas of saturated soil not removed by excavation (Section 7.2.1) would undergo treatment by biostimulation. The process is similar to that described in Section 7.1.4, except it is expanded to include treatment of the saturated soils in areas where contaminated soil is left in place. In-situ treatment by biostimulation would be implemented at the following locations (see Figure 7-3): (1) 14 injection wells south of the natural gas line in the alley; (2) 7 injection wells in the asphalt easement on the western side of 16th Street; (3) 11 injection wells in the immediate vicinity of MW-6; (4) 8 injection wells in the immediate vicinity of MW-4; (5) 17 injection wells immediately downgradient of the deep "hot spot" in the southern portion of the property; and (6) 29 injection wells in a line immediately upgradient of wells MW-1 and MW-2, near the northern property boundary along B Street. Injection wells and injection drive points would be placed and operated similar to that described in Section 7.1.4.

Performance monitoring of the biostimulation process would be initiated after the injections are complete. New shallow monitoring wells would be installed in the following locations for the purposes of biostimulation performance monitoring: (1) near existing well MW-5; (2) in the alley south of the property line; and (3) in the asphalt easement adjacent to 16th Street. Details of performance monitoring for biostimulation are presented in Section 7.1.5. Additional biostimulation treatment, beyond the EVO injection for solvent degradation, may be required in the area of the asphalt easement along 16th Street (in the vicinity of SB-60) where high petroleum contamination is also present. If these contaminants do not sufficiently degrade after the solvent contaminant degradation is complete, then an oxygen-containing solution (chemical oxidant) would be injected into the groundwater to stimulate aerobic biodegradation.

7.2.3 Environmental Monitoring

Environmental monitoring aspects are identical to that in Alternative 1, except there are an additional number of biostimulation points, which will require monitoring. The restoration time frame to achieve groundwater CULs for PCE and TCE is the same as for Alternative 2 – approximately 3 years. Results of time frame calculations are presented in Table 7-3 under the biostimulation condition.

7.3 Alternative 3—Electrical Resistance Heating, Biostimulation and MNA

This alternative would reduce and control exposures to contaminants by the following response actions:

- Apply electrical resistance heating (ERH) of soils throughout contaminant zone.
- Use biostimulation treatment of specific groundwater and soil contaminated areas.
- Implement environmental monitoring, including biostimulation-enhanced attenuation of groundwater contamination.

This alternative is distinct from the other alternatives in that it does not involve excavation and removal of soil. Instead, the ERH technology would be used to treat in-situ the contaminated site soils. Implementation of environmental monitoring would be identical to Alternative 1. The location of these remedial actions is shown on Figure 7-4. The following sections explain those features that differ from Alternatives 1 and 2.

7.3.1 Electrical Resistance Heating

The electrical resistance heating of contaminated soils would be performed throughout the site. The area that is being treated, including the sidewalk, would be fenced off to prevent access by individuals who might be exposed to stray electrical current and hot surfaces. Installation of the ERH system includes drilling boreholes, installing electrodes and soil vapor extraction screens in each borehole, and staging and connecting operating equipment (power control unit, transformer, power cables, vapor recovery lines, activated carbon, steam condenser, blower, and cooling tower). The boreholes are drilled in a triangular grid pattern (15-foot spacing) that is located to optimize electrical and thermal distribution in the subsurface. At each borehole, the electrode and vapor extraction screen are installed as one carbon steel well screen or as two separate components, a fiberglass vapor screen and an iron I or L beam. The backfill around the electrode/vapor screen consists of a conducting material such as a sand and graphite or sand and steel shot mix. The electrodes would be in electrical contact with the soil matrix from the bottom of contamination, some of which lies at the bedrock interface, up to approximately 1 foot bgs. The vapor extraction screen would be positioned over the same vertical interval.

Once the electrode and vapor recovery system is constructed, including connection of all electrical and vapor lines at the surface, then the system would undergo functional testing. After testing is successfully completed, the system would be turned on. Electrical power is supplied continuously to the electrodes to heat up the subsurface. Heating the soil to the target temperature of 190°F to 205°F usually takes 3 to 6 months. After the target temperature is achieved, it would be maintained for a period of several months to complete the thermal treatment. During the entire heating period, the vapor extraction system would be operating. As the soil is heated, contaminant vapor flow in the recovery system would progressively increase as the volatility of the contaminants increases. When the soil temperatures get close to the target, a significant amount of water would start to vaporize, which creates a steam-stripping effect for the volatiles. This steam is subsequently condensed in the steam condenser. Because of the heat and the steam-stripping effect, the removal of volatile contaminants from low-permeability silty soils is much more effective than standard air sparging and soil vapor extraction.

The progress of treatment with ERH is monitored through soil temperature monitoring of the subsurface, periodic collection and analysis of extracted vapors, and soil sampling for treatment confirmation. Thermocouples located at 5-foot intervals spanning the vertical target treatment zone would be used to track the subsurface soil temperature profile as it approaches and attains the target temperature. Air samples collected weekly from the vapor recovery line, after the condenser and before the activated carbon treatment, would be used along with vapor recovery stream flow-rate readings, to track the total amount of volatile contaminants removed from the subsurface as thermal treatment progresses. The soil samples, typically collected at 60, 90, and 100 percent of the thermal treatment cycle, would be used to verify the extent of contaminant removal indicated by the air sampling results.

One of the uncertainties with the application of ERH is the resultant final concentrations of soil contaminants when the system reaches a point of diminishing returns during the treatment cycle, and a decision is made to shut down the system. This technology has been utilized successfully at many petroleum and chlorinated VOC sites, with more than 99 percent mass removal and often greater than 99.9 percent; yet the final soil concentrations at the site are difficult to predict accurately to determine if CULs would be fully achieved. However, a recognized benefit of the ERH process is contaminant degradation that continues to occur by in-situ abiotic or biotic reactions even after heating ceases. Further biostimulation may also be used as a polishing step.

7.3.2 Environmental Monitoring

Environmental monitoring aspects are identical to that in Alternative 1. The restoration time frame to achieve groundwater CULs for PCE and TCE is the same as for the other alternatives – approximately 3 years. Results of time frame calculations are presented in Table 7-3 under the biostimulation condition.

8.0 Analysis and Comparison of Alternatives

MTCA requires the use of permanent solutions in which cleanup levels will be attained at the site without additional remedial actions; however, MTCA also recognizes that costs of the permanent solution may be disproportionate to the benefits it provides. Disproportionate costs are defined in MTCA as cases where the incremental costs of an alternative over that of a lower cost alternative exceed the incremental degree of benefits provided by the higher cost alternative. In the case of disproportionate costs, MTCA allows selection of a lower cost alternative that "uses permanent solutions to the maximum extent practicable" [WAC 173-340-360(3)]. This lower cost alternative is selected by conducting a disproportionate cost analysis, which compares the costs and benefits of all remedial alternatives in the feasibility study. This analysis also provides a framework for evaluating non-cost criteria of alternatives.

8.1 Permanence Ranking of Alternatives

The disproportionate cost analysis requires that the alternatives be ranked from most to least permanent and that the permanent solution alternative serve as the baseline against which all other alternatives are evaluated. When the benefits of two or more alternatives are equal, the lower cost alternative shall be selected as the preferred alternative.

All three of the alternatives in the FS will result in permanent solutions at the MWL site. These alternatives are intended to eliminate risk by removing or destroying contaminants above CUL concentrations in soil and eventually in groundwater. All alternatives will remove from the site a significant amount of source material. Alternatives 1 and 2 operate primarily by transporting contaminated soil from the site, while Alternative 3 operates by actively destroying contamination in-situ. All three alternatives involve components that actively reduce levels of groundwater contamination. Total costs and the time required to reach final groundwater cleanup levels are also similar for all three alternatives. The major distinguishing criteria involve implementation risks and consideration of public concerns.

8.2 Evaluation of Alternatives Using Disproportionate Cost Criteria

MTCA specifies several major criteria for evaluation and comparison of alternatives when conducting a disproportionate cost analysis to determine whether a remedial action is permanent to the maximum extent practicable [WAC 173-340-360(3)(e-f)]. The alternative analysis presented in Table 8-1 involves an evaluation of each alternative relative to the specified criteria listed below.

Protectiveness. Overall protectiveness of human health and the environment, including the following considerations:

- Degree to which existing risks are reduced,
- Time required to reduce risks and attain cleanup standards,
- Onsite and offsite risks resulting from implementation of the alternative, and
- Improvement in the overall environmental quality.

Permanence. The degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances, including the following considerations:

- Adequacy of the alternative in destroying hazardous substances,
- Reduction or elimination of hazardous substance releases or sources of releases,
- Degree of irreversibility of the waste treatment process, and
- Characteristics and quantity of treatment residuals generated.

Cost. The cost to implement the alternative, including the followings costs:

- Cost of construction (cost estimates for treatment technologies include pretreatment, analytical, labor, and waste management costs; the cost of replacement and repair of major elements for the estimated design life of the project is included);
- Net present value of any long-term costs (includes O&M costs, monitoring costs, equipment replacement costs, and the cost of maintaining institutional controls); and
- Agency oversight costs that are cost-recoverable.

Long-term effectiveness. Long-term effectiveness includes the following considerations:

- Degree of certainty that the alternative will be successful,
- Reliability of the alternative during the time that hazardous substances are expected to remain onsite at concentrations exceeding CULs,
- Magnitude of the residual risk with the alternative in place, and
- Effectiveness of controls required to manage the treatment residues or remaining wastes.

Management of short-term risks. Short-term risk includes the risk to human health and the environment associated with the alternative during construction and the implementation and effectiveness of mitigation measures.

Technical and administrative implementability. The ability of the alternative to be implemented includes the following considerations:

- Technical possibility of alternative;
- Availability of necessary offsite facilities, services, and materials;
- Administrative and regulatory requirements;
- Scheduling, size, and complexity;
- Monitoring requirements;
- Access for construction operations and monitoring; and
- Integration with existing facility operations and other current or potential remedial actions.

Consideration of public concerns. Consideration of public concerns includes whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This criterion includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.

Restoration time frame. In addition to the above criteria, MTCA requires the determination as to whether a cleanup action provides for a reasonable restoration time frame [WAC 173-340-360(4)]. Shorter time frames are preferred, using active remedial measures where practicable, unless the longer time period is associated with a cleanup action having a greater degree of long-term effectiveness. To determine if an alternative has a reasonable restoration time frame, the following factors are to be considered:

- Potential risks posed by the site,
- Practicability of achieving a shorter restoration time frame,
- Current and potential future uses of site and surrounding area and associated resources that may be affected by site releases,
- Likely effectiveness and reliability of institutional controls,
- Ability to control and monitor migration of site hazardous substances and consideration of their toxicity, and
- Natural processes that reduce concentrations of hazardous substances at site.

An evaluation of the alternative versus the cost criterion was accomplished by preparation of estimates of probable capital costs and expenses for operation and maintenance (O&M), and by estimating the life-cycle cost for each alternative using present worth analysis. The time period used in the present worth analysis for each alternative was selected to match the estimate of the life of the remedial action, through completion of groundwater restoration (Table 7-3). The present worth was calculated using a net discount rate of 5 percent before taxes and after inflation.

Estimated capital costs and O&M costs for each alternative are presented in Appendix F and summarized in Table 8-1. Unit costs were obtained from vendor quotations and from historical costs for other sites; dewatering costs were based on engineering estimates. Costs for offsite disposal and treatment were obtained from regional solid waste disposal facilities. This feasibility-level cost estimate (-30%/+50%) is accurate and valid only to the extent that components of this project follow those of past similar projects that costs are based upon. When process conditions are not well known or when a remedial action requires a detailed design or pilot test prior to implementation, uncertainties in the specified parameters (e.g., treatment volume or rate, concentrations of contaminants, or size of equipment) will result in additional cost uncertainty. Potential costs for pilot or bench-scale testing are not included in Appendix F. To compensate for uncertainty, a 25 percent contingency amount has been incorporated into the total cost.

8.3 Comparative Evaluation of Alternatives

The remedial action alternatives are usually evaluated relative to the most permanent solution to illustrate the relative pros and cons between alternatives and to assist in identification of the most permanent alternative to the extent practicable. However, because all three alternatives provide permanent solutions, the alternatives will simply be compared against each other using the criteria in Section 8.2. MTCA allows identification of a preferred alternative in the feasibility study [WAC 173-340-350(8)(c)(i)]. The preferred alternative will be identified based on the comparative evaluation presented in Table 8-1 and discussed below. One of the criteria, public concerns, is typically addressed in the Cleanup Action Plan after comments on the FS Report have been received. The currently anticipated public concerns are included in Table 8-1.

Through the analysis and evaluation of alternatives using the specified criteria, all three of the presented alternatives are capable of permanently removing site contaminants from the subsurface. The difference in risk reduction between the alternatives is minor, because all alternatives provide aggressive means of contaminant reduction from the site. The differences between alternatives in levels of contaminant reduction are not necessarily predictable, but it appears that Alternative 1 would provide slightly more thorough and more certain reduction. All three alternatives carry a measure of uncertainty, although the biostimulation component of each may be used to further reduce any contamination remaining after the primary remedial component (soil removal or ERH) is completed. Pilot testing may be necessary to determine the adequacy of the biostimulation component prior to full implementation. The following text highlights the significant pros, cons and differences between alternatives.

Alternative 1 involves complete removal of identified contaminated soil to the extent practicable, using LDABs in the deep “hot spot” area and conventional excavation elsewhere. It assumes that the difficulties inherent in working around subsurface utilities in the alley and street easement can be overcome (in part through rerouting of the gas line) to allow full access to contaminated areas; this may result in some utility interruptions. All contaminated soil is transported 275 miles to Arlington, Oregon, for disposal and for prior treatment of about 30 percent of this soil, entailing about 37,000 round-trip miles. This alternative involves utilizing biostimulation to decrease the time frame for groundwater remediation to approximately 3 years. This alternative has the advantage of fully removing all identified contaminated soil, but there is the likelihood of not completely identifying remnant contamination. This alternative has the risk of exposing workers and neighbors to high levels of solvent and petroleum vapors during soil removal, stockpiling, loading, and dewatering. In addition, the number of truckloads of soil and CDF that are transported through Hoquiam is highest in Alternative 1, with resultant traffic and noise concerns. This alternative carries the risks and environmental burden associated with about 67 round trips for large trucks full of highly contaminated soil. Total cost for Alternative 1 is approximately $1.47M present worth.

Alternative 2 involves removing most of the site contaminated soil, using dual techniques similar to those for Alternative 1. Contaminated soil is also transported to Arlington for disposal and treatment, entailing about 31,000 round-trip miles. This alternative differs in that it does not remove soil below the water table and near utilities in the alley and street easement. Thus, it does not face the difficulties involved with working around subsurface utilities. To compensate for this remnant contaminated soil and to treat groundwater, Alternative 2 adds biostimulation, which is more extensive than in the other two alternatives; groundwater restoration time frame is also approximately 3 years. This alternative has the same risk of exposing workers and neighbors to high levels of vapors during soil removal, stockpiling, loading, and dewatering, as well as a large number of transported truckloads of soil and CDF that results in traffic and noise concerns. This alternative also carries the risks and environmental burden associated with about

57 round trips for large trucks full of highly contaminated soil. Total cost for Alternative 2 is approximately $1.39M present worth.

Alternative 3 involves addressing site soil contamination with electrical resistance heating. This technology is very thorough in removing volatile substances at all depths, although it may not reduce concentrations fully down to all soil CULs (biostimulation may act as a polishing step). This alternative does not include removal of site soils, thus avoiding the difficulties of excavating, transporting, treating, and disposing of these contaminated soils. Similar to the other alternatives, it adds biostimulation to reduce contamination in groundwater (and any remnant soil), resulting in an approximate 3-year restoration time frame. Overall, Alternative 3 is expected to leave a volume of remnant soil contamination at about the same magnitude as the other two alternatives (which may potentially leave unidentified contaminated soil). This alternative has a much lower risk of exposing workers and neighbors to vapors, traffic, and noise because soil is not being handled and dewatering is not required. The risk of thermal or electrical hazards can be addressed through engineering and access controls, and these risks are likely lower than the hazards inherent in soil removal actions. Compared to the other alternatives, Alternative 3 carries lower risks and environmental burden. Total cost for Alternative 3 is approximately $1.48M present worth.

All three alternatives have significant pros and cons based on an analysis of the specified MTCA criteria. The following salient aspects are taken into consideration in selecting the preferred alternative:

- All three alternatives have similar costs, within the margin of error for estimates in this FS.
- All three alternatives are expected to remove a total source mass of contamination at roughly similar levels.
- All three alternatives have a similar restoration time frame of approximately 3 years following commencement of biostimulation.
- Implementation risks are expected to be lower in Alternative 3 compared to the other two, due to lack of removal and transport of contaminated soil, resulting in less exposure to vapors, traffic, and noise.
- In Alternatives 2 and 3, utilities in the alley and street easement do not require rerouting or supporting during excavation, although some protection from electrical and thermal energy will be required for Alternative 3.

Considering that all alternatives have similar costs, contaminant reduction amounts, and restoration time frames, other factors that will discriminate between them include short-term risks, consideration of public concerns, and the overall environmental burden. Alternative 3 has been identified as the preferred remedial alternative for the MWL site. Alternative 3 meets the goals of MTCA in that it is protective of human health and the environment; it meets the preference for a permanent solution, active remediation, and reasonable restoration time frame; it is expected to have relatively low short-term risks; it is readily implementable; it takes into account currently anticipated public concerns; and it is compatible with the future land use of the property.

9.0 References

AT AM Test, Inc. 1988. Analysis report for Most Western Laundry. June 28, 1988.

CES. 1988. Letter from Pat Sanborn, Regional Manager, Crowley Environmental Services, to Mr. Mike Bonney, Most Western Laundry and Dry Cleaners, Inc. RE: Summary report of work activities. August 12, 1988.

E&E (Ecology and Environment, Inc.). 1988. Site inspection report for Most Western Laundry and Dry Cleaning, Hoquiam, Washington. Prepared by Ecology and Environment, Inc. Submitted to: J.E. Osborn, Regional Project Officer, Field Operations and Technical Support Branch, U.S. Environmental Protection Agency, Region X. TDD F10-8808-19, PAN FWA0596SA. December 1988.

Ecology (Washington State Department of Ecology). 1984a. RCRA Inspection Report and Photos for Most Western Laundry and Dry Cleaners. K. Burdorff and K. Cook, Inspectors, Washington State Department of Ecology. September 28, 1984.

Ecology. 1984b. Inspection report and photo for Most Western Laundry. September 26, 1984.

Ecology. 1984c. RCRA WAC 173-303 Dangerous Waste Compliance Checklist/ Questionnaire for Most Western Laundry and Dry Cleaners. K. Burdorff, Inspector. September 28, 1984.

Ecology. 1984d. Order No. DE 84-622. Issued to Most Western Laundry and Dry Cleaners, Hoquiam, WA. October 12, 1984.

Ecology. 1984e. RCRA Inspection Report and Photos for Most Western Laundry and Dry Cleaners. K. Burdorff, Inspector, Washington State Department of Ecology. October 30, 1984.

Ecology. 1984f. Manchester Lab results for volatile organics in spill samples at Most Western Laundry. October 9, 1984.

Ecology. 1984g. Manchester Lab results for purgeable halocarbon in cleaner waste solvents/sludge at Most Western Laundry. October 29, 1984.

Ecology. 1984h. Manchester Environmental Lab results for tetrachloroethene at Most Western Laundry. November 19, 1984.

Ecology. 1985a. Order No. DE 85-370. Issued to Most Western Laundry and Dry Cleaners, Hoquiam, WA. May 22, 1985.

Ecology. 1985b. Memorandum from Art Johnson to Bill Yake RE: Preliminary assessment for a receiving environment survey in the Hoquiam River in the vicinity of Most Western Laundry. February 5, 1985.

Ecology. 1985c. Manchester Lab results for volatile organics in Hoquiam River water samples. February 5, 1985.

Ecology. 1985d. Manchester Lab results for organic analyses of pump station at Most Western Laundry. June 24, 1985.

Ecology. 1986. Manchester Environmental Lab results for purgeable chlorinated hydrocarbon at Most Western Laundry. November 17, 1986.

Ecology. 1987a. Consent Order No. DE 86-S149. Issued to Most Western Laundry and Dry Cleaners, Hoquiam, WA. April 23, 1987.

Ecology. 1987b. Consent Order No. DE 86-S149. First Amendment. Issued to Most Western Laundry and Dry Cleaners, Hoquiam, WA. July 2, 1987.

Ecology. 1988. Letter from Paul Stasch, Hazardous Waste Inspector, to Mike Bonney, Most Western Laundry, RE: Review and comments on Howard Edde Investigation Report. April 4, 1988.

Ecology. 1991. Letter and score sheets from Megan White, Southwest Region Supervisor, Toxics Cleanup Program, to Mr. Kevin Varness, Director Environmental Health Section, Grays Harbor Human Services Department, RE: Most Western Laundry and Dry Cleaning site hazard assessment ranking of 1. August 22, 1991.

Ecology. 2007. Agreed Order No. DE 4074. In the matter of remedial action by Most Western Limited, Inc. February 7, 2007.

Ecology. 2009. Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action. Review Draft, October 2009. Publication No. 09-09-047.

Fetter, C.W. 2001. Applied Hydrogeology (fourth edition); Prentice Hall, Inc.

Hoquiam Fire Department. 1994. Post Incident Fire Investigation Team Report. HFD Response Number 94-422. HPD Case Number 94-2197. June 27, 1994.

Howard Edde. 1986. Sampling Plan and Schedule for Investigation of Soil and Water Contamination at Most Western Laundry and Dry Cleaners, Inc., Hoquiam, Washington. For Washington State Department of Ecology, Olympia, Washington. By Howard Edde, Inc., Consulting Engineers, Redmond, WA. November 3, 1986.

Howard Edde. 1987. Investigation of Contamination and Recommendations for Remedial Action at Most Western Laundry & Dry Cleaners, Hoquiam, WA. Submitted to Washington Department of Ecology, Olympia, WA, by Howard Edde, Inc., Redmond, WA. October 1987.

Johnson, P.C. and Ettinger, R.A. 1991. Heuristic model for predicting the intrusion rate of contaminant vapors into buildings. Environmental Science and Technology, Vol. 25, no.8. pp. 1445-1452.

MWL. 1984a. Application for Relief from Penalty, Compliance Order No. DE 84-687. December 3, 1984.

MWL. 1984b. Supplement to Application for Relief from Penalty, Compliance Order No. DE 84-687. December 10, 1984.

MWL. 1985. Letter from Mike Bonney, Most Western Laundry and Dry Cleaners, Inc., to Kay Burdorff, Department of Ecology, RE: Compliance with item 4 of Order # DE 84-622, Closing the industrial dry cleaning department. January 4, 1985.

MWL. 1987. Facility Management Plan. September/October 1987.

Parker, Johnson & Parker. 2006. Letter from Jon C. Parker, Attorney, Parker, Johnson & Parker, P.S. Law Offices, to Ms. Andrea Clausen, RE: Site information on Most Western Laundry. May 19, 2006.

PCHB (Public Control Hearings Board). 1985. Stipulation and Agreed Order of Dismissal, PCHB No. 85-33. August 30, 1985.

R.L. Polk & Company, Inc. Various years (1907 to 2005). City directories for Hoquiam, included within Aberdeen/Hoquiam City directories or Grays Harbor County directories.

Rau, Weldon W. 1986. Geologic Map of the Humptulips Quadrangle and Adjacent Areas, Grays Harbor County, Washington: Washington State Department of Natural Resources Geologic Map GM-33, scale 1:62,500.

SAIC (Science Applications International Corporation). 2007a. Personal communication between Science Applications International Corporation and MWL neighbors, RE: Waste disposal and history. April 2007.

SAIC. 2007b. Final Remedial Investigation Sampling and Analysis Plan, Most Western Laundry Site, 16th & B Streets, Hoquiam, Washington. Submitted to Washington State Department of Ecology, Olympia, WA. Prepared by Science Applications International Corporation, Bothell, WA. March 30, 2007.

SAIC. 2010. Personal communication. Telephone conversation between Tom Dubé, Science Applications International Corporation, and Guy Barrett, Washington State Department of Ecology, RE: Property ownership. January 2010.

Sanborn Map Company. 1907. Fire insurance map of Hoquiam, Washington (January 1907).

Sanborn Map Company. 1916. Fire insurance map of Hoquiam, Washington (August 1916).

SCRD (State Coalition for Remediation of Drycleaners). 2009. Chemicals Used in Drycleaning Operations (revised July 2009). Website accessed January 15, 2009: http://www.drycleancoalition.org/chemicals/ChemicalsUsedInDrycleaning-Operations.pdf.

URS. 1992a. Site Inspection Report, Most Western Laundry. November 18, 1992. (This contains site inspection photos and handwritten notes)

URS (URS Consultants, Inc.). 1992b. Letter from Jeffrey M. Kesner, Environmental Scientist, URS Consultants, Inc., to Bill Bonney, Most Western Laundry & Dry Cleaners, Inc., RE: Planned site inspection. October 20, 1992.

U.S. EPA (U.S. Environmental Protection Agency) Files. 1981. Product Safety Information and Material Safety Data Sheets for Most Western Laundry. February 1981.

U.S. EPA. 2004. User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. Prepared by Environmental Quality Management Inc., for Industrial Economics Inc., for submittal to USEPA, Washington, D.C. February 22, 2004 revision. (EPA's web page: http://www.epa.gov/oswer/riskassessment/airmodel/pdf/2004_0222_3phase_users_guide.pdf)

Tables

Table 2-1
Numbers of RI Borings, Wells, and Samples
Most Western Laundry Site

Samples Collected or Wells Installed	Analyses and Methods								Borings or Wells Installed	Total Samples Collected
	VOCs (5035/8260, full suite)	VOCs (5035/8260, selected VOCs)	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	Tin (6020)	Tri-n-butyltin (Krone)	Total Organic Carbon (9060M)		
April 2 to 5, 2007										
Soil (geoprobe, HA)	75		5	3	5	14	11		49 (SB-1 through SB-49)	80
Duplicates (soil)	3									3
Groundwater (geoprobe)	6		2							6
Trip Blanks	2									2
April 23 to 24, 2007										
Soil (HA)	13								5 (SB-50 through SB-54)	soil: 13
Wells Installed (HSA)									5 (MW-1 through MW-5)	
May 2, 2007										
Groundwater (low flow)	5		1	1	1					5
Duplicates (groundwater)	1									1
Trip Blanks	1									1
June 13 to 15, 2007										
Soil (HSA, HA)	31			14	15				13 (SB-55 through SB-67)	soil: 31
Wells Installed (HSA)									4 (MW-6 through MW-9)	
Surface Water (SD outfall)	1									1
Trip Blanks	1									1
June 27, 2007										
Soil (HA)	1								1 (SB-68)	1
Groundwater (low flow)	9			3	3					9
Duplicates (groundwater)	1			1	1					1
Trip Blanks	1									1
October 20 to 22, 2009										
Soil (geoprobe)		10	8	2	3			2	7 (SB-69 through SB-75)	soil: 10
Wells Installed (geoprobe)									1 (MW-10)	
Groundwater (low flow)		10								10
Duplicates (groundwater)		1								1
Trip Blanks		1								1

HA = Hand auger
HSA = Hollow-stem auger
SD = Storm drain (outfall along Hoquiam River at 15th Street and Riverside Street)

Table 2-2
RI Monitoring Well Construction Information
Most Western Laundry Site

Well Identification	Date Installed	Elevation of Top of Well Casing (relative feet)	Elevation of Ground Surface (relative feet)	PVC Casing Diameter (inches)	Boring Diameter (inches)	Screened Interval (feet bgs)	Sand Pack Interval (feet bgs)
MW-1	4/23/2007	100.40	100.83	2	8.25	2.3 - 7.3	1.8 - 8
MW-2	4/23/2007	100.94	101.27	2	8.25	3.2 - 8.2	2 - 9
MW-3	4/23/2007	101.67	102.00	2	8.25	3.4 - 8.4	2.2 - 9
MW-4	4/23/2007	101.28	101.71	2	8.25	2.7 - 7.7	2 - 9
MW-5	4/24/2007	101.41	101.73	2	8.25	17.8 - 32.8	16.5 - 33
MW-6	6/13/2007	100.68	101.13	2	8.25	2.8 - 7.8	2 - 8.5
MW-7	6/13/2007	101.73	102.03	2	8.25	3.2 - 13.2	2 - 14
MW-8	6/13/2007	100.51	101.05	2	8.25	3.2 - 8.2	2.5 - 9
MW-9	6/14/2007	100.67	101.04	2	8.25	2.8 - 7.8	2 - 9
MW-10	10/21/2009	101.24	101.62	1	2.0	2.5 - 7.5	1.8 - 8.5

Boring logs and monitoring well construction logs are included in Appendix B

relative feet = relative to site datum (see Appendix B, Table B-1)

feet bgs = feet below ground surface

Table 3-1
Groundwater Depths and Elevations
Most Western Laundry Site

WELL ID/ DATE	TOC Elev* (relative ft)	DTW (ft)	GWE (relative ft)	Comments
MW-1	100.40			
4/24/2007		1.65	98.75	
5/2/2007		1.68	98.72	
6/8/2007		3.05	97.35	
6/27/2007		3.64	96.76	suspect elevation
10/22/2009		1.58	98.82	
MW-2	100.94			
4/24/2007		2.75	98.19	
5/2/2007		2.71	98.23	
6/8/2007		3.55	97.39	
6/27/2007		3.63	97.31	
10/22/2009		2.59	98.35	
MW-3	101.67			
4/24/2007		3.32	98.35	
5/2/2007		3.26	98.41	
6/8/2007		3.85	97.82	
6/27/2007		3.75	97.92	
10/22/2009		3.01	98.66	
MW-4	101.28			
4/24/2007		2.21	99.07	
5/2/2007		2.15	99.13	
6/8/2007		3.63	97.65	
6/27/2007		3.42	97.86	
10/22/2009		1.75	99.53	
MW-5 (deep)	101.41			
5/2/2007		4.00	97.41	deep aquifer zone; not contoured
6/8/2007		4.63	96.78	deep aquifer zone; not contoured
6/27/2007		4.70	96.71	deep aquifer zone; not contoured
10/22/2009		5.12	96.29	deep aquifer zone; not contoured
MW-6	100.68			
6/27/2007		2.44	98.24	
10/22/2009		1.18	99.50	
MW-7	101.73			
6/27/2007		3.62	98.11	
10/22/2009		2.83	98.90	
MW-8	100.51			
6/27/2007		3.36	97.15	
10/22/2009		2.37	98.14	
MW-9	100.67			
6/27/2007		5.61	95.06	sandy aquifer zone; not contoured
10/22/2009		3.75	96.92	sandy aquifer zone; not contoured
MW-10	101.24			
10/22/2009		1.90	99.34	

TOC = Top of casing in well (surveyed PVC well casing)
DTW = depth to water below the TOC
GWE = groundwater elevation (in relative feet according to site datum; see Appendix X)
Groundwater sampling event dates include 5/2/07, 6/27/07, and 10/22/09

Table 3-2
Groundwater Purging Parameters
Most Western Laundry Site

Well ID	Date	Temperature (°C)	pH	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Purge Rate (L/min)	Total Drawdown (ft)	Total Purging Time (min)
MW-1	10/21/2009	15.7	4.87	618	1.68	+170.2	1.2	0.13	0.08	26
MW-2	10/21/2009	17.0	4.85	991	1.71	+39.4	4.5	0.10	0.36	25
MW-3	10/21/2009	15.0	6.04	545	0.40	-4.7	5.7	0.10	0.23	30
MW-4	10/21/2009	14.4	5.90	346	1.23	+119.1	2.2	0.10	0.35	25
MW-5	10/21/2009	13.7	6.86	2587	0.93	-108.0	0.0	0.10	0.78	25
MW-6	10/20/2009	15.3	6.08	556	0.41	-33.1	3.9	0.13	0.28	29
MW-7	10/22/2009	15.4	5.65	1418	1.34	+18.9	31	0.09	0.42	33
MW-8	10/21/2009	17.1	5.28	314	2.94	+104.1	0.0	0.10	0.70	25
MW-9	10/21/2009	16.9	6.33	516	0.73	-96.4	0.0	0.10	0.54	25
MW-10	10/22/2009	NM	NM	NM	NM	NM	NM	0.03	2.05	15

NOTES
°C = degrees Celsius
µS/cm = micro-Siemens per centimeter
mg/L = milligrams per liter
ORP = Oxygen Reduction Potential (redox potential)
NTU = nephelometric turbidity units
mV = millivolts (equivalent to Eh)
L/min = liters per minute
ft = feet
NM = parameter not measured in MW-10 due to very slow recharge rate
All purge rates were estimated by measuring the time necessary to pump the flow cell (~1 liter capacity) full of groundwater.
Water quality data represent final stable values at end of purging.

Table 4-1
Summary of Exceedances for Chemicals of Concern in Soil and Groundwater
Most Western Laundry Site

	Soil				Groundwater			
	Total Nondetects	Nondetects, MDL exceeds MTCA CUL	Total Detects	Detects, Value exceeds MTCA CUL	Total Nondetects	Nondetects, MDL exceeds MTCA CUL	Total Detects	Detects, Value exceeds MTCA CUL
Benzene	67	16	66	14	17	3	16	1
1,4-Dichlorobenzene	121	0	12	1	34	3	0	0
cis-1,2-Dichloroethene	30	0	103	2	6	0	27	9
trans-1,2-Dichloroethene	101	0	32	0	22	0	11	3
1,2-Dichloropropane	119	0	14	0	27	2	6	1
Methylene Chloride	19	8	114	32	27	1	6	2
Naphthalene	114	2	19	1	33	0	1	0
Tetrachloroethene (PCE)	21	1	112	47	9	0	24	11
Trichloroethene (TCE)	62	10	71	30	13	0	20	8
Vinyl Chloride	47	2	86	21	8	0	25	23
TPH - Gasoline Range	13	0	19	12	4	0	8	3
TPH - Diesel Range	5	0	23	1	1	1	11	5
TPH - Heavy Oil Range	5	0	23	4	3	1	9	5

MDL - Method Detection Limit

MTCA - Model Toxics Control Act

CUL - Cleanup Level

TPH - Total Petroleum Hydrocarbons

Table 4-2
Summary of Soil and Groundwater Duplicate Sample Results
Most Western Laundry Site

Soil Duplicate Sample Comparison

Location/Sample	Date	Number of Individual VOCs Analyzed	Duplicate Sample Results[1]			Relative Percent Difference[2]		
			ND in Both	Detected in Both	1 ND, 1 Detection	Min	Max	Average
SB-26-10	4/4/2007	64	51	8	5	22	156	105
FD-1 (SB-26-10)	4/4/2007							
SB-46-4	4/5/2007	64	45	17	2	0	138	61
FD-2 (SB-46-4)	4/5/2007							
SB-47-0	4/5/2007	64	59	3	2	43	80	65
FD-3 (SB-47-0)	4/5/2007							
SB-62-11.5	6/14/2007	64	43	14	7	12	100	66
DUP-1-0614-7 (SB-62-11.5)	6/14/2007							

Groundwater Duplicate Sample Comparison

Location/Sample	Date	Number of Individual VOCs Analyzed	Number of Individual TPH Ranges Analyzed	Duplicate Sample Results[1]				Relative Percent Difference[2]					
								VOCs			TPH		
				Chemical Class	ND in Both	Detected in Both	1 ND, 1 Detection	Min	Max	Average	Min	Max	Average
MW-3	5/2/2007	64	0	VOC	54	9	1	4	36	17	NA	NA	NA
Dup 1 (MW-3)	5/2/2007			TPH	NA								
MW-3	10/21/2009	17	3	VOC	12	5	0	0	18	5	3	7	5
Dup 1 (MW-3)	10/21/2009			TPH	1	2	0						
MW-7	6/27/2007	64	3	VOC	55	7	2	5	78	20	3	20	12
Dup-1 (MW-7)	6/27/2007			TPH	0	3	0						

1 - Numbers of individual analytes that are not detected in both the sample and duplicate, are detected in both the sample and duplicate, and that are detected and not detected in either the sample or duplicate.

2 - Relative percent difference results are shown only for the samples where the individual analytes were detected in both samples.

NA - Not Applicable

ND - Nondetect

VOCs - Volatile Organic Compounds

TPH - Total Petroleum Hydrocarbons

Table 4-3
Soil Analytical Data
Most Western Laundry Site

Location/Sample	Sampling Date	Benzene	1,4-Dichlorobenzene	cis-1,2-Dichloroethene (cis-1,2-DCE)	Methylene Chloride (Dichloromethane)	Naphthalene	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	TPH - Gasoline Range	TPH - Diesel Range	TPH - Heavy Oil Range
Soil Samples (mg/kg):												
SB-1-4	4/2/2007	0.000077 U	**0.00084**	0.00064 U	**0.00091**	0.00067 U	**0.012**	0.00017 U	0.00024 U	--	--	--
SB-2-3	4/2/2007	0.000085 U	**0.00041**	**0.00091**	**0.0015**	0.00074 U	**0.0067**	0.00019 U	**0.00066**	--	--	--
SB-3-4	4/2/2007	0.019 U	0.016 U	**8.6**	**0.062**	0.051 U	**0.14**	**0.088**	**0.067**	--	--	--
SB-4-4	4/2/2007	0.000074 U	**0.00038**	0.00061 U	**0.0013**	0.00064 U	**0.0052**	0.00016 U	0.00023 U	--	--	--
SB-5-0	4/2/2007	**0.0012**	0.00028 U	0.00055 U	**0.00069**	0.00058 U	**0.011**	**0.00046**	0.00021 U	--	--	--
SB-5-3.5	4/2/2007	0.000075 U	0.00031 U	0.00062 U	**0.00088**	0.00065 U	**0.018**	**0.0016**	0.00023 U	--	--	--
SB-5-8	4/2/2007	**0.016**	0.00037 U	**0.0047**	**0.0014**	0.00077 U	**0.022**	**0.0011**	**0.0092**	20 U	**320**	**980**
SB-6-3	4/2/2007	**0.023**	0.016 U	**11**	**0.058**	0.052 U	0.020 U	*0.035 U*	**1.6**	--	--	--
SB-7-0	4/2/2007	--	--	--	--	--	--	--	--	--	--	--
SB-7-4	4/2/2007	0.000075 U	**0.00044**	0.00062 U	**0.0012**	0.00065 U	**0.0023**	0.00017 U	0.00023 U	--	--	--
SB-8-4	4/2/2007	0.000053 U	0.00022 U	**0.00062**	**0.00081**	0.00046 U	**0.0062**	**0.00061**	**0.00047**	--	--	--
SB-9-4	4/3/2007	0.012 U	0.0099 U	0.014 U	**0.027**	0.033 U	**0.17**	0.022 U	0.025 U	--	--	--
SB-10-9	4/3/2007	0.000085 U	0.00036 U	**0.0025**	**0.00076**	0.00074 U	0.00016 U	0.00019 U	**0.023**	--	--	--
SB-11-0	4/3/2007	0.000064 U	0.00027 U	0.00053 U	**0.00063**	0.00056 U	**0.0035**	0.00014 U	0.00020 U	--	--	--
SB-11-5	4/3/2007	**0.0030**	0.00032 U	0.00063 U	**0.00073**	0.00067 U	**0.0037**	0.00017 U	0.00024 U	--	--	--
SB-11-9	4/3/2007	**0.0039**	0.00059 U	0.0012 U	**0.0012**	0.0013 U	**0.0041**	0.00031 U	**0.00099**	20 U	**1,200**	**3,400**
SB-11-15	4/3/2007	0.000070 U	0.00029 U	0.00058 U	**0.00066**	0.00061 U	**0.0031**	0.00016 U	0.00022 U	--	--	--
SB-12-0	4/3/2007	--	--	--	--	--	--	--	--	--	--	--
SB-12-4	4/3/2007	0.000073 U	0.0003 U	0.0006 U	**0.00082**	0.00063 U	**0.00068**	0.00016 U	0.00023 U	--	--	--
SB-13-10	4/3/2007	**0.024**	0.00031 U	**2.5**	**0.00072**	0.00064 U	**0.0070**	0.00016 U	**0.27**	--	--	--
SB-14-4	4/3/2007	**0.0013**	0.0003 U	0.0006 U	**0.00078**	0.00063 U	**0.0025**	**0.00040**	**0.00044**	--	--	--
SB-15-0	4/3/2007	0.013 U	0.011 U	**0.26**	**0.034**	0.033 U	**19**	**0.82**	0.025 U	--	--	--
SB-15-4	4/3/2007	**0.0022**	**0.0004**	**0.061**	**0.00095**	0.00044 U	**3.7**	**0.13**	**0.00033**	--	--	--
SB-16-3.5	4/3/2007	**0.00055**	0.00023 U	**0.0092**	**0.00023**	0.00047 U	**0.081**	**0.015**	0.00017 U	--	--	--
SB-16-9	4/3/2007	**0.0021**	0.00043 U	**0.0047**	**0.0015**	0.00089 U	**0.016**	**0.00080**	**0.0018**	--	--	--
SB-17-4	4/3/2007	**0.0014**	0.0003 U	**0.0036**	**0.00086**	0.00063 U	**0.0045**	0.00016 U	0.00022 U	--	--	--
SB-18-4	4/3/2007	**0.0011**	0.00032 U	**0.0026**	**0.00090**	0.00067 U	**0.0048**	0.00017 U	**0.023**	--	--	--
SB-19-3	4/3/2007	**0.0018**	0.00054 U	**0.0033**	**0.0015**	0.0012 U	**0.0088**	0.00029 U	**0.0033**	--	--	--

Table 4-3
Soil Analytical Data
Most Western Laundry Site

Location/Sample	Sampling Date	Benzene	1,4-Dichlorobenzene	cis-1,2-Dichloroethene (cis-1,2-DCE)	Methylene Chloride (Dichloromethane)	Naphthalene	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	TPH - Gasoline Range	TPH - Diesel Range	TPH - Heavy Oil Range
SB-20-4	4/3/2007	0.000083 U	0.00034 U	0.00068 U	**0.00052**	0.00072 U	**0.0012**	0.00018 U	0.00025 U	--	--	--
SB-21-4	4/3/2007	**0.00097**	0.00037 U	**0.028**	**0.0020**	0.00078 U	**0.0041**	0.0002 U	**0.050**	--	--	--
SB-22-4	4/3/2007	0.000067 U	0.00028 U	**0.0012**	**0.00050**	0.00058 U	**0.011**	**0.0037**	**0.00082**	--	--	--
SB-23-4	4/3/2007	0.00007 U	0.00029 U	**0.00072**	**0.0012**	0.00061 U	**0.016**	0.00016 U	**0.0021**	--	--	--
SB-24-4	4/3/2007	0.000089 U	0.00037 U	**0.0011**	**0.00072**	0.00078 U	0.00017 U	0.00020 U	**0.0043**	--	--	--
SB-25-0	4/3/2007	--	--	--	--	--	--	--	--	--	--	--
SB-25-4	4/3/2007	0.000074 U	0.00031 U	**0.049**	**0.00075**	0.00064 U	**0.0017**	**0.00063**	**0.015**	--	--	--
SB-26-0	4/4/2007	*0.18 U*	0.15 U	**4.8**	**0.57**	0.48 U	**410**	**8.4**	0.36 U	--	--	--
SB-26-2	4/4/2007	*0.73 U*	0.61 U	0.81 U	**2.0**	2.0 U	**2,300**	**5.8**	*1.5 U*	--	--	--
SB-26-4	4/4/2007	--	--	--	--	--	--	--	--	**4,700**	**480**	**800**
SB-26-10	4/4/2007	*4.6 U*	3.8 U	**1,200**	**13**	*13 U*	**8,300**	**110**	**35**	--	--	--
FD-1 (SB-26-10)	4/4/2007	*0.58 U*	0.48 U	**780**	**1.6**	1.6 U	**2,000**	**45**	**28**	--	--	--
SB-26-17	4/4/2007	*2.4 U*	2.0 U	**790**	**7.3**	*6.4 U*	**8,200**	**340**	**26**	--	--	--
SB-26-23	4/4/2007	*0.073 U*	0.060 U	**22**	**0.18**	0.20 U	**170**	**33**	**0.87**	--	--	--
SB-27-0	4/4/2007	*0.096 U*	0.079 U	**4.4**	**0.28**	0.26 U	**220**	**12**	0.20 U	--	--	--
SB-27-1	4/4/2007	--	--	--	--	--	--	--	--	**1,600**	**2,400**	**3,400**
SB-27-8	4/4/2007	**0.31**	0.048 U	**200**	**0.18**	**0.35**	**46**	**40**	**29**	--	--	--
SB-27-12	4/4/2007	**0.51**	0.035 U	**160**	**0.13**	0.12 U	**0.084**	*0.076 U*	**50**	--	--	--
SB-28-4	4/4/2007	0.016 U	0.013 U	**0.037**	**0.061**	0.042 U	**0.11**	0.028 U	0.031 U	--	--	--
SB-28-8	4/4/2007	0.000078 U	0.00033 U	**0.0028**	**0.00094**	0.00068 U	**0.0061**	**0.00045**	**0.16**	--	--	--
SB-29-4	4/4/2007	**0.00077**	0.00028 U	**0.68**	**0.00069**	0.00058 U	**0.017**	**0.0015**	**0.048**	--	--	--
SB-30-0	4/4/2007	**0.0018**	0.00024 U	**0.0070**	**0.0012**	0.00049 U	**4.1**	**0.036**	**0.0013**	--	--	--
SB-30-4	4/4/2007	0.000068 U	0.00028 U	**0.050**	**0.00085**	0.00059 U	**10**	**0.14**	**0.00068**	--	--	--
SB-31-3	4/4/2007	0.000072 U	0.0003 U	**0.11**	**0.0011**	0.00063 U	**0.0046**	**0.00081**	**0.080**	--	--	--
SB-32-4	4/4/2007	0.000069 U	0.00029 U	**0.011**	**0.00099**	0.0006 U	**0.052**	**0.0044**	**0.0021**	--	--	--
SB-33-3.5	4/4/2007	0.000059 U	0.00025 U	**0.0031**	**0.00071**	0.00051 U	**0.0040**	**0.00079**	**0.0013**	--	--	--
SB-34-0	4/4/2007	**0.016**	0.013 U	**5.8**	**0.13**	0.043 U	**59**	**9.3**	0.032 U	--	--	--
SB-35-4	4/4/2007	0.000073 U	0.0003 U	**0.00066**	**0.00089**	0.00063 U	**0.0030**	0.00016 U	**0.0028**	--	--	--
SB-36-0	4/4/2007	**0.0025**	0.00028 U	**0.033**	**0.0012**	**0.0014**	**0.13**	**0.013**	**0.031**	--	--	--
SB-36-4	4/4/2007	0.016 U	0.013 U	**0.031**	**0.05**	**0.12**	**0.086**	0.028 U	0.032 U	--	--	--

Table 4-3
Soil Analytical Data
Most Western Laundry Site

Location/Sample	Sampling Date	Benzene	1,4-Dichlorobenzene	cis-1,2-Dichloroethene (cis-1,2-DCE)	Methylene Chloride (Dichloromethane)	Naphthalene	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	TPH - Gasoline Range	TPH - Diesel Range	TPH - Heavy Oil Range
SB-37-0	4/4/2007	0.0012	0.00022 U	0.027	0.00098	0.00045 U	0.17	0.029	0.040	--	--	--
SB-37-4	4/4/2007	0.000074 U	0.00031 U	0.0016	0.00093	0.00064 U	0.0059	0.00063	0.0013	--	--	--
SB-37-8	4/4/2007	0.0018	0.00038 U	0.014	0.0017	0.0008 U	0.044	0.0060	0.0039	--	--	--
SB-38-0	4/4/2007	0.000054 U	0.00023 U	0.00045 U	0.00038	0.00047 U	0.0017	0.00012 U	0.00017 U	--	--	--
SB-38-4	4/4/2007	0.000075 U	0.00031 U	0.0090	0.0012	0.00065 U	0.025	0.0012	0.0024	--	--	--
SB-39-0	4/4/2007	0.0018	0.00025 U	0.011	0.0027	0.00052 U	0.057	0.012	0.00019 U	--	--	--
SB-39-2.5	4/4/2007	0.0021	0.00024 U	0.0070	0.0027	0.00051 U	0.086	0.018	0.00018 U	--	--	--
SB-40-2	4/4/2007	0.17 U	0.15 U	5.7	0.69	0.46 U	780	26	0.35 U	--	--	--
SB-40-4	4/4/2007	0.044 U	0.037 U	30	0.18	0.12 U	140	37	0.52	--	--	--
SB-40-8	4/5/2007	0.002	0.0004 U	2.6	0.0016	0.00084 U	2.1	0.36	0.43	--	--	--
SB-41-4	4/5/2007	0.0012	0.00041 U	0.00094	0.0045	0.00086 U	0.0037	0.00022 U	0.0011	--	--	--
SB-42-0	4/5/2007	0.087	0.00024 U	0.00048 U	0.00098	0.00051 U	0.027	0.00028	0.00018 U	--	--	--
SB-42-4	4/5/2007	0.056	0.012 U	9.8	0.057	0.038 U	0.015 U	0.11	0.77	--	--	--
SB-43-4	4/5/2007	0.0043	0.00043 U	0.044	0.0012	0.0009 U	0.16	0.028	0.004	--	--	--
SB-44-4	4/5/2007	0.0017	0.0003 U	0.014	0.00097	0.00063 U	0.024	0.0047	0.006	--	--	--
SB-45-3	4/5/2007	0.015 U	0.013 U	0.11	0.057	0.42	0.050	0.027 U	0.030 U	--	--	--
SB-45-5	4/5/2007	0.0025	0.00037 U	0.0011	0.00082	0.005	0.0024	0.00020 U	0.0030	--	--	--
SB-45-12	4/5/2007	0.020 U	0.016 U	0.027	0.036 U	0.12	0.064	0.035 U	0.069	--	--	--
SB-46-4	4/5/2007	0.019 U	0.015 U	2.6	0.081	0.2	2.0	0.11	1.3	100	2,000	2,800
FD-2 (SB-46-4)	4/5/2007	0.017 U	0.014 U	7.7	0.079	0.084	0.37	0.029 U	3.7	--	--	--
SB-46-8	4/5/2007	0.013	0.00037 U	0.0034	0.0011 U	0.00078 U	0.0040	0.00020 U	0.013	--	--	--
SB-47-0	4/5/2007	0.17 U	0.14 U	15	0.31 U	0.46 U	620	27	0.34 U	--	--	--
FD-3 (SB-47-0)	4/5/2007	0.13 U	0.11 U	6.4	0.24 U	0.35 U	400	13	0.26 U	--	--	--
SB-48-0	4/5/2007	0.00098	0.00022 U	0.0052	0.00044	0.00068	0.061	0.0096	0.00054	--	--	--
SB-49-0	4/5/2007	0.000066 U	0.00028 U	0.0039	0.0080	0.00058 U	0.030	0.0042	0.00021 U	--	--	--
SB-50-4	4/23/2007	0.000061 U	0.00025 U	0.00051	0.00049	0.00061	0.0012	0.00014 U	0.0005	--	--	--
SB-51-2	4/23/2007	0.000064 U	0.00027 U	0.0015	0.00053	0.00056 U	0.0052	0.0006	0.0051	--	--	--
SB-51-4.5	4/23/2007	0.000098 U	0.00041 U	0.0016	0.00086	0.00085 U	0.026	0.00068	0.0055	--	--	--
SB-52-2	4/23/2007	0.055	0.015 U	0.11	0.039	0.058	0.39	0.091	0.037 U	--	--	--
SB-53-3	4/23/2007	0.0046	0.00035 U	0.016	0.0011	0.001	0.00065	0.00046	0.025	--	--	--
SB-54-1.5	4/24/2007	0.0043	0.00025 U	0.019	0.00063	0.00068	0.099	0.015	0.00062	--	--	--

Table 4-3
Soil Analytical Data
Most Western Laundry Site

Location/Sample	Sampling Date	Benzene	1,4-Dichlorobenzene	cis-1,2-Dichloroethene (cis-1,2-DCE)	Methylene Chloride (Dichloromethane)	Naphthalene	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	TPH - Gasoline Range	TPH - Diesel Range	TPH - Heavy Oil Range
SB-55-1.5*	6/13/2007	0.025	0.00028	0.00064	0.00066	0.00026 U	0.0016	0.00051	0.0010	--	--	--
SB-55-3	6/13/2007	0.32	0.016 U	0.021 U	0.035 U	0.051 U	0.020 U	0.034 U	0.038 U	--	--	--
SB-55-4	6/13/2007	--	--	--	--	--	--	--	--	790	1,500	6,100
SB-55-7.5	6/13/2007	0.84	0.025 U	4.2	0.055 U	0.081 U	0.031 U	0.054 U	14	16	3.6	12
SB-56-4	6/13/2007	1.1	320	0.47 U	0.79 U	38	2.1	0.77 U	1.1	--	--	--
SB-56-7.5	6/13/2007	0.0041	0.00023 U	0.0033	0.0017	0.00032 U	0.00095	0.00016 U	0.042	--	--	--
SB-57-4	6/14/2007	0.013	0.00018 U	0.0083	0.00069	0.00025 U	0.012	0.0025	0.0031	13	4.9	21
SB-57-7	6/14/2007	0.021	0.0002 U	0.00089	0.0031	0.00027 U	0.00015 U	0.00014 U	0.00042	81	35	31
SB-58-4	6/14/2007	0.013 U	0.011 U	0.028	0.024 U	0.035 U	3.2	0.089	0.026 U	5.8	140	300
SB-58-7	6/14/2007	0.0019	0.00019 U	0.0022	0.00066	0.00026 U	0.0013	0.00013 U	0.0056	8.2	16	42
SB-58-13	6/14/2007	0.00012 U	0.00015 U	0.00015 U	0.00045	0.00021 U	0.00084	0.00011 U	0.0014	--	--	--
SB-59-4	6/14/2007	0.040 U	0.033 U	36	0.29	0.11 U	0.71	0.071 U	8.5	--	--	--
SB-60-4	6/14/2007	0.14 U	0.11 U	16	1.1	0.36 U	270	19	0.35	3,800	330	30
SB-61-4	6/14/2007	0.00013 U	0.00018	0.00039	0.00055	0.00023 U	0.0017	0.00012 U	0.00055	2.0	5.0	16
SB-61-7	6/14/2007	0.0015	0.00023 U	0.00023 U	0.0008	0.00031 U	0.0021	0.00016 U	0.00021 U	11	5.8	31
SB-62-4	6/14/2007	0.14	0.035	26	0.26	0.34	42	1.3	2.7	1,200	330	510
SB-62-11.5	6/14/2007	0.37	0.017 U	36	0.16	0.056 U	0.022 U	0.037 U	36	--	2.8	11
DUP-1-0614-7 (SB-62-11.5)	6/14/2007	0.77	0.020 U	69	0.18	0.066 U	0.030	0.044 U	55	--	--	--
SB-62-17	6/14/2007	0.024	0.00016 U	0.38	0.0014	0.0037	0.0011	0.00012 U	8.1	29	10	21
SB-62-20	6/14/2007	0.0076	0.0003	2.8	0.0017	0.00022 U	0.0010	0.00033	0.99	--	--	--
SB-63-3.5	6/14/2007	1.1 U	0.88 U	56	8.2	2.9 U	2,700	560	2.2 U	2,700	650	1,700
SB-63-5	6/14/2007	0.69 U	0.57 U	160	6.1	2.1	1,700	470	2.4	--	--	--
SB-64-7	6/14/2007	0.00018 U	0.00022 U	0.00061	0.0005	0.00031 U	0.0012	0.00016 U	0.062	--	--	--
SB-65-4	6/15/2007	0.0025	0.00019 U	0.0037	0.00056	0.00026 U	0.0033	0.0013	0.0075	--	--	--
SB-66-3.5	6/15/2007	0.00014 U	0.00017 U	0.025	0.00049	0.00024 U	0.0010	0.00032	0.19	--	--	--
SB-67-3	6/15/2007	0.00013 U	0.00016 U	0.049	0.00041	0.00023 U	0.0011	0.0039	0.0054	--	--	--
SB-68-4	6/27/2007	0.0025	0.00013 U	0.25	0.00021	0.00018 U	0.088	0.061	0.010	--	--	--
SB-69-3	10/20/2009	0.0044	0.0016 U	0.0016 U	0.0031 U	0.0077 U	0.0016 U	0.0016 U	0.0016 U	20 U	50 U	100 U
SB-70-4	10/20/2009	0.0019	0.0014 U	0.025	0.0028 U	0.007 U	0.048	0.0039	0.023	20 U	35	200
SB-71-3.5	10/20/2009	0.007	0.0014 U	0.0016	0.0028 U	0.0071 U	0.0014 U	0.0014 U	0.0015 U	220	50 U	100 U

Table 4-3
Soil Analytical Data
Most Western Laundry Site

Location/Sample	Sampling Date	Benzene	1,4-Dichlorobenzene	cis-1,2-Dichloroethene (cis-1,2-DCE)	Methylene Chloride (Dichloromethane)	Naphthalene	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	TPH - Gasoline Range	TPH - Diesel Range	TPH - Heavy Oil Range
SB-72-3.5	10/20/2009	**0.0034**	0.0014 U	0.0014 U	0.0028 U	0.007 U	0.0014 U	0.0014 U	0.0014 U	20 U	50 U	100 U
SB-73-3.5	10/21/2009	**0.0076**	0.0018 U	**0.0046**	0.0036 U	0.009 U	0.0018 U	0.0018 U	**0.0050**	20 U	50 U	100 U
SB-74-3.5	10/21/2009	**0.0078**	0.0017 U	0.0017 U	0.0035 U	0.0086 U	0.0017 U	0.0017 U	0.0017 U	**90**	**52**	**110**
SB-75-6.5	10/21/2009	**0.0066**	0.0026 U	0.0026 U	0.0053 U	0.013 U	0.0026 U	0.0026 U	0.0026 U	20 U	**130**	**1,600**
MW-1-4	4/23/2007	0.000095 U	0.00039 U	0.00078 U	**0.0012**	**0.0013**	**0.00096**	0.00021 U	0.00029 U	--	--	--
MW-2-4	4/23/2007	0.000099 U	0.00041 U	0.00082 U	**0.0014**	0.00086 U	0.00019 U	0.00022 U	0.0003 U	--	--	--
MW-3-4	4/23/2007	**0.036**	0.00036 U	0.00071 U	**0.00086**	0.00075 U	0.00016 U	0.00019 U	0.00027 U	--	--	--
MW-3-9	4/23/2007	**0.033**	0.00048 U	**0.038**	**0.0014**	0.001 U	0.00022 U	0.00025 U	0.00035 U	--	--	--
MW-4-4	4/23/2007	0.000093 U	0.00039 U	**0.033**	**0.00064**	**0.0011**	**0.025**	**0.0078**	**0.0091**	--	--	--
MW-5-5	4/24/2007	**0.0014**	0.00034 U	0.00068 U	**0.0014**	0.00072 U	0.00016 U	0.00018 U	0.00025 U	--	--	--
MW-5-20	4/24/2007	0.000069 U	0.00029 U	0.00057 U	**0.00079**	0.0006 U	0.00013 U	0.00015 U	0.00021 U	--	--	--
MW-6-3	6/13/2007	0.00015 U	**0.00034**	**0.042**	**0.0023**	0.00027 U	**0.0017**	**0.00053**	**0.010**	--	--	--
MW-7-4	6/13/2007	0.019 U	0.016 U	**18**	*0.035 U*	0.052 U	**16**	**12**	**0.51**	**480**	**38**	**25**
MW-7-9	6/13/2007	*1.3 U*	1.1 U	**1,700**	**9.7**	3.5 U	**4,600**	**190**	**70**	**2,600**	**220**	**300**
MW-7-12	6/13/2007	**0.29**	0.17 U	**580**	**1.5**	0.56 U	*0.22 U*	*0.37 U*	**37**	--	--	--
MW-8-5	6/13/2007	0.00013 U	**0.00033**	**0.0015**	**0.0016**	0.00023 U	**0.014**	**0.00041**	0.00015 U	--	--	--
MW-9-4	6/14/2007	**0.0013**	0.00014 U	**0.00095**	**0.0015**	0.00019 U	**0.0057**	**0.00041**	**0.00047**	--	--	--
MW-10-4	10/21/2009	0.0018 U	0.0018 U	0.0018 U	0.0036 U	0.0091 U	0.0018 U	0.0018 U	0.0018 U	20 U	50 U	100 U
MTCA Method A CUL (mg/kg)		**0.03**	**--**	**--**	**0.02**	**5**	**0.05**	**0.03**	**--**	**30**	**2,000**	**2,000**
MTCA Method B CUL (mg/kg)		**18**	**42**	**800**	**130**	**1,600**	**1.9**	**11**	**0.67**	--	--	--
Selected CUL for MWL (mg/kg)		**0.03**	**42**	**800**	**0.02**	**5**	**0.05**	**0.03**	**0.67**	**30**	**2,000**	**2,000**

All results are presented in mg/kg (ppm)

Soil data have not undergone third-party validation.

Yellow highlighted detections are those values exceeding the selected MTCA cleanup levels.

Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.

Italicized non-detected values are those detection limits or reporting limits that exceed the selected MTCA cleanup levels.

U = Not detected at or above the reporting limit.

-- = Not analyzed or not applicable

* This sample was inadvertently labeled MW-7-1.5 when delivered to the laboratory for analysis.

Table 4-4
Estimated Depth Range of Soil Contamination Based on MTCA CUL Exceedances
Most Western Laundry Site

Boring/ Well	Depth to Top of Soil Sample (ft bgs)	Total Boring Depth (ft bgs)	MTCA Exceedances[1]	PID Reading (ppm)	Odor Description	Sheen Description	Estimated Depth Range of Contamination, Top to Bottom (ft bgs)[2]
SB-1	4	20	<MTCA	0.6	None	None	None
SB-2	3	16	<MTCA	0.9	None	None	None
SB-3	4	12	MC, PCE, TCE	3.4	None	None	2 to 5
	8		--	1.5	None	None	
SB-4	4	12	<MTCA	0.9	None	None	None
SB-5	0	16	<MTCA	0.8	None	None	None
	3.5		<MTCA	5.2	Slight	Slight	
	8		<MTCA	1.7	Solvent, slight to moderate	Moderate to heavy	
	9		--	1.5	Slight to moderate	Moderate	
	11		--	1.1	None	None	
SB-6	3	28	MC, VC	32.1	Solvent, slight	Slight	3 to 5
	4		--	12.8	Subtle	Slight	
	6		--	3.4	None	None	
SB-7	0	12	--	1.0	None	None	None
	4		<MTCA	1.1	None	None	
SB-8	4	5	<MTCA	1.4	None	None	None
SB-9	2	12	--	27.1	Slight	Moderate	2 to 6
	4		MC, PCE	0.0	Slight	Slight	
	10		--	17.3	None	Moderate	
SB-10	9	12	<MTCA	0.0	None	None	None
SB-11	0	20	<MTCA	0.0	None	None	8 to 11
	4.5		--	0.0	None	Moderate	
	5		<MTCA	0.0	None	Moderate	
	9		HRO	2.9	Some heavy oil and solvent odor	Heavy	
	15		<MTCA	2.7	None	Slight to moderate	
	16		--	--	None	Slight	
SB-12	0	12	--	0.0	None	None	None
	4		<MTCA	0.3	None	Slight	
SB-13	10	12	<MTCA	0.5	None	Very slight	None
SB-14	4	12	<MTCA	0.0	None	None	None
SB-15	0	5	MC, PCE, TCE	--	None	Slight	0 to >5 (6.5)
	4		PCE, TCE	0.0	None	None	
SB-16	1	12	--	--	Solvent, very weak	--	2 to 5
	3.5		PCE	6.8	Solvent, weak	None	
	9		<MTCA	1.2	Slight	Slight	
	10.5		--	0.3	None	None	
SB-17	4	8	<MTCA	1.1	None	None	None
SB-18	4	9	<MTCA	1.6	None	None	None
SB-19	3	8	<MTCA	0.4	None	None	None
SB-20	4	12	<MTCA	0.4	None	None	None
SB-21	4	8	<MTCA	0.4	None	None	None
SB-22	4	8	<MTCA	1.3	None	None	None
SB-23	3	8	--	2.2	None	Slight	None
	4		<MTCA	0.4	None	Slight	
	5		--	0.7	None	None	
SB-24	4	8	<MTCA	0.4	None	None	None
SB-25	0	8	--	0.4	None	None	None
	4		<MTCA	0.4	None	None	
SB-26	0	26	MC, PCE, TCE	26	Slight	Moderate	0 to 23.5
	2		MC, PCE, TCE	>10,000	Slight	Moderate	
	4		GRO	3691	Solvent, slight	Moderate	
	10		DCE, MC, PCE, TCE, VC	>10,000	Solvent, strong	Heavy	
	17		MC, PCE, TCE, VC	9,999	Moderate	Moderate	
	23		MC, PCE, TCE, VC	66.6	None	None	

Table 4-4
Estimated Depth Range of Soil Contamination Based on MTCA CUL Exceedances
Most Western Laundry Site

Boring/ Well	Depth to Top of Soil Sample (ft bgs)	Total Boring Depth (ft bgs)	MTCA Exceedances[1]	PID Reading (ppm)	Odor Description	Sheen Description	Estimated Depth Range of Contamination, Top to Bottom (ft bgs)[2]
SB-27	0	20	MC, PCE, TCE	87.5	--	--	0 to >20 (24)
	1		GRO, DRO, HRO	44 to 515	Petroleum, heavy	Heavy	
	8		B, MC, PCE, TCE, VC	1326	Slight	Moderate	
	12		B, MC, PCE, VC	878	None	None	
	19		--	577	None	None	
SB-28	2	12	--	183	None	None	2 to 5.5
	4		MC, PCE	20.7	Solvent, slight	Moderate	
	8		<MTCA	11.3	None	Subtle	
	9		--	3.0	None	None	
SB-29	4	8	<MTCA	7.6	None	None	None
SB-30	0	4.5	PCE, TCE	4.1	None	Slight	0 to >4.5 (6)
	4		PCE, TCE	3.1	None	None	
SB-31	2	12	--	1.8	None	Slight	None
	3		<MTCA	4.1	Slight	Moderate	
	4		--	1.0	None	None	
SB-32	4	8	PCE	1.5	None	None	2 to 5
	5.5		--	1.0	None	None	
SB-33	3.5	12	<MTCA	1.0	None	None	None
SB-34	0	3	MC, PCE, TCE	9.7	None	Slight	0 to >3 (9)
	2		--	5.8	None	None	
SB-35	4	12	<MTCA	0.3	None	None	None
SB-36	0	12	PCE	1.3	--	--	0 to 5.5
	2		--	24.9	None	Moderate	
	4		MC, PCE	49.0	None	Moderate	
	5		--	5.2	None	None	
SB-37	0	12	PCE	3.3	--	--	0 to 3.5
	4		<MTCA	5.8	None	Heavy	
	8		<MTCA	0.7	None	Slight	
	10		--	0.3	None	None	
SB-38	0	12	<MTCA	0.2	--	--	None
	4		<MTCA	1.1	None	Subtle	
SB-39	0	3.5	PCE	0.3	None	None	0 to >3.5 (4)
	2.5		PCE	0.3	None	None	
SB-40	2	16	MC, PCE, TCE	1550	None	Moderate	1 to 10
	4		MC, PCE, TCE	574	None	Moderate	
	8		PCE, TCE	39.4	None	None	
	13		--	32.2	None	None	
SB-41	4	40	<MTCA	0.9	None	None	None
SB-42	0	6	B	0.7	None	Subtle	0 to 5
	4		B, MC, TCE, VC	58.3	None	None	
SB-43	4	12	PCE	1.2	None	None	2 to 5.5
SB-44	4	12	<MTCA	1.4	None	None	None
SB-45	1	16	--	14.6	None	Slight	2 to 5[3]
	3		MC, (PCE)	313	Solvent, strong	Heavy	
	5		<MTCA	16.8	None	Slight	
	12		PCE[3]	6.3	None	Slight	
	14		--	3.4	None	None	
SB-46	1	16	--	4.2	Slight	Slight	2 to 8
	4		MC, PCE, TCE, VC, GRO, (DRO), HRO	18.2	Heavy oil, strong	Heavy	
	8		<MTCA	6.1	None	Slight	
SB-47	0	1	PCE, TCE	425	None	Slight	0 to >1 (24)
SB-48	0	1	PCE	1.6	None	None	0 to >1 (4)
SB-49	0	1	<MTCA	0.8	None	None	None

Table 4-4
Estimated Depth Range of Soil Contamination Based on MTCA CUL Exceedances
Most Western Laundry Site

Boring/ Well	Depth to Top of Soil Sample (ft bgs)	Total Boring Depth (ft bgs)	MTCA Exceedances[1]	PID Reading (ppm)	Odor Description	Sheen Description	Estimated Depth Range of Contamination, Top to Bottom (ft bgs)[2]
SB-50	4	8	<MTCA	--	Very weak	None	None
SB-51	2	7	<MTCA	--	Very weak	Subtle	None
	4.5		<MTCA	--	Weak to moderate	None	
SB-52	2	2	B, MC, PCE, TCE	--	Moderate	Subtle	1.5 to >2 (4)
SB-53	3	3	<MTCA	--	None	--	None
SB-54	1.5	3	PCE	--	None	None to subtle	1 to >3 (3.5)
SB-55	1.5	8	<MTCA	224	Moderate	Subtle	2 to >8 (12)
	3		B	274	Hydrocarbon & Solvent, moderate	Strong	
	4		GRO, HRO	76	Petroleum, strong	Strong	
	7.5		B, VC	67.1	Petroleum, moderate	Very heavy	
SB-56	1	10.5	--	0.2	Solvent, very weak	Slight	2 to 6
	4		B, PCE, VC	559	Solvent, strong	Moderate to heavy	
	7.5		<MTCA	0	None	None	
SB-57	4	13	<MTCA	0	None	Slight	5 to 8
	7		GRO	211	Solvent, slight	Slight	
	11		--	0	None	None	
SB-58	4	14	PCE, TCE	0	Slight	Moderate	3 to 6
	7		<MTCA	4.4	None	Moderate	
	13		<MTCA	7.5	None	None	
SB-59	3	14	--	--	None	Slight	3 to 7
	4		MC, PCE, VC	1.4	None	Slight	
	7		--	18	None	None	
	9		--	0	None	None	
SB-60	3.5	4.5	--	1634	Solvent, strong	Heavy	2 to >4.5 (10)
	4		MC, PCE, TCE, GRO	1562	Solvent, strong	Heavy	
SB-61	4	10.5	<MTCA	0	--	--	None
	7		<MTCA	0	None	None	
SB-62	3	23	--	--	Moderate	Heavy	2 to 21
	4		B, MC, PCE, TCE, VC, GRO	37.5	Moderate	Heavy	
	11.5		B, MC, VC	230	Moderate	Heavy	
	17		B, MC	1510	Strong	Heavy	
	20		VC	0	None	Subtle	
SB-63	3.5	5.5	MC, PCE, TCE, GRO	358	PCE, strong	Heavy	3 to >5.5 (15)
	5		MC, PCE, TCE, VC	>2,000	PCE, strong	Heavy	
SB-64	7	10.5	<MTCA	0	None	None	None
SB-65	4	5.0	<MTCA	0	None	None	None
SB-66	3.5	4.5	<MTCA	0	None	None	None
SB-67	1	4.5	--	5.3	None	None	None
	3		<MTCA	0	None	None	
SB-68	4	4.5	PCE, TCE	0	None	None	3 to >4.5 (5)
SB-69	2.5	16	--	1.2	None	--	None
	3		<MTCA	0.6	Petroleum, weak	None	
	5.5		--	133	None	None	
	6.5		--	1.6	None	None	
SB-70	4	12	<MTCA	133	Petroleum, weak	None	None
	6		--	1.6	None	--	
SB-71	3.5	12	GRO	33.7	Petroleum, weak	None	3.5 to 5
SB-72	3.5	12	<MTCA	0	Petroleum, weak	None	None
SB-73	3.5	12	<MTCA	0.2	None	None	None
	8.5		--	48.3	None	--	
SB-74	3.5	8	GRO	0.9	Very weak	None	3.5 to 5
SB-75	6.5	12	<MTCA	0.2	Petroleum, moderate	Moderate to heavy	None
	7		--	0	Petroleum, weak	None	

Table 4-4
Estimated Depth Range of Soil Contamination Based on MTCA CUL Exceedances
Most Western Laundry Site

Boring/ Well	Depth to Top of Soil Sample (ft bgs)	Total Boring Depth (ft bgs)	MTCA Exceedances[1]	PID Reading (ppm)	Odor Description	Sheen Description	Estimated Depth Range of Contamination, Top to Bottom (ft bgs)[2]
MW-1	4	14	<MTCA	--	None	None	None
MW-2	4	11	<MTCA	0	None	None	None
MW-3	4	15.5	B	--	Moderate	Heavy	3 to 10
	9		B	--	Subtle	Slight	
	10		--	--	None	None	
MW-4	4	10.5	<MTCA	--	None	Subtle	None
	6		--	--	None	None	
MW-5	5	33	<MTCA	--	None	None	None
	20		<MTCA	--	None	None	
MW-6	3	12	<MTCA	0	None	None	None
MW-7	1.5	18	<MTCA	--	--	--	2.5 to >18 (24)
	4		PCE, TCE, GRO	1353	Solvent, strong	Heavy	
	9		DCE, MC, PCE, TCE, VC, GRO	>1,900	Solvent, strong	Heavy	
	12		B, MC, VC	1544	None	None	
	18		--	1602	None	None	
MW-8	5	10.5	<MTCA	0	None	None	None
MW-9	3	10.5	--	--	Solvent, slight	Subtle	None
	4		<MTCA	25.7	Slight	Slight	
	6		--	9.4	None	Subtle	
MW-10	4	19	<MTCA	0.4	Hydrocarbon, moderate	None	None
	8		--	0.5	None	--	

Notes:
Field indicators were used to supplement analytical data to estimate depth ranges of contaminant MTCA exceedances.
1: Substances listed refer to exceedances of MTCA Method A/B soil CULs; <MTCA = all results are less than MTCA CULs
2: For borings with contamination extending below base, number in parentheses represents estimate of bottom depth
3: Boring SB-45 appears to be uncontaminated from 5 to 12 feet, and very weakly contaminated at about 12 to 13 feet; PCE slightly exceeds the MTCA CUL in SB-45-12, but this zone is considered as de minimis contamination in this RI/FS.
ft bgs = feet below ground surface
PID = Photo-ionization detector (ppm = parts per million)
B = Benzene
DCE = cis-1,2-Dichloroethene
MC = Methylene chloride (Dichloromethane)
PCE = Tetrachloroethene
TCE = Trichloroethene
VC = Vinyl chloride
GRO = Gasoline-range organics
DRO = Diesel-range organics
HRO = Heavy oil-range organics
-- = No data available
In addition, pre-RI samples have the following approximate depth ranges for chlorinated VOC contaminant exceedances:
- BH-2: 0 to >5 ft bgs
- BH-6: 1 to 2 ft bgs
- BH-8: 1 to 2 ft bgs
- BH-10: 0 to >5 ft bgs
- BH-11: 0 to >5 ft bgs
- BH-12: 1 to >5 ft bgs

Table 4-5
Vapor Intrusion Modeling Results
Most Western Laundry Site

Monitoring Well	MWL Groundwater Sample Concentrations (µg/L)															
	Benzene Groundwater Concentration		PCE Groundwater Concentration		TCE Groundwater Concentration		Vinyl Chloride Groundwater Concentration		Methylene Chloride Groundwater Concentration		cis-1,2-DCE Groundwater Concentration		trans-1,2-DCE Groundwater Concentration		1,2-Dichloropropane Groundwater Concentration	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
MW-1	0.14 U	0.2 U	0.13 U	**0.31**	0.14 U	**0.23**	0.2 U	**2.9**	0.2 U	0.5 U	**0.6**	**5.1**	0.15 U	0.2 U	0.14 U	0.2 U
MW-3	**1.0**	**18**	**0.75**	**15**	**0.62**	**2.1**	**4.4**	**820**	0.2 U	**1.0**	**2.9**	**1600**	0.2 U	**1.2**	0.14 U	0.70 U
MW-6	0.2 U	**0.15**	**0.78**	**4.2**	**0.15**	**8.7**	**0.22**	**0.6**	0.2 U	0.5 U	**0.49**	**9.7**	0.15 U	0.2 U	0.14 U	0.2 U
MW-7	20 U	28 U	**39,000**	**97,000**	**11,000**	**23,000**	**2,000**	**10,000**	**44**	**100**	**20,000**	**73,000**	**170**	**220**	20 U	**44**
MW-8	0.14 U	0.2 U	**0.4**	**54**	0.2 U	**1.6**	0.2 U	**0.22**	0.2 U	0.5 U	0.2 U	**2.1**	0.15 U	0.2 U	0.14 U	0.2 U
Vapor Intrusion GW Screening Levels (µg/L):	*2.4*		*1.0*		*0.42*		*0.35*		*94*		*160*		*130*		*28*	

Monitoring Well	Modeled Indoor Air Concentrations (µg/m³) Calculated from Groundwater Concentrations															
	Benzene Indoor Air Concentration		PCE Indoor Air Concentration		TCE Indoor Air Concentration		Vinyl Chloride Indoor Air Concentration		Methylene Chloride Indoor Air Concentration		cis-1,2-DCE Indoor Air Concentration		trans-1,2-DCE Indoor Air Concentration		1,2-Dichloropropane Indoor Air Concentration	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
MW-1	0.0020	0.0028	0.0043	0.021	0.0031	0.010	0.018	0.52	--	--	--	--	--	--	--	--
MW-3	0.028	0.50	0.049	0.99	0.027	0.092	0.77	144	--	--	0.056	31	--	--	--	--
MW-6	0.007	0.011	0.14	0.76	0.018	1.03	0.10	0.29	0.0036	0.0090	0.024	0.47	0.0080	0.011	0.0023	0.0033
MW-7	0.71	0.99	6,948	17,282	1,268	2,651	928	4,640	1.5	3.5	941	3,433	18	23	0.33	1.4
MW-8	0.0050	0.007	0.071	9.64	0.012	0.18	0.046	0.10	0.0035	0.0087	0.0047	0.10	0.0078	0.010	0.0023	0.0033
Method B Indoor Air CULs (µg/m³):	*0.32*		*0.42*		*0.10*		*0.28*		*5.3*		*16*		*32*		*1.8*	

Monitoring Well	Modeled Site-Specific Groundwater Concentrations (µg/L) Protective of Vapor Intrusion Pathway							
	Benzene Groundwater Concentration	PCE Groundwater Concentration	TCE Groundwater Concentration	Vinyl Chloride Groundwater Concentration	Methylene Chloride Groundwater Concentration	cis-1,2-DCE Groundwater Concentration	trans-1,2-DCE Groundwater Concentration	1,2-Dichloropropane Groundwater Concentration
MW-1	11	6.3	2.3	1.6	--	--	--	--
MW-3	11	6.4	2.3	1.6	--	825	--	--
MW-6	4.4	2.3	0.85	0.59	148	331	299	54
MW-7	4.5	2.4	0.87	0.60	152	340	307	55
MW-8	4.5	2.4	0.87	0.60	151	339	306	55
MTCA Method A Groundwater CULs (µg/L):	*5.0*	*5.0*	*5.0*	*0.20*	*5.0*	*NA*	*NA*	*NA*
GW Concentration Most Protective of VI (µg/L):	*4.4*	*2.3*	*0.85*	*0.59*	*148*	*331*	*299*	*54*
Selected Groundwater CULs for MWL (µg/L):	*4.4*	*2.3*	*0.85*	*0.20*	*5.0*	*331*	*299*	*54*

Yellow highlighted cells are those that exceed groundwater screening levels or indoor air cleanup levels
Vapor intrusion groundwater screening levels and indoor air cleanup levels are from Ecology (2009).
For nondetected values, half the detection limit was utilized as input to the model.
-- = Not modeled (not necessary to determine most protective cleanup levels)
GW = Groundwater; NA = Not applicable; VI = Vapor intrusion
Groundwater data have not undergone third-party validation.

Table 4-6
Groundwater and Surface Water Analytical Data
Most Western Laundry Site

Location/Sample	Sampling Date	Benzene	cis-1,2-Dichloroethene (cis-1,2-DCE)	trans-1,2-Dichloroethene (trans-1,2-DCE)	1,2-Dichloropropane	Methylene Chloride (Dichloromethane)	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	TPH - Gasoline Range	TPH - Diesel Range	TPH - Heavy Oil Range
Groundwater Samples (µg/L):												
SB-3-GW	4/5/2007	**0.32**	**56**	**0.31**	0.14 U	0.20 U	**2.5**	**2.0**	**11**	--	--	--
SB-5-GW	4/5/2007	**2.7**	**1.5**	0.15 U	0.14 U	0.20 U	**3.7**	**0.49**	**1.8**	**66**	**20,000**	**54,000**
SB-17-GW	4/3/2007	**0.72**	**0.25**	0.15 U	**0.15**	0.20 U	0.13 U	0.14 U	**1.3**	--	--	--
SB-19-GW	4/3/2007	**0.31**	**0.70**	0.15 U	**0.20**	0.20 U	0.13 U	0.14 U	**2.2**	--	--	--
SB-37-GW	4/4/2007	**0.29**	**0.47**	0.15 U	0.14 U	0.20 U	**3.0**	**0.3**	*0.4 U*	--	--	--
SB-46-GW	4/5/2007	**2.1**	**3,300**	**2.6**	1.4 U	**2.5**	**69**	**21**	**4,100**	**300**	**40,000**	**50,000**
MW-1	5/2/2007	0.14 U	**5.1**	0.15 U	0.14 U	0.20 U	**0.31**	0.14 U	**2.9**	--	--	--
MW-1	6/27/2007	0.14 U	**1.1**	0.15 U	0.14 U	0.20 U	0.13 U	**0.23**	**0.45**	--	--	--
MW-1	10/21/2009	0.2 U	**0.6**	0.2 U	0.2 U	0.5 U	**0.30**	0.2 U	0.2 U	--	--	--
MW-2	5/2/2007	**0.55**	**7.9**	0.15 U	**0.25**	0.20 U	0.13 U	0.14 U	**17**	--	--	--
MW-2	6/27/2007	**0.65**	**11**	0.15 U	**0.28**	0.20 U	0.13 U	0.14 U	**19**	--	--	--
MW-2	10/21/2009	**0.20**	**2.1**	0.2 U	**0.20**	0.5 U	**0.20**	0.2 U	**3.1**	--	--	--
MW-3	5/2/2007	**2.6**	**97**	**0.19**	0.14 U	0.20 U	**4.6**	**0.62**	**110**	**71**	**38**	21 U
Dup 1 (MW-3)	5/2/2007	**3.1**	**140**	**0.23**	0.14 U	0.20 U	**4.3**	**0.75**	**130**	--	--	--
MW-3	6/27/2007	**18**	**1,600**	**1.2**	*0.70 U*	**1.0**	**0.75**	**2.1**	**820**	**590**	**42**	**61**
MW-3	10/21/2009	**1.2**	**2.9**	0.2 U	0.2 U	0.5 U	**14**	**1.1**	**4.4**	250 U	**3,800**	**1,400**
Dup 1 (MW-3)	10/21/2009	**1.0**	**2.9**	0.2 U	0.2 U	0.5 U	**15**	**1.1**	**4.5**	250 U	**3,900**	**1,300**
MW-4	5/2/2007	0.28 U	**920**	**9.4**	0.28 U	**0.60**	**460**	**540**	**11**	--	--	--
MW-4	6/27/2007	**0.32**	**540**	**2.0**	0.28 U	**0.42**	**20**	**100**	**160**	--	--	--
MW-4	10/21/2009	0.2 U	**73**	**0.7**	0.2 U	0.5 U	**96**	**93**	**0.20**	--	--	--
MW-5	5/2/2007	0.14 U	0.12 U	0.15 U	0.14 U	0.20 U	0.13 U	0.14 U	0.042 U	250 U	*630 U*	*630 U*
MW-5	6/27/2007	0.14 U	0.12 U	0.15 U	0.14 U	0.20 U	0.13 U	0.14 U	**0.060**	**18**	**20**	**60**
MW-5	10/21/2009	0.2 U	0.2 U	0.2 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	--	--	--
MW-6	6/27/2007	**0.15**	**0.49**	0.15 U	0.14 U	0.20 U	**0.78**	**0.15**	**0.22**	--	--	--
MW-6	10/20/2009	0.2 U	**9.7**	0.2 U	0.2 U	0.5 U	**4.2**	**8.7**	**0.60**	--	--	--
MW-7	6/27/2007	*68 U*	**63,000**	**200**	*70 U*	**100**	**39,000**	**11,000**	**8,300**	**22,000**	**57**	**61**
Dup-1 (MW-7)	6/27/2007	*28 U*	**73,000**	**220**	**44**	**44**	**41,000**	**12,000**	**10,000**	**27,000**	**51**	**63**
MW-7	10/22/2009	*20 U*	**20,000**	**170**	*20 U*	*50 U*	**97,000**	**23,000**	**2,000**	**55,000**	**1,300**	**510**
MW-8	6/27/2007	0.14 U	**2.1**	0.15 U	0.14 U	0.20 U	**54**	**1.6**	**0.22**	--	--	--
MW-8	10/21/2009	0.2 U	0.2 U	0.2 U	0.2 U	0.5 U	**0.4**	0.2 U	0.2 U	--	--	--
MW-9	6/27/2007	0.14 U	**0.14**	0.15 U	0.14 U	0.20 U	**6.5**	0.14 U	0.042 U	--	--	--
MW-9	10/21/2009	0.2 U	0.2 U	0.2 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	--	--	--
MW-10	10/22/2009	0.2 U	0.2 U	0.2 U	0.2 U	0.5 U	**0.8**	**0.20**	0.2 U	250 U	**370**	500 U
Surface Water Sample (µg/L):												
Outfall 15th St*	6/15/2007	0.14 U	**4.7**	0.15 U	0.14 U	0.20 U	0.13 U	0.14 U	**0.31**	--	--	--
MTCA Method A CUL (µg/L)		**5**	**--**	**--**	**--**	**5**	**5**	**5**	**0.2**	**800**	**500**	**500**
GW VI Protection (µg/L)		**4.4**	**331**	**299**	**54**	**148**	**2.3**	**0.85**	**0.59**	**--**	**--**	**--**
Selected CUL for MWL (µg/L)		**4.4**	**331**	**299**	**54**	**5**	**2.3**	**0.85**	**0.2**	**800**	**500**	**500**

All results are presented in µg/L (ppb)
Groundwater data have not undergone third-party validation.
Yellow highlighted detections are those values exceeding the selected MTCA cleanup levels.
Italicized non-detected values are those detection limits or reporting limits that exceed the selected MTCA cleanup levels.
Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.
U = Not detected at or above the reporting limit.
-- = Not analyzed or not applicable
The first six samples listed (SB-) were collected from temporary geoprobe well screens.
* Surface water sample collected at the regional storm drain outfall on the Hoquiam River at 15th Street; the results do not exceed any marine surface water criteria or MTCA Method B CULs (VC CUL = 3.7 ug/L, no criteria for cis-1,2-DCE).
Trans-1,2-DCE and 1,2-dichloropropane concentrations in some wells exceeded MTCA Method B cleanup levels, thus passing the initial screening for COCs at the site. Concentrations of these chemicals do not exceed the groundwater vapor intrusion levels; therefore, these two chemicals have been excluded from further consideration in the RI/FS report.

Table 5-1
Cleanup Levels in Soil and Groundwater
Most Western Laundry Site

Hazardous Substance	Soil (mg/kg)		Groundwater (µg/L)	
	MTCA Method A Soil CUL	MTCA Method B Soil CUL	MTCA Method A Groundwater CUL	Vapor Intrusion Protection for Groundwater
Tetrachloroethene (PCE)	0.05	1.9	5	2.3
Trichloroethene (TCE)	0.03	11	5	0.85
cis-1,2-Dichloroethene	--	800	--	331
trans-1,2-Dichloroethene	NA		--	299*
Vinyl chloride	--	0.67	0.2	0.59
Methylene chloride	0.02	130	5	148
1,2-Dichloropropane	NA		--	54*
Benzene	0.03	18	5	4.4
1,4-Dichlorobenzene	--	42	NA	
Naphthalene	5	1600	NA	
TPH: gasoline-range	30	--	800	--
TPH: diesel-range	2,000	--	500	--
TPH: heavy oil-range	2,000	--	500	--

TPH = Total Petroleum Hydrocarbons

NA = Not considered as COCs in that medium (no exceedances)

-- = No cleanup level promulgated

* These VI Protection cleanup levels for groundwater are higher than maximum site and are not carried forward as COCs in this FS.

Underlined cleanup levels are those utilized going forward in the FS report.

Table 6-1
Screening of Cleanup Alternative Components

Cleanup Action Category	Cleanup Alternative Component	Description of Action	Effectiveness	Implementability	Relative Cost		Alternative Selection Screening Comment
					Capital	O&M	
No Action	None	None	Does not reduce contaminant exposures except by natural attenuation processes (not monitored)	No implementation	Zero	Zero	Rejected – protectiveness
Institutional Controls/ Access Restrictions	Physical access controls	Use of signs or security measures to limit or prevent public access	Limits direct contact with surface soils for short-term uses only	Readily implemented	Low	Low	Rejected – effectiveness and protectiveness
	Deed restrictions	Covenants to limit conveyance of property and the types of land uses and construction allowed at the site	Minimizes disturbance and direct contact with subsurface contamination	Readily implemented	Low	Low	Retained
	Groundwater monitoring	Use of wells to monitor contaminant concentrations and groundwater quality over time	Effective in determining residual contaminant levels after remedial measures implemented	Readily implemented	Low	Low	Retained
Containment	Subsurface vapor barrier	Vapor barrier placed in shallow excavation extending over entire contaminated area	Effective when properly placed; effectiveness diminished by future subsurface construction or utility repair/upgrade	Readily implemented on property with concrete slab removal; difficult to implement elsewhere	Moderate	Low	Rejected – effectiveness and implementability
Removal/ Excavation	Deep soil excavation	Remove soil to 25 feet bgs using large-diameter augers	Effective for permanent removal of soil contamination from the deep “hot spot” on site; minimizes amount of dewatering	Readily implemented in saturated zone (especially deep) soils and in areas without utilities	High	Zero	Retained
	Shallow soil excavation	Excavate soil <10 feet deep using standard excavation techniques	Effective for permanent removal of more shallow soil contamination from the site	Readily implemented in areas without utilities	Moderate	Zero	Retained
	Excavation dewatering	Collect water from excavation and pre-treat by filtration or sedimentation	Effective for controlling water in excavation into saturated soils of moderate permeability	Readily implemented	Moderate	Moderate	Retained

Table 6-1
Screening of Cleanup Alternative Components

Cleanup Action Category	Cleanup Alternative Component	Description of Action	Effectiveness	Implementability	Relative Cost		Alternative Selection Screening Comment
					Capital	O&M	
On-Site Treatment/ In-Situ Treatment	Soil vapor extraction	Removal of volatile contaminants from the vadose zone by vacuum-induced air flow	Marginal effectiveness in thin vadose zone contaminated areas interspersed with concrete slabs, bricks, and heterogeneous soil	Readily implemented in shallow vadose zone	Moderate	Low	Rejected – effectiveness
	Air sparging	Removal of volatile contaminants from the saturated zone by air injection into the aquifer and collection of vapors by soil vapor extraction	Moderate to poor effectiveness in organic-rich silty soils at MWL due to permeability; same problems with soil vapor extraction as above	Readily implemented	Moderate	Low	Rejected – effectiveness
	Biostimulation and bioaug-mentation	Injection of electron donor solutions into aquifer to promote in-situ degradation by anaerobic reductive dechlorination pathway	Moderate to good effectiveness anticipated based upon evidence of past anaerobic reductive dechlorination, likely fueled by petroleum hydrocarbons present	Readily implemented; injection volumes and radii of influence are critical to good distribution	Moderate	Low	Retained
	In-situ chemical oxidation	Injection of oxidant chemicals into aquifer to promote in-situ chemical oxidation; may also be placed at margins of excavation as a polishing step	Effective in reducing organic contaminant concentrations but requires multiple chemical injections in high-concentration areas; excessive oxidant demand required due to high natural organic content prevalent at MWL (Section 3.1.3)	Readily implemented; injection volumes and radii of influence are critical to good distribution; silty units at MWL may limit distribution	Moderate	Very high (chemical costs for full imple-mentation)	Retained, but only as a localized polishing step

Table 6-1
Screening of Cleanup Alternative Components

Cleanup Action Category	Cleanup Alternative Component	Description of Action	Effectiveness	Implementability	Relative Cost		Alternative Selection Screening Comment
					Capital	O&M	
On-Site Treatment/ In-Situ Treatment	Electrical resistance heating	In-situ heating of vadose and saturated zone soil to near boiling to mobilize volatile contaminants, which are subsequently captured by vacuum extraction and treated	Highly effective for volatile contaminant mobilization and removal; excellent technology for in-situ high-concentration source treatment; applicable to MWL silty soils	Readily implemented; requires significant electrical power on site	High	High	Retained
	Monitored natural attenuation	Attenuation of groundwater contaminants by natural processes of biodegradation, adsorption, dispersion, and dilution	Moderately effective for degradable contaminants, however degradation typically occurs over a long time frame	Readily implemented	Low	Low	Retained
	Activated carbon filtration	Treatment of contaminated vapors from soil vapor extraction, air sparging, electrical resistance heating, or contaminated groundwater from dewatering by adsorption onto activated carbon	Highly effective treatment for volatiles present in air or water media collected from the subsurface	Readily implemented; requires monitoring for contaminant breakthrough and change out when carbon is spent	Moderate	Moderate	Retained

Table 7-1
Development of Cleanup Alternatives

Action	ALTERNATIVE 1 Complete Soil Removal, Biostimulation and MNA	ALTERNATIVE 2 Significant Soil Removal, Biostimulation and MNA	ALTERNATIVE 3 ERH, Biostimulation and MNA
Implement institutional controls	●	●	●
Reroute/support/shield subsurface utilities	●		●
Excavate deep soil by large-diameter augers	●	●	
Excavate soil (<10 ft bgs) by standard methods	●	●	
Excavate only shallow soil in utility areas		●	
Mitigate vapor emissions from excavated soil	●	●	
Excavation dewatering and treatment	●	●	
Off-site disposal of excavated soil	●	●	
Implement biostimulation/bioaugmentation for saturated soil and groundwater		●	
Implement biostimulation/bioaugmentation for groundwater only	●		●
Implement ERH with off-gas treatment			●
Implement natural attenuation	●	●	●
Restore site	●	●	●
Implement groundwater monitoring	●	●	●

MNA = monitored natural attenuation
ERH = electrical resistance heating

Table 7-2
Hazardous Waste Treatment Standards and MWL Exceedances

Hazardous Waste (EPA F001 or F002)	LDR Treatment Standards (mg/kg) (40 CFR 268.40)	10x LDR Treatment Standards for Soil (mg/kg) (40 CFR 268.49)	MWL Soil Sample Exceedances of 10x LDR Treatment Standards
Tetrachloroethylene (PCE)	6.0	60	15 total exceedances; maximum = 8,300 mg/kg (SB-26-0, -2, -10, -17, -23; SB-27-0; SB-40-2, -4; SB-47-0; SB-60-4; SB-63-3.5, -5; MW-7-9)
Trichloroethylene (TCE)	6.0	60	5 exceedances; maximum = 560 mg/kg (SB-26-10, -17; SB-63-3.5, -5; MW-7-9)
Vinyl chloride	6.0	60	1 exceedance; maximum = 70 mg/kg (MW-7-9)
Methylene chloride	30	300	no exceedances; maximum = 13 mg/kg

Estimated exceedance depth ranges for 10x LDR treatment standards include: SB-26 (0 to 23.5 ft), SB-27 (0 to 7 ft), SB-40 (1 to 5 ft), SB-47 (0 to >1 ft), SB-60 (2 to >4.5 ft), SB-63 (3 to >5.5 ft), MW-7 (7 to 11 ft), BH-10 (0 to >5 ft), BH-11 (0 to >5 ft); in addition, sample results below but close to 10x LDR treatment standards include: SB-34 (0 to 2 ft), SB-62 (4 to 12 ft).

Table 7-3
Approximate Restoration Time Frames for Groundwater

Hazardous Substance	Max Concentration in Groundwater (µg/L)	Groundwater CUL (µg/L)	Half-life, t½ (years)	Number of Halves to CUL	Restoration Time (CUL attained) (years)
MNA Conditions:					
PCE	96	2.3	2.6	5.4	14
TCE	93	0.85	2.1	6.8	14
cis-1,2-DCE	73	331	2.3	NA	NA
Vinyl chloride	3.1	0.2	0.2	4.0	2.3
Biostimulation Conditions:					
PCE	96	2.3	0.51	5.4	2.75
TCE	93	0.85	0.43	6.8	2.9
cis-1,2-DCE	73	331	0.46	NA	NA
Vinyl chloride	3.1	0.2	0.12	4.0	0.5

Table 8-1
Comparison of Cleanup Alternatives

Evaluation Factor	ALTERNATIVE 1 Complete Soil Removal, Biostimulation and MNA	ALTERNATIVE 2 Significant Soil Removal, Biostimulation and MNA	ALTERNATIVE 3 Electrical Resistance Heating, Biostimulation and MNA
Protectiveness	• Moderate to high degree of risk reduction due to elimination of risk through source removal and active groundwater treatment Short time frame for risk reduction: source removal and groundwater treatment implementation possible in 3 months; remedial objectives for soil met immediately upon completion • Moderate probability of additional short-term risks (exposure to contaminated soils, vapors, and offsite transport) due to implementation • High degree of environmental quality improvement due to elimination of risk	• High degree of risk reduction due to elimination of risk through source removal and active groundwater treatment • Short time frame for risk reduction: source removal and groundwater treatment implementation possible in 3 months; remedial objectives for soil met immediately upon completion • Moderate probability of additional short-term risks (exposure to contaminated soils, vapors, and offsite transport) due to implementation • High degree of environmental quality improvement due to elimination of risk	• High degree of risk reduction due to elimination of risk through source removal and active groundwater treatment • Short time frame for risk reduction: source removal and groundwater treatment implementation possible in 1 year; remedial objectives for soil met immediately upon completion • Low probability of additional short-term risks due to implementation • High degree of environmental quality improvement due to elimination of risk
Permanence	• Hazardous substances in soil fully removed by excavation • Hazardous substances in groundwater treated by in-situ biostimulation • Elimination of future potential for contaminant release due to excavation and in-situ treatment • Does not include onsite waste treatment process for soils; therefore, no irreversibility and no treatment residuals related to soils • Onsite waste treatment process (biostimulation) for groundwater will result in complete irreversibility • Presence of treatment residuals dependent on completeness of biostimulation process	• Majority of hazardous substances in soil removed by excavation; remainder removed by in-situ biostimulation treatment • Hazardous substances in groundwater treated by in-situ biostimulation • Elimination of future potential for contaminant release due to excavation and in-situ treatment • Onsite waste treatment process (biostimulation) for soils and groundwater will result in complete irreversibility • Presence of treatment residuals dependent on completeness of biostimulation process with time	• Hazardous substances in soil removed by in-situ ERH thermal treatment • Hazardous substances in groundwater treated by in-situ biostimulation • Elimination of future potential for contaminant release due to in-situ treatment • Onsite waste treatment processes for soils and groundwater will result in complete irreversibility • Treatment residual from thermal treatment consists of activated carbon; recycled • Treatment residuals from biostimulation process dependent upon the completeness of the process with time
Cost	• $1,284,000 capital cost • $1,466,000 total cost, present worth @ 5%	• $1,212,000 capital cost • $1,394,000 total cost, present worth @ 5%	• $1,294,000 capital cost • $1,476,000 total cost, present worth @ 5%

Table 8-1
Comparison of Cleanup Alternatives

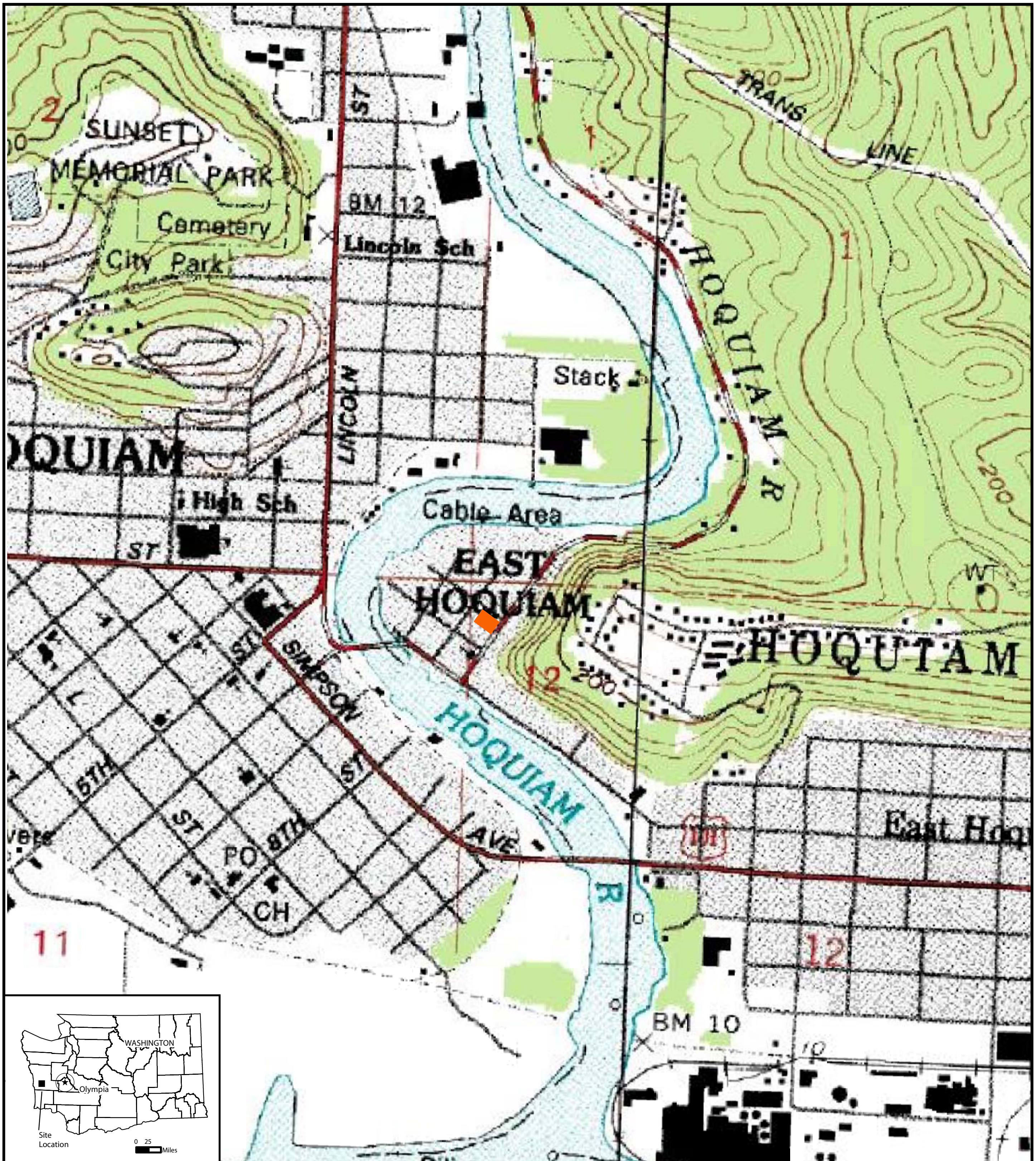
Evaluation Factor	ALTERNATIVE 1 Complete Soil Removal, Biostimulation and MNA	ALTERNATIVE 2 Significant Soil Removal, Biostimulation and MNA	ALTERNATIVE 3 Electrical Resistance Heating, Biostimulation and MNA
Long-Term Effectiveness	• High degree of certainty for success due to complete removal by excavation; some uncertainty arises from contaminated soil areas missed in excavation or LDABs; incomplete reaction by biostimulation can be remedied by additional biostimulation or bioaugmentation • Moderate to high degree of certainty for success of groundwater treatment by biostimulation • High degree of reliability due to contaminant removal • Low magnitude of residual risk due to source removal and in situ treatment of groundwater contamination • High degree of effectiveness in managing remaining groundwater wastes by biostimulation • Excellent degree of effectiveness for offsite disposal facility to contain soil wastes	• High degree of certainty for success due to removal by excavation or in-situ treatment; some uncertainty arises from contaminated soil areas missed in excavation or LDABs; incomplete reaction by biostimulation can be remedied by additional biostimulation or bioaugmentation • Moderate to high degree of certainty for success of groundwater treatment by biostimulation • High degree of reliability due to contaminant removal or treatment • Low magnitude of residual risk due to source removal and in-situ treatment of soils and groundwater • High degree of effectiveness in managing remaining groundwater waste by biostimulation process • Excellent degree of effectiveness for offsite disposal facility to contain soil wastes	• High degree of certainty for success due to contaminant removal by ERH; incomplete reaction by biostimulation can be remedied by additional biostimulation or bioaugmentation • Moderate to high degree of certainty for success of groundwater treatment by biostimulation • High degree of reliability due to contaminant removal or treatment • Low magnitude of residual risk due to source removal and in-situ treatment of groundwater • High degree of effectiveness in managing remaining groundwater waste by biostimulation process
Management of Short-Term Risks	• Moderate to high potential for short-term risks including worker exposures to contaminants in soil and air during soil excavation, especially highly disturbed soils from LDAB process • Moderate potential of short-term risks for nearby residential exposures to air contaminants generated by excavation • Moderate risk to public for offsite releases and traffic accidents during transport of excavated highly contaminated soils for disposal	• Moderate to high potential for short-term risks including worker exposures to contaminants in soil and air during soil excavation, especially highly disturbed soils from LDAB process • Moderate potential of short-term risks for nearby residential exposures to air contaminants generated by excavation • Moderate risk to public for offsite releases and traffic accidents during transport of excavated highly contaminated soils for disposal	• Low potential for short-term risk of worker exposure to soil contaminants, due to use of in-situ ERH process used for contaminated soil treatment • Low to moderate potential for risk of stray electrical current (site access control needed)

Table 8-1
Comparison of Cleanup Alternatives

Evaluation Factor	ALTERNATIVE 1 Complete Soil Removal, Biostimulation and MNA	ALTERNATIVE 2 Significant Soil Removal, Biostimulation and MNA	ALTERNATIVE 3 Electrical Resistance Heating, Biostimulation and MNA
Technical and Administrative Implementability	• High technical possibility, uses standard construction techniques; low probability of soil contamination left in place due to utility interferences • All offsite services are readily available • Expected to comply with all regulations will require UIC permit from Ecology for vegetable oil injections • Long-term monitoring of groundwater required for estimated period of 3 years • Access difficulties due to utilities; some re-rerouting will be required • Remedial action will require coordination with the City of Hoquiam for traffic issues and possible utility interference on 16th Street	• High technical possibility, uses standard construction techniques; moderate probability of soil contamination left in place due to utility interferences • All offsite services are readily available • Expected to comply with all regulations; will require UIC permit from Ecology for vegetable oil injections • Long-term monitoring of groundwater required for estimated period of 3 years • Access restrictions due to utilities; some re-rerouting might be considered • Remedial action will require coordination with the City of Hoquiam for traffic issues and possible utility interference on 16th Street	• High technical possibility, uses standard construction techniques and proven thermal treatment technology; low probability of soil contamination left in place due to in-situ treatment of “hot spot” area; moderate probability of soil contamination left in place due to utility interferences • All offsite services are readily available • Expected to comply with all regulations; will require UIC permit from Ecology for vegetable oil injections and an air standard exemption for discharge of treated vapors from the ERH system • Long-term monitoring of groundwater required for estimated period of 3 years • Access restrictions due to utilities; some re-rerouting might be considered • Remedial action will require coordination with the City of Hoquiam for traffic issues and possible utility interference on 16th Street
Consideration of Public Concerns	To be addressed after public comment period; anticipated public concerns would be significant due to impact of vapors, noise, heavy truck traffic, movement of highly contaminated soil, and likely utility interruption	To be addressed after public comment period; anticipated public concerns would be significant due to impact of vapors, noise, heavy truck traffic, and movement of highly contaminated soil	To be addressed after public comment period; anticipated public concerns would be low to moderate due to impact of significantly lesser amounts (compared to other alternatives) of vapors and noise, but possible added concerns of fencing the site to prevent access to electrical and thermal energy
Estimated Restoration Time Frame	Approximately 3 years from implementation of biostimulation for groundwater to meet CULs	Approximately 3 years from implementation of biostimulation for groundwater to meet CULs	Approximately 3 years from implementation of biostimulation for groundwater to meet CULs

Figures

X:\WA Ecology\MWL\projects\MWL_locationmap.mxd March 28, 2007



LEGEND

Former MWL Location

0 250 500 1,000 Feet

0 50 100 200 300 Meters

N W E S

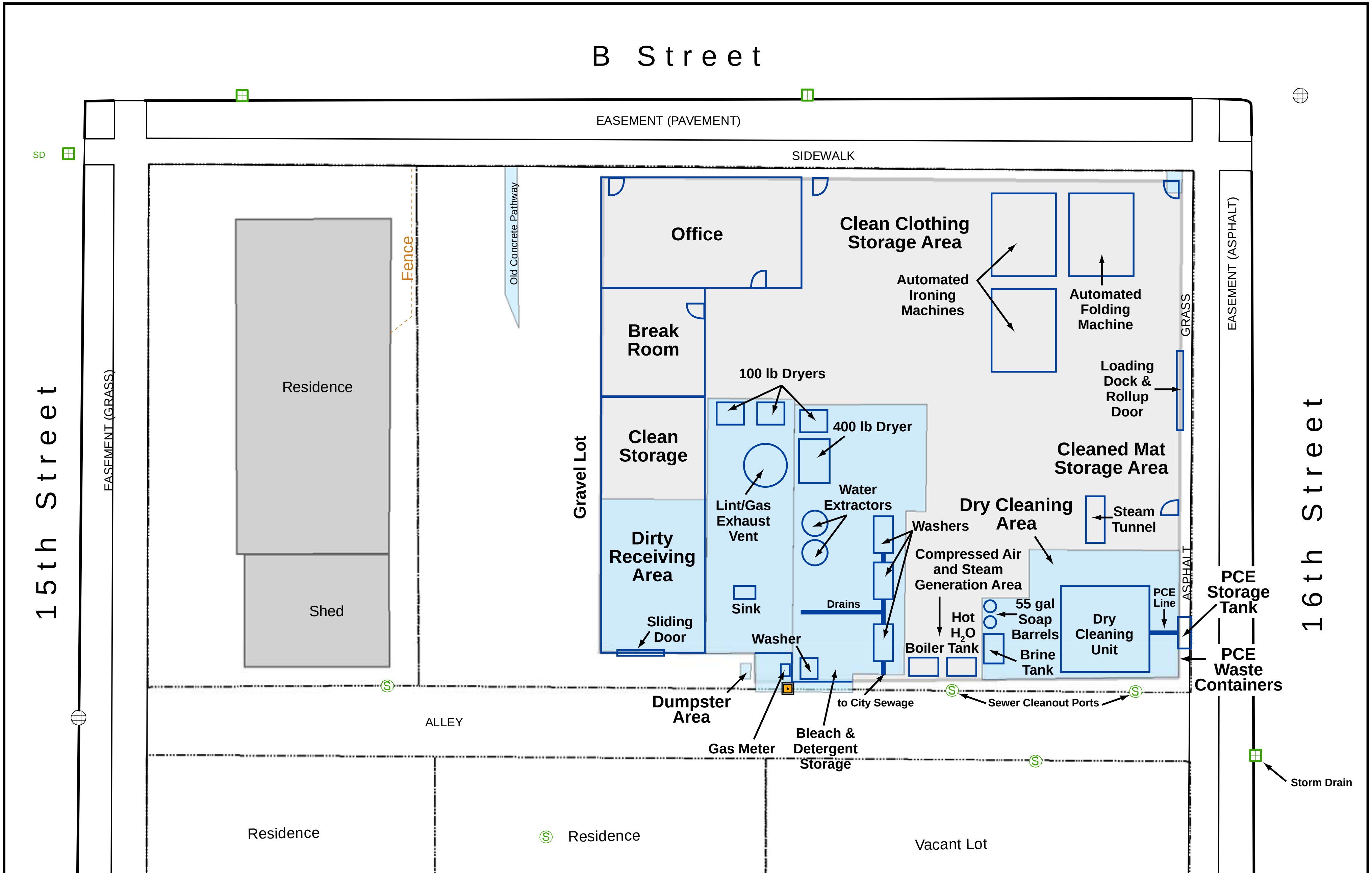
State Plane Washington South
Horizontal Datum: NAD 83

FIGURE 1–1
Location Map

Former Most Western Laundry
Hoquiam, Washington

DEPARTMENT OF ECOLOGY State of Washington

SAIC From Science to Solutions



LEGEND

- Facility Key Features (not to scale)
- Concrete Slab
- Former Laundry Building
- Residence; Shed
- Property Boundary
- Sewer Cleanout
- Storm Drain Catch Basin
- Sewer or Storm Drain Manhole
- Curb
- Sidewalk
- Fence
- Power Pole

FIGURE 1–2
Historical Laundry Facility Map

Compiled Primarily from:
- City of Hoquiam Fire Dept 1994
- URS 1992

N

0 5 10 20 Feet

0 2 4 8 Meters

DRAWING APPROXIMATELY TO SCALE

DEPARTMENT OF ECOLOGY State of Washington

SAIC From Science to Solutions

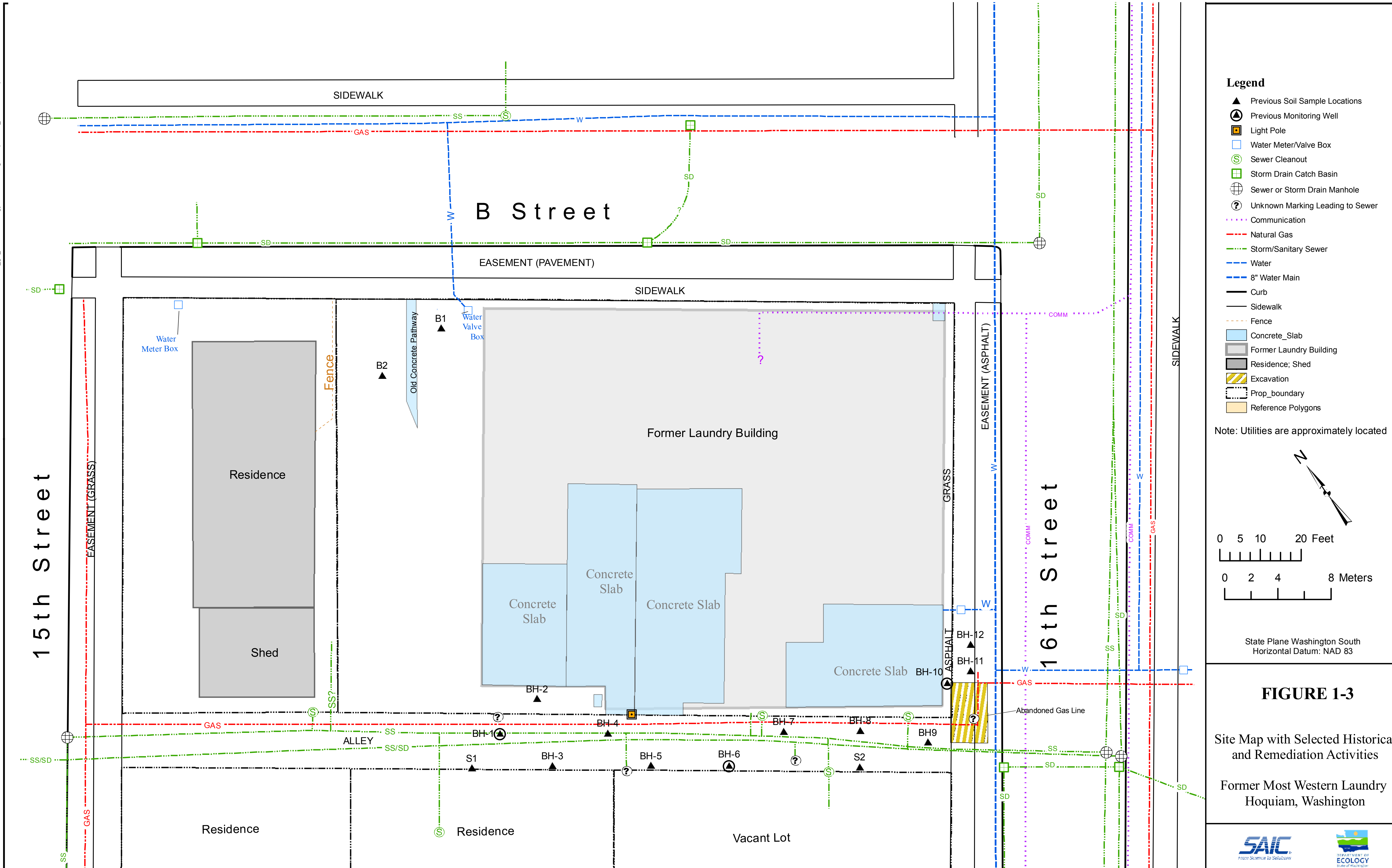


FIGURE 1-3

Site Map with Selected Historical and Remediation Activities

Former Most Western Laundry
Hoquiam, Washington

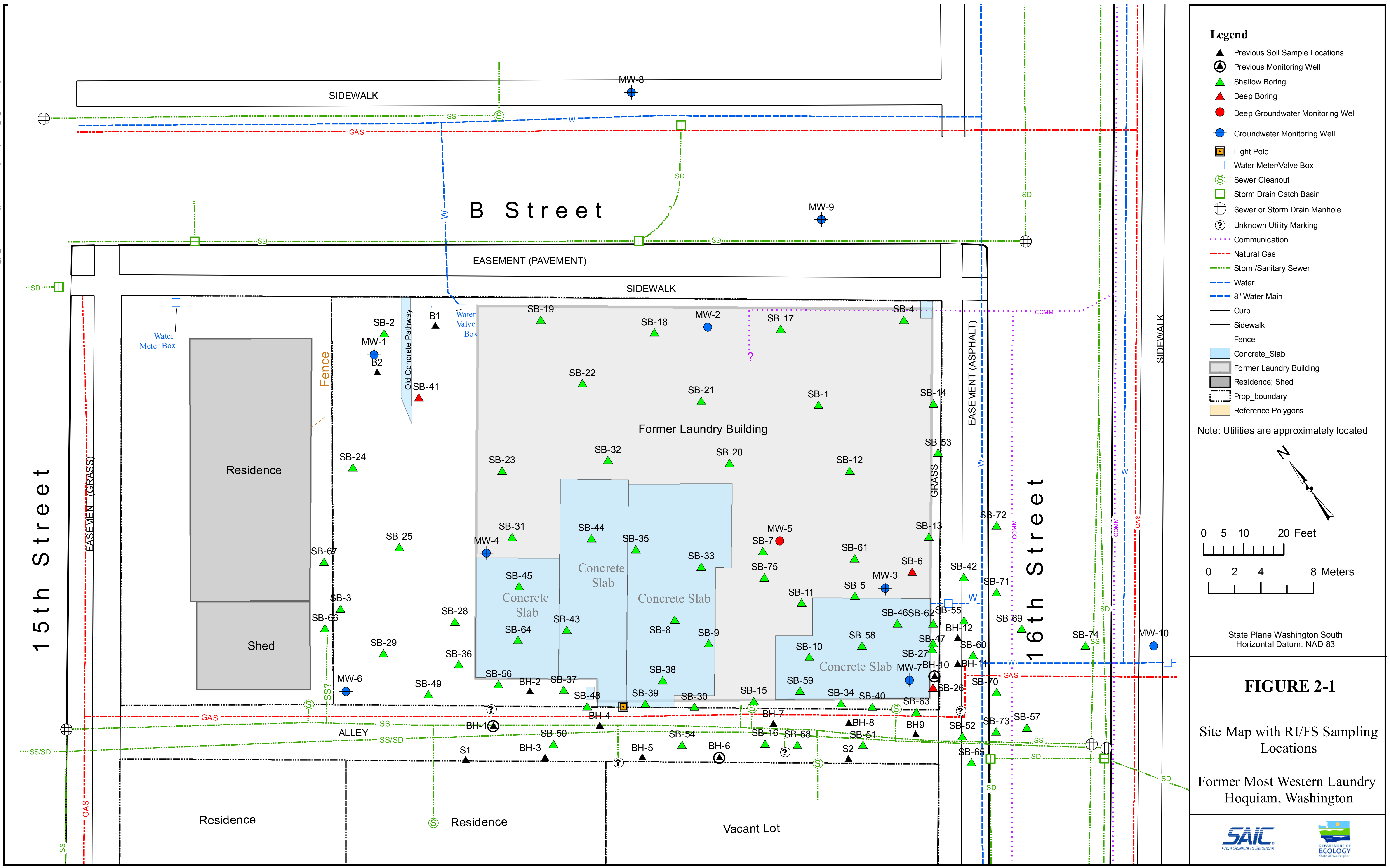


FIGURE 2-1

Site Map with RI/FS Sampling Locations

Former Most Western Laundry
Hoquiam, Washington

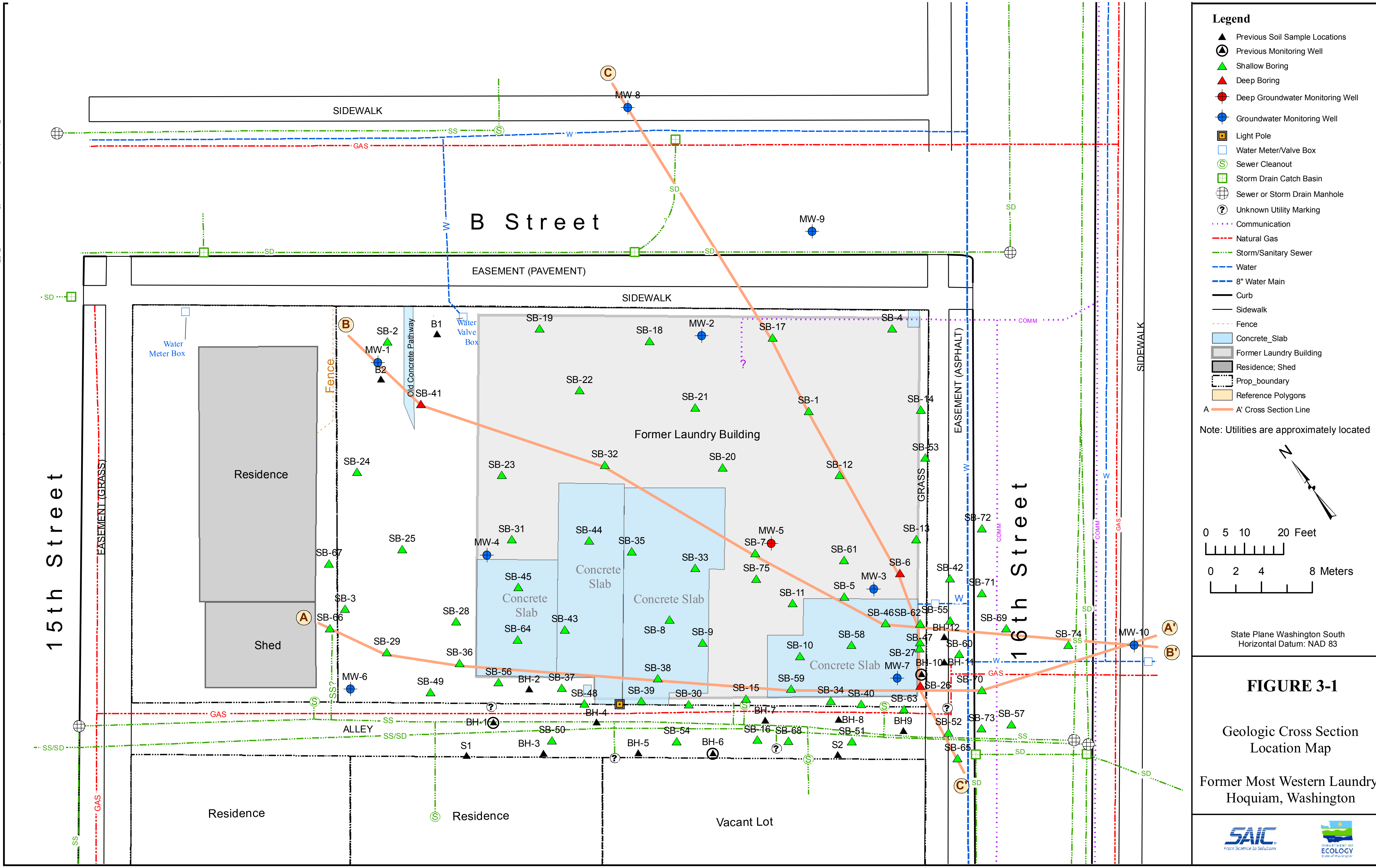
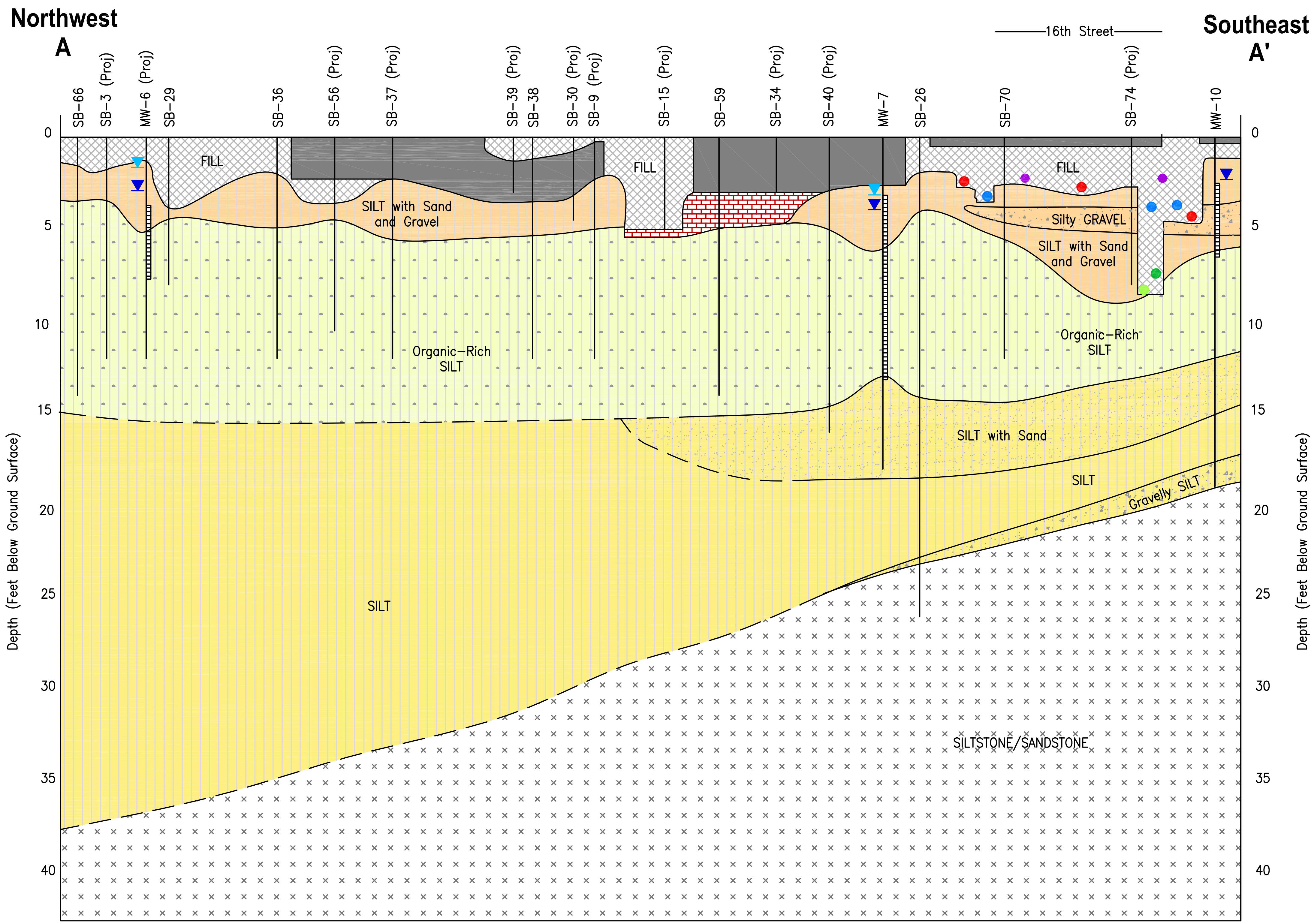


FIGURE 3-1

Geologic Cross Section Location Map

Former Most Western Laundry
Hoquiam, Washington



SOIL/ROCK CLASSIFICATION LEGEND:

LITHOLOGIC UNIT A

Concrete or Asphalt: Concrete slab from former Most Western Laundry facility and sidewalk and asphalt in street.

Brick Unit: Red brick under the former Most Western Laundry facility.

Fill: Brown, silty sand, sandy silt with gravel, or silty sandy crushed rock or road fill base. Local wood fragments, organic matter, and debris. Commonly with grassy topsoil near ground surface.

LITHOLOGIC UNIT B

Silt Unit: Brown to dark brown, soft to firm SILT with occasional sand and/or gravel (up to 20%). May also contain organic matter. A portion of this unit may be fill material.

Silty Gravel Unit: Dark gray to brownish-gray, dense, sandy GRAVEL with some silt, or greenish-gray hard SILT with gravel.

LITHOLOGIC UNIT C

Organic-Rich Silt Unit: Greenish-black, firm to stiff SILT with organics and wood debris.

Gravelly Silt Unit: Greenish-black, gravelly SILT with minor sand.

LITHOLOGIC UNIT D

Silt Unit: Greenish-black SILT with minor sand and/or gravel; locally interbedded with organic-rich silt.

Sand-Rich Silt Unit: Greenish-black SILT with approximately 12% to 40% sand and minor gravel. Local organic matter is also present.

Gravelly Silt Unit: Greenish-gray or black, hard SILT with gravel and local sand.

LITHOLOGIC UNIT E

Bedrock: Gray, green or brown SILTSTONE/SANDSTONE.

LEGEND:

— Boring

— Screened Interval

— Highest Recorded Groundwater Elevation

— Lowest or Only Recorded Groundwater Elevation

SUBSURFACE UTILITIES:

Water Line

Sanitary Sewer Line

Storm Drain Line

Communications Line

Natural Gas Line

0 10 20
Feet
Horizontal Scale 1" = 20'
Vertical Exaggeration 3:1 (1"= 6')

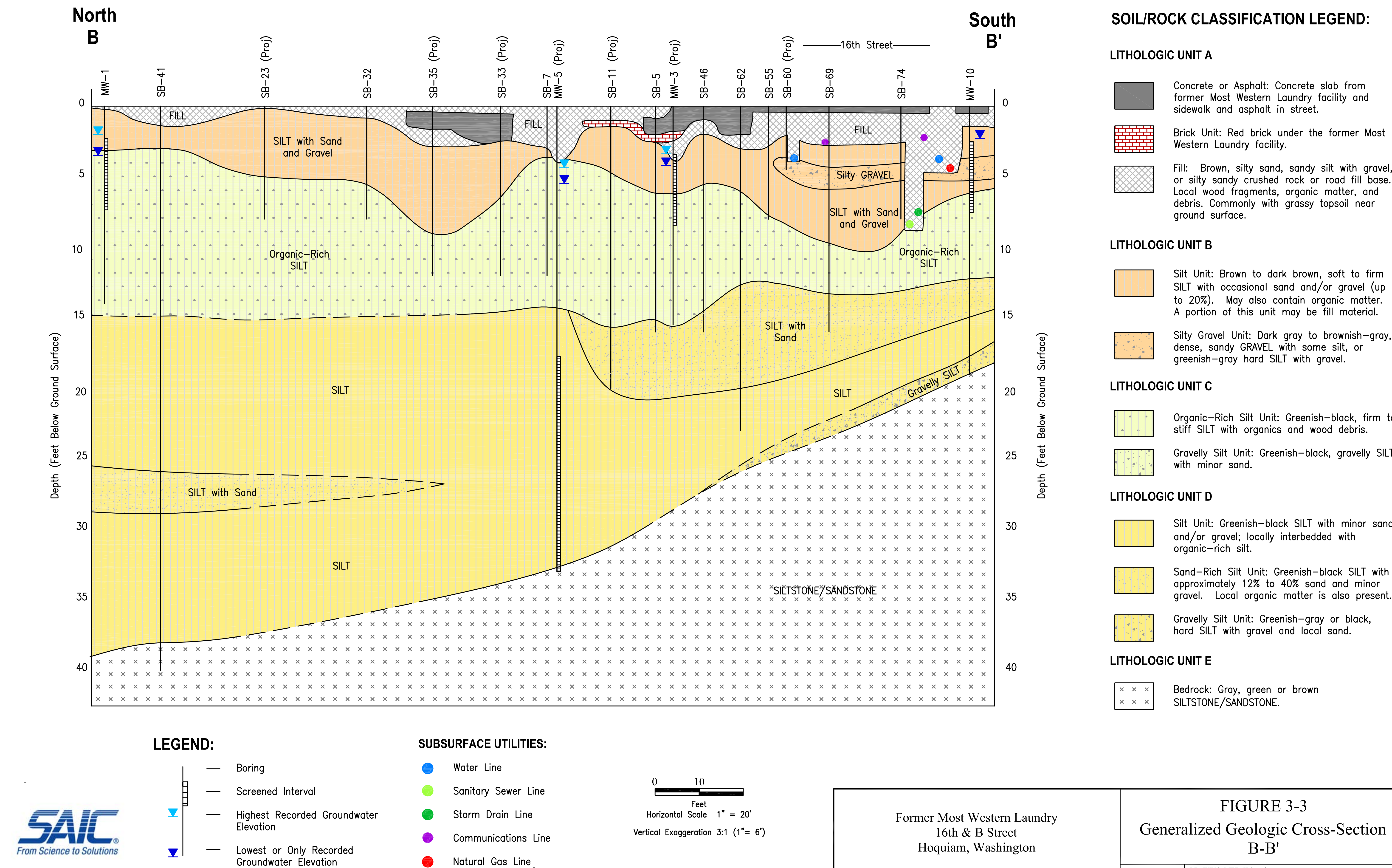
Drawn By H. Lee
Path: Bothell168-2k(Z:/Ecology/MWL/MWL_X-Sect.dwg

SAIC From Science to Solutions

Former Most Western Laundry
16th & B Street
Hoquiam, Washington

FIGURE 3-2
Generalized Geologic Cross-Section
A-A'

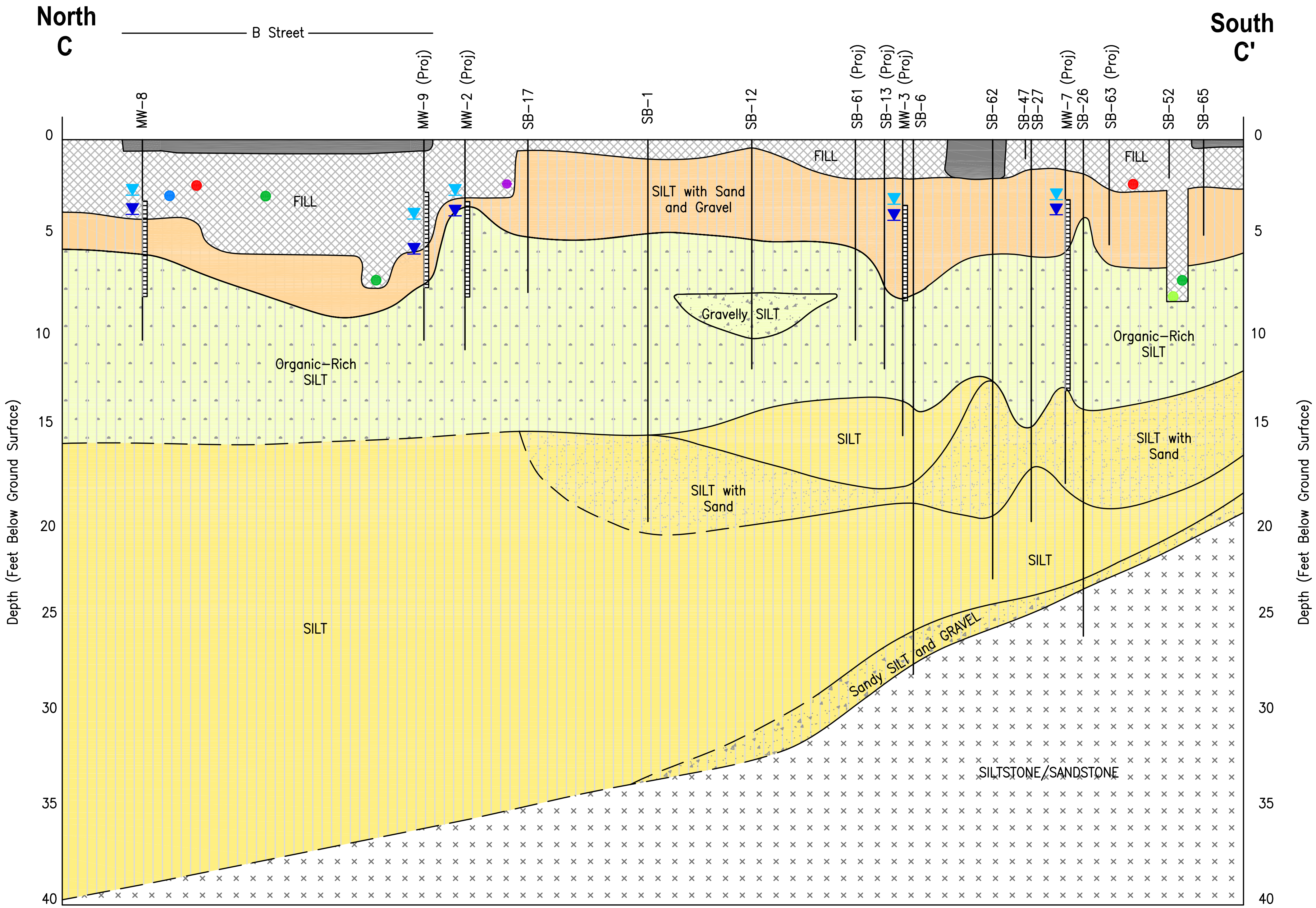
DATE: 01/27/2010 | DRAWING: MWL_X-Sect.dwg



Former Most Western Laundry
16th & B Street
Hoquiam, Washington

FIGURE 3-3
Generalized Geologic Cross-Section
B-B'

DATE: 01/27/2010 | DRAWING: MWL_X-Sect.dwg



SOIL/ROCK CLASSIFICATION LEGEND:

LITHOLOGIC UNIT A

- Concrete or Asphalt: Concrete slab from former Most Western Laundry facility and sidewalk and asphalt in street.
- Brick Unit: Red brick under the former Most Western Laundry facility.
- Fill: Brown, silty sand, sandy silt with gravel, or silty sandy crushed rock or road fill base. Local wood fragments, organic matter, and debris. Commonly with grassy topsoil near ground surface.

LITHOLOGIC UNIT B

- Silt Unit: Brown to dark brown, soft to firm SILT with occasional sand and/or gravel (up to 20%). May also contain organic matter. A portion of this unit may be fill material.
- Silty Gravel Unit: Dark gray to brownish-gray, dense, sandy GRAVEL with some silt, or greenish-gray hard SILT with gravel.

LITHOLOGIC UNIT C

- Organic-Rich Silt Unit: Greenish-black, firm to stiff SILT with organics and wood debris.
- Gravelly Silt Unit: Greenish-black, gravelly SILT with minor sand.

LITHOLOGIC UNIT D

- Silt Unit: Greenish-black SILT with minor sand and/or gravel; locally interbedded with organic-rich silt.
- Sand-Rich Silt Unit: Greenish-black SILT with approximately 12% to 40% sand and minor gravel. Local organic matter is also present.
- Gravelly Silt Unit: Greenish-gray or black, hard SILT with gravel and local sand.

LITHOLOGIC UNIT E

- Bedrock: Gray, green or brown SILTSTONE/SANDSTONE.

LEGEND:

- Boring
- Screened Interval
- Highest Recorded Groundwater Elevation
- Lowest or Only Recorded Groundwater Elevation

SUBSURFACE UTILITIES:

- Water Line
- Sanitary Sewer Line
- Storm Drain Line
- Communications Line
- Natural Gas Line

0 10
Feet
Horizontal Scale 1" = 20'
Vertical Exaggeration 3:1 (1"= 6')

SAIC
From Science to Solutions

Former Most Western Laundry
16th & B Street
Hoquiam, Washington

FIGURE 3-4
Generalized Geologic Cross-Section C-C'

DATE: 01/27/2010 | DRAWING: MWL_X-Sect.dwg

Drawn By: H. Lee
Path: Bothell16B-2k(Z:/Ecology/MWL/MWL_X-Sect.dwg

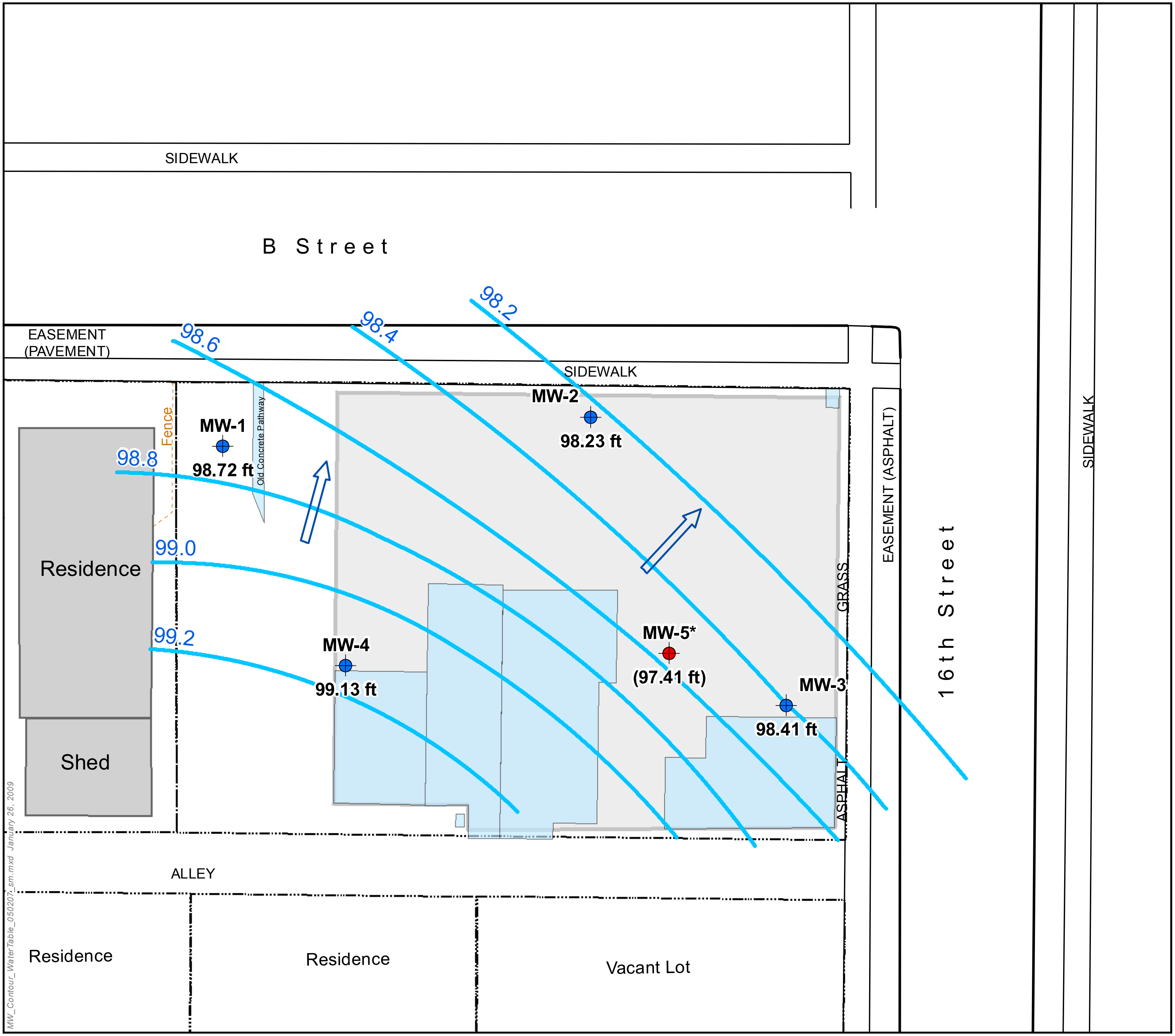


FIGURE 3-5

Water-Table Contour Map
May 2, 2007

Former Most Western Laundry
Hoquiam, Washington

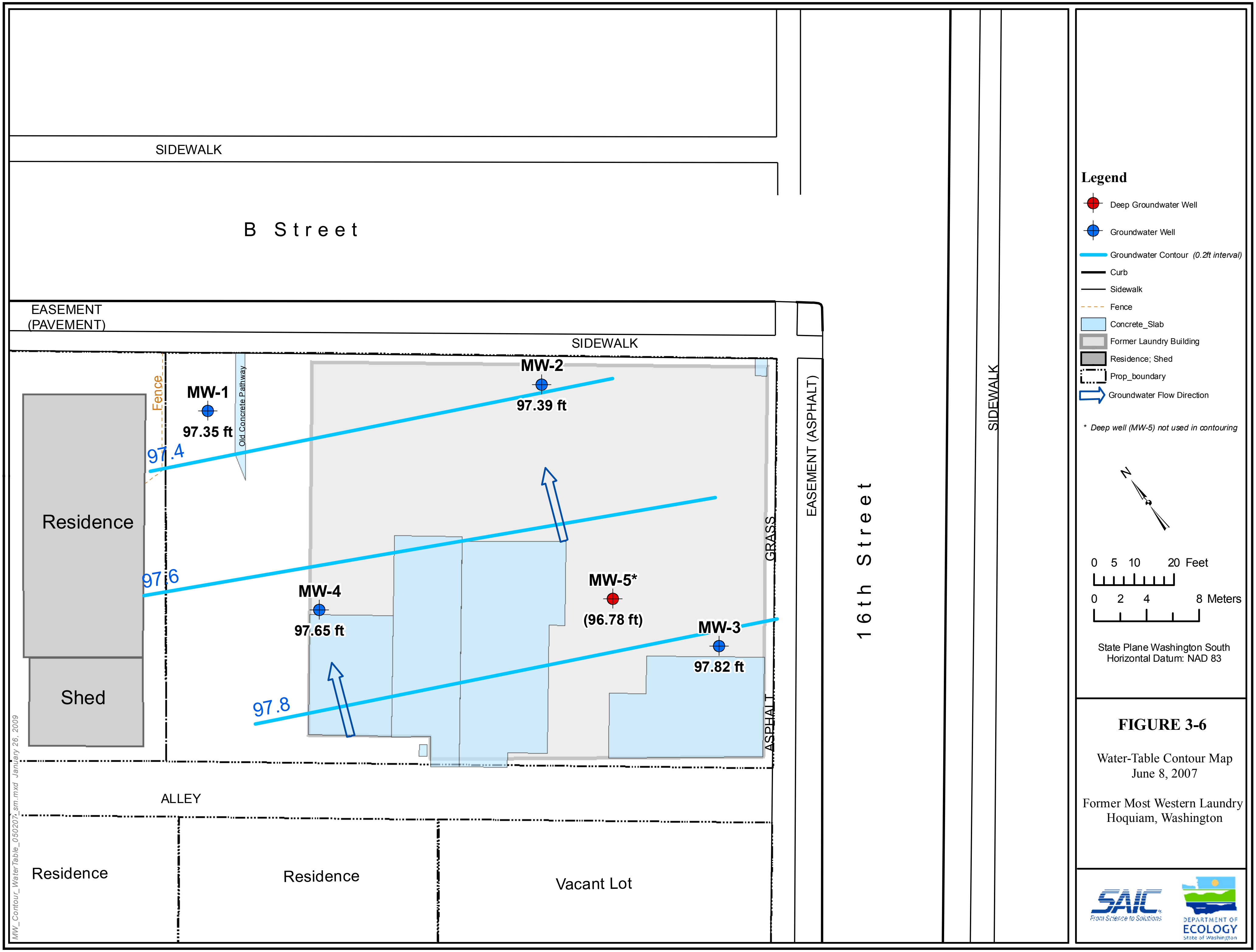


FIGURE 3-6

Water-Table Contour Map
June 8, 2007

Former Most Western Laundry
Hoquiam, Washington

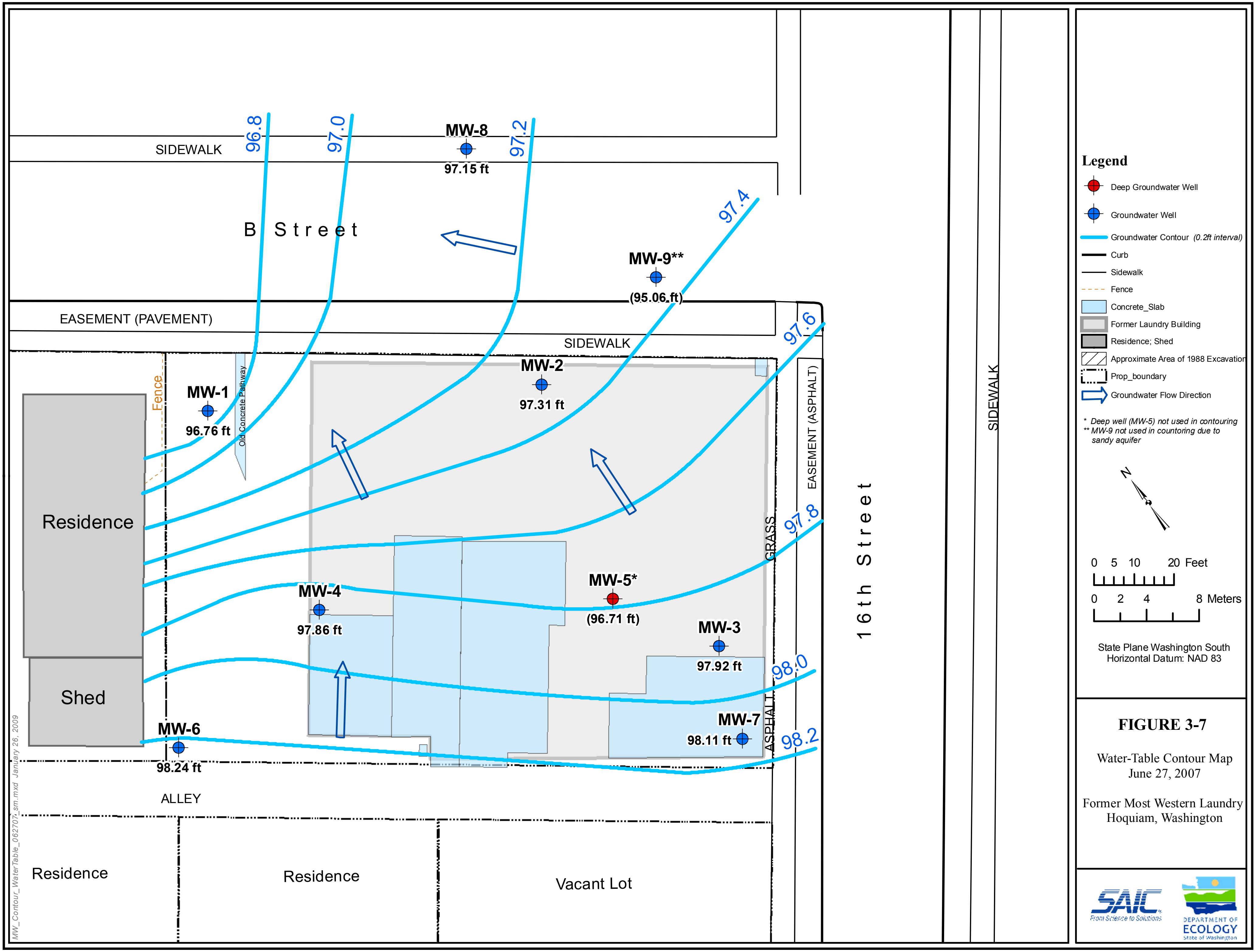


FIGURE 3-7

Water-Table Contour Map
June 27, 2007

Former Most Western Laundry
Hoquiam, Washington

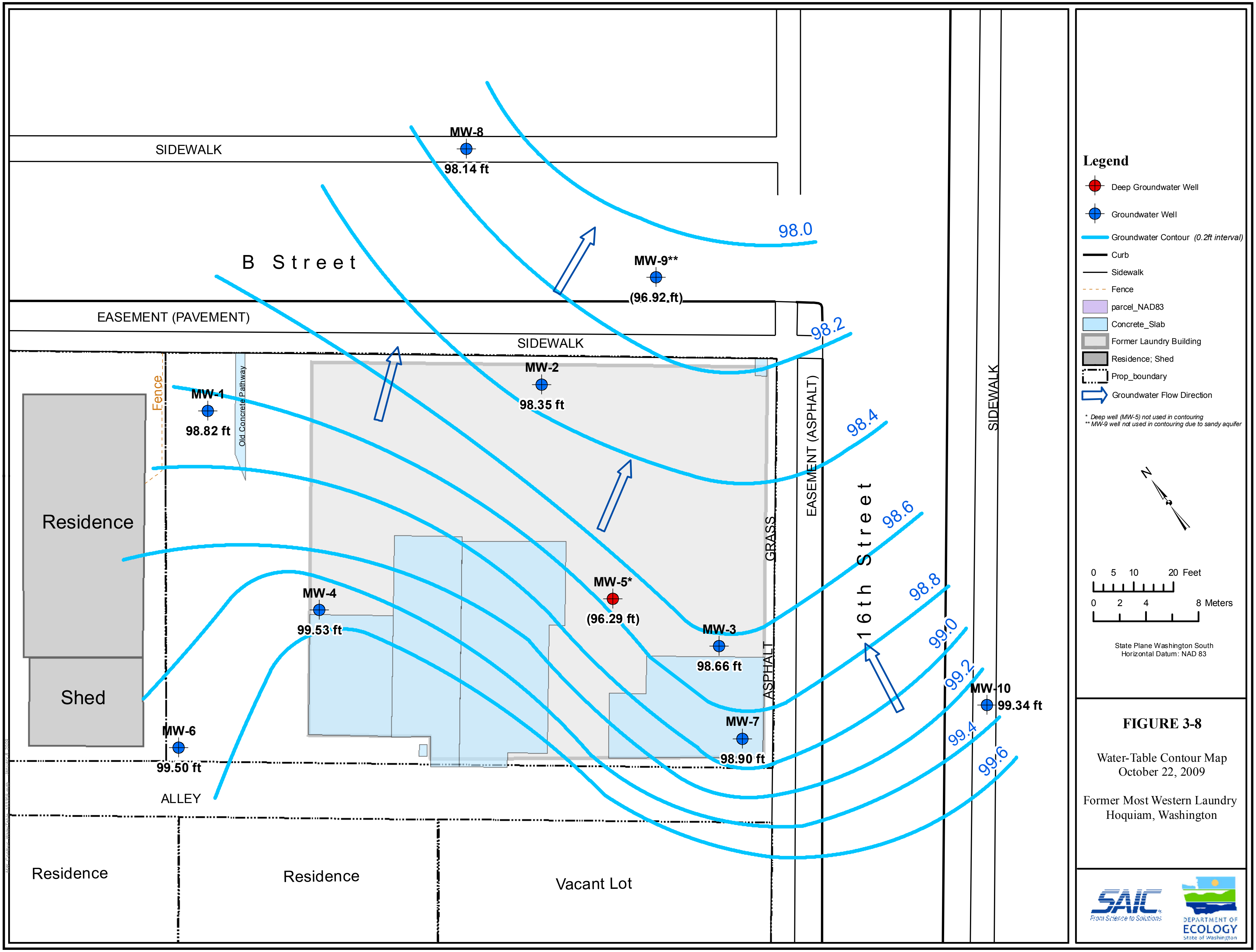
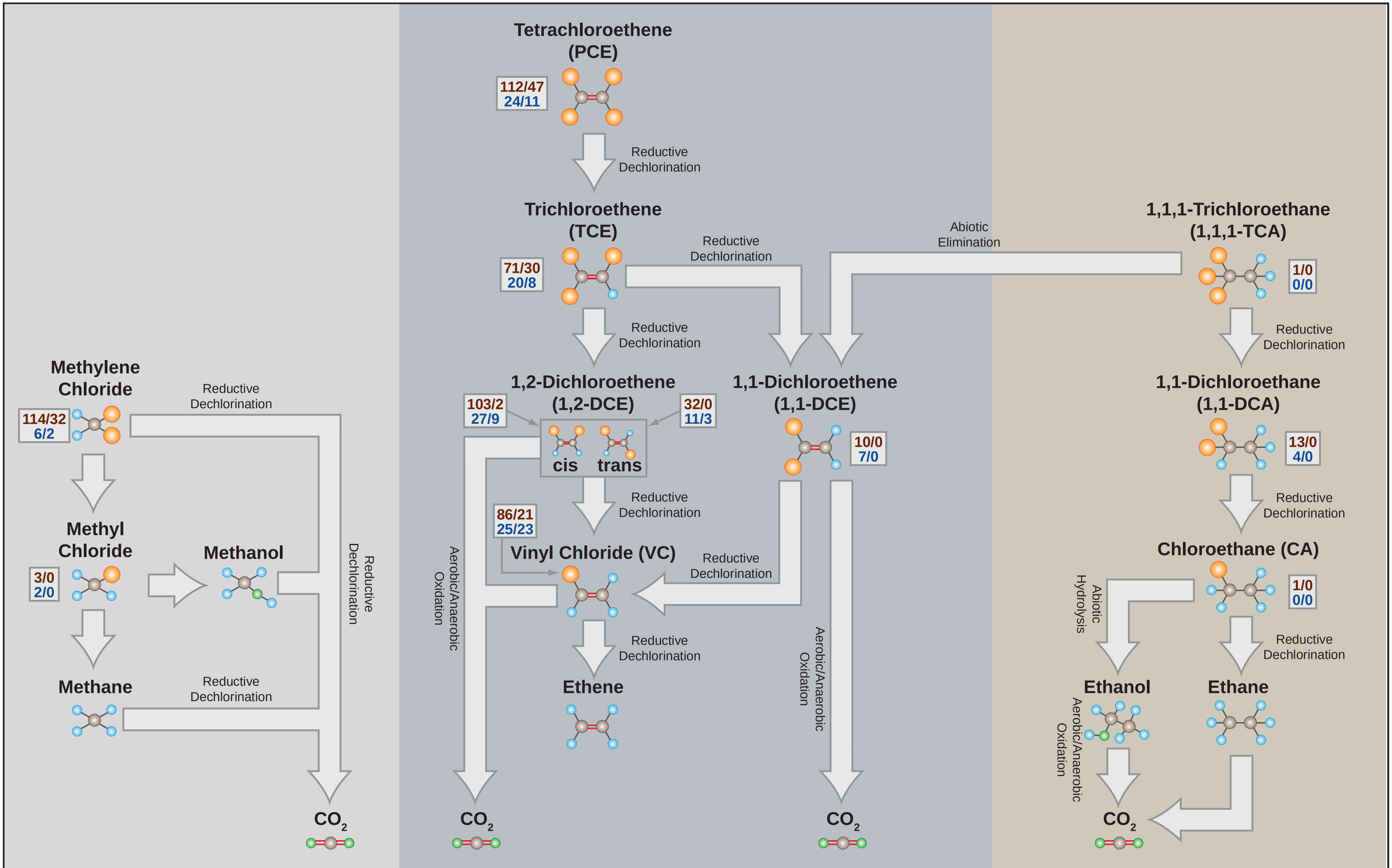


FIGURE 3-8

Water-Table Contour Map
October 22, 2009

Former Most Western Laundry
Hoquiam, Washington



LEGEND

- Hydrogen
- Oxygen
- Carbon
- Chlorine
- Single Molecular Bond
- Double Molecular Bond
- Degradation Pathway
- Detections/Exceedances (Soil)
- Detections/Exceedances (GW)

FIGURE 4-1
Degradation Pathways for Chlorinated VOCs

Compiled from numerous sources.

DEPARTMENT OF ECOLOGY State of Washington

SAIC® From Science to Solutions

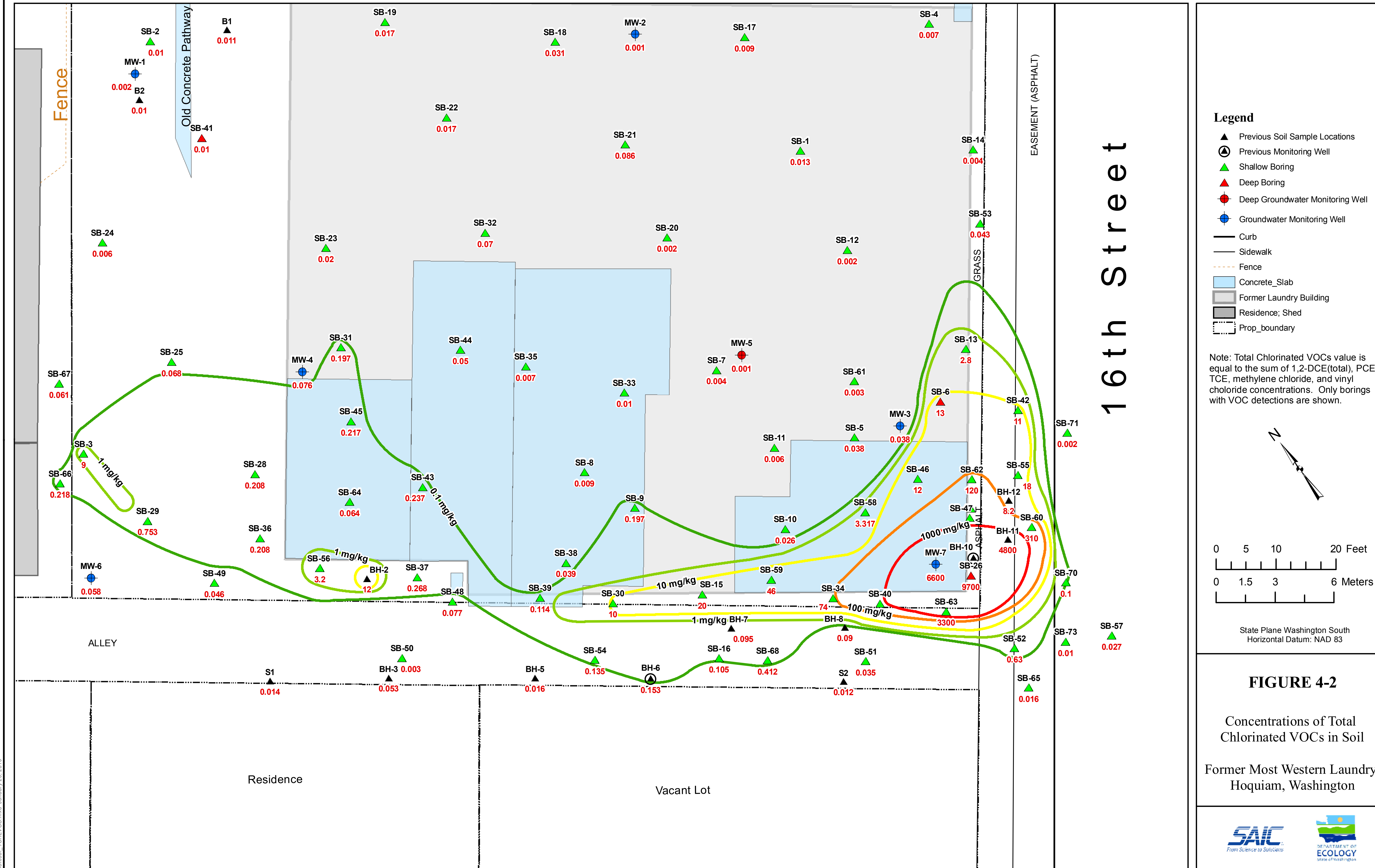


FIGURE 4-2

Concentrations of Total Chlorinated VOCs in Soil

Former Most Western Laundry
Hoquiam, Washington

SAIC From Science to Solutions

Department of Ecology State of Washington

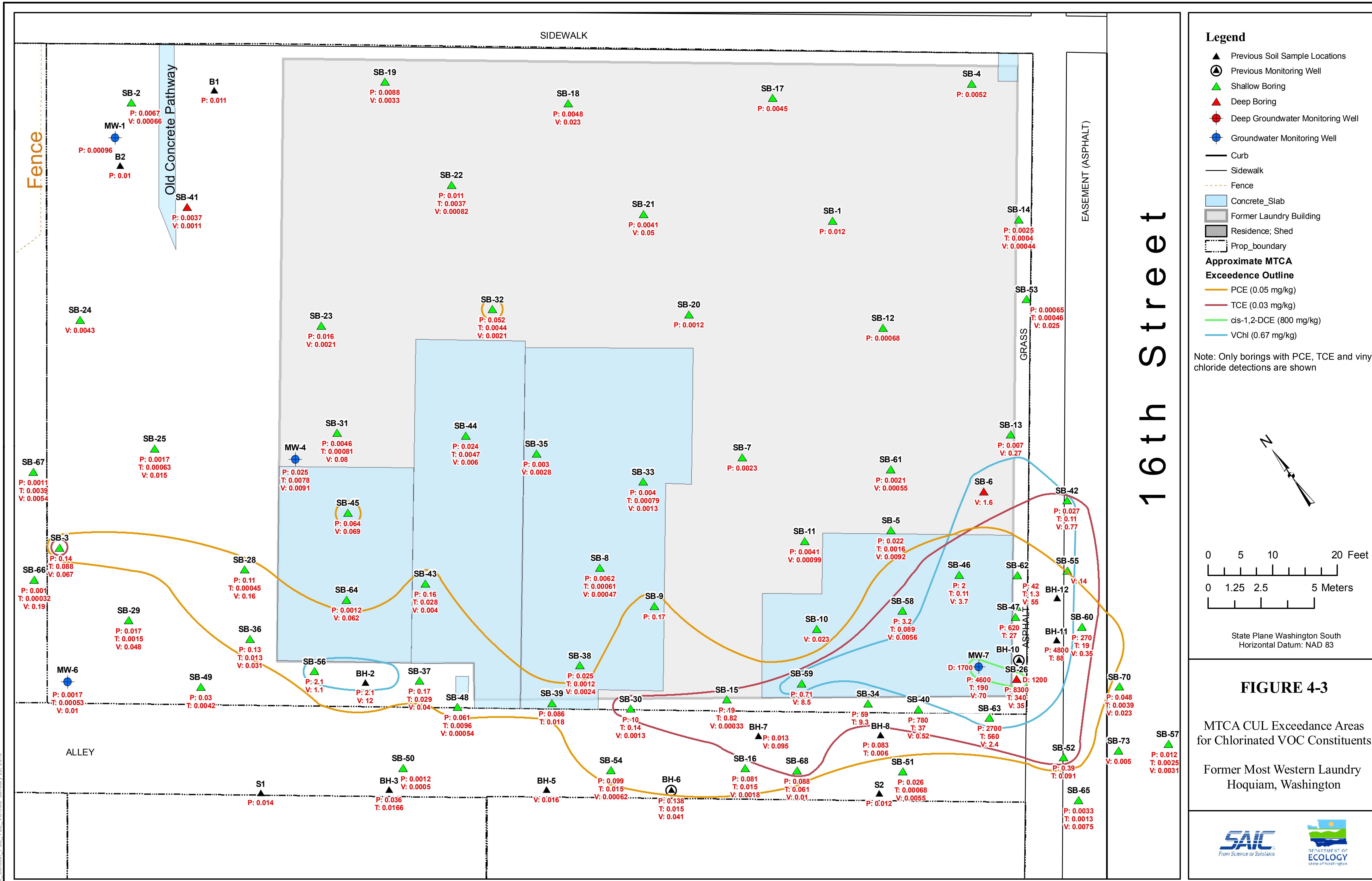


FIGURE 4-3

MTCA CUL Exceedance Areas for Chlorinated VOC Constituents

Former Most Western Laundry
Hoquiam, Washington

SAIC From Science to Solutions

Department of Ecology State of Washington

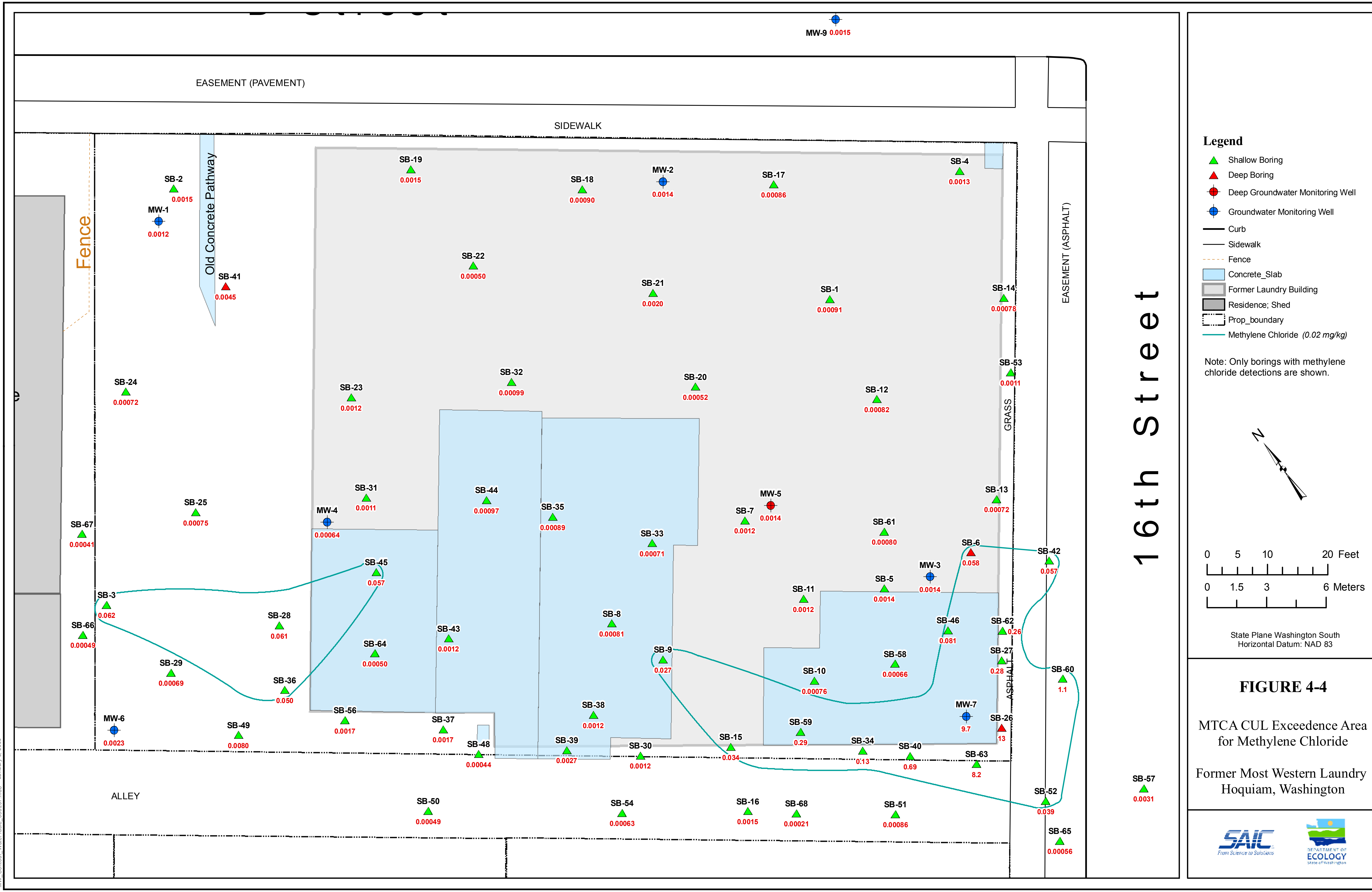
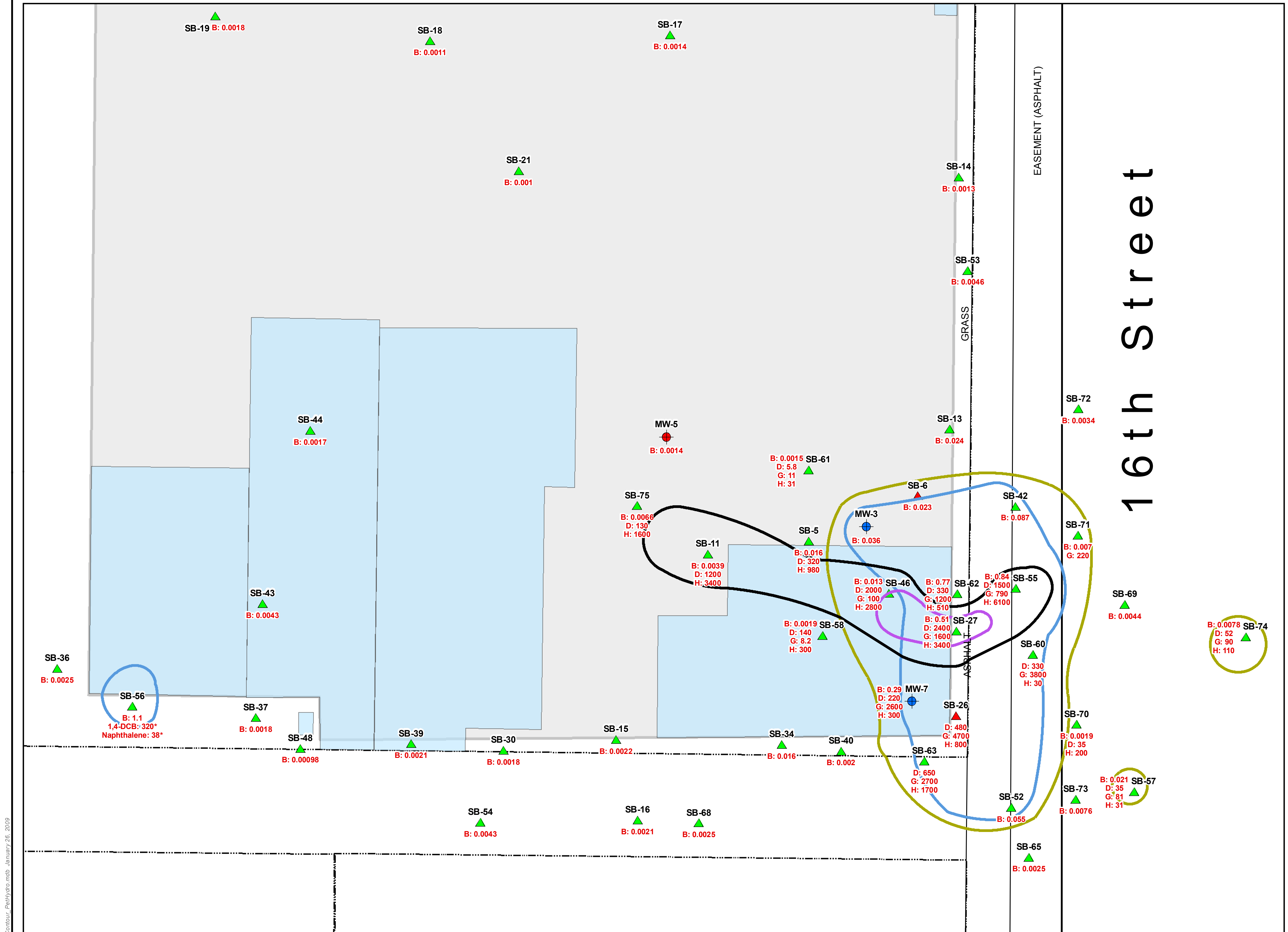


FIGURE 4-4

MTCA CUL Exceedence Area for Methylene Chloride

Former Most Western Laundry
Hoquiam, Washington



Legend

- Shallow Boring
- Deep Boring
- Deep Groundwater Monitoring Well
- Groundwater Monitoring Well
- Curb
- Sidewalk
- Fence
- Concrete_Slab
- Former Laundry Building
- Prop_boundary

Constituent Contour

- Benzene (0.03 mg/kg)
- Diesel (2000 mg/kg)
- Gas (30 mg/kg)
- Heavy Oil (2000 mg/kg)

*Concentrations of 1,4-Dichlorobenzene and Naphthalene exceeded MTCA CULs at SB-56 only.

Note: Only borings with petroleum hydrocarbon constituent detections are shown.

N

0 5 10 20 Feet

0 1 2 4 Meters

State Plane Washington South
Horizontal Datum: NAD 83

FIGURE 4-5

MTCA CUL Exceedance Areas for Petroleum Hydrocarbon Constituents

Former Most Western Laundry
Hoquiam, Washington

SAIC From Science to Solutions

DEPARTMENT OF ECOLOGY State of Washington

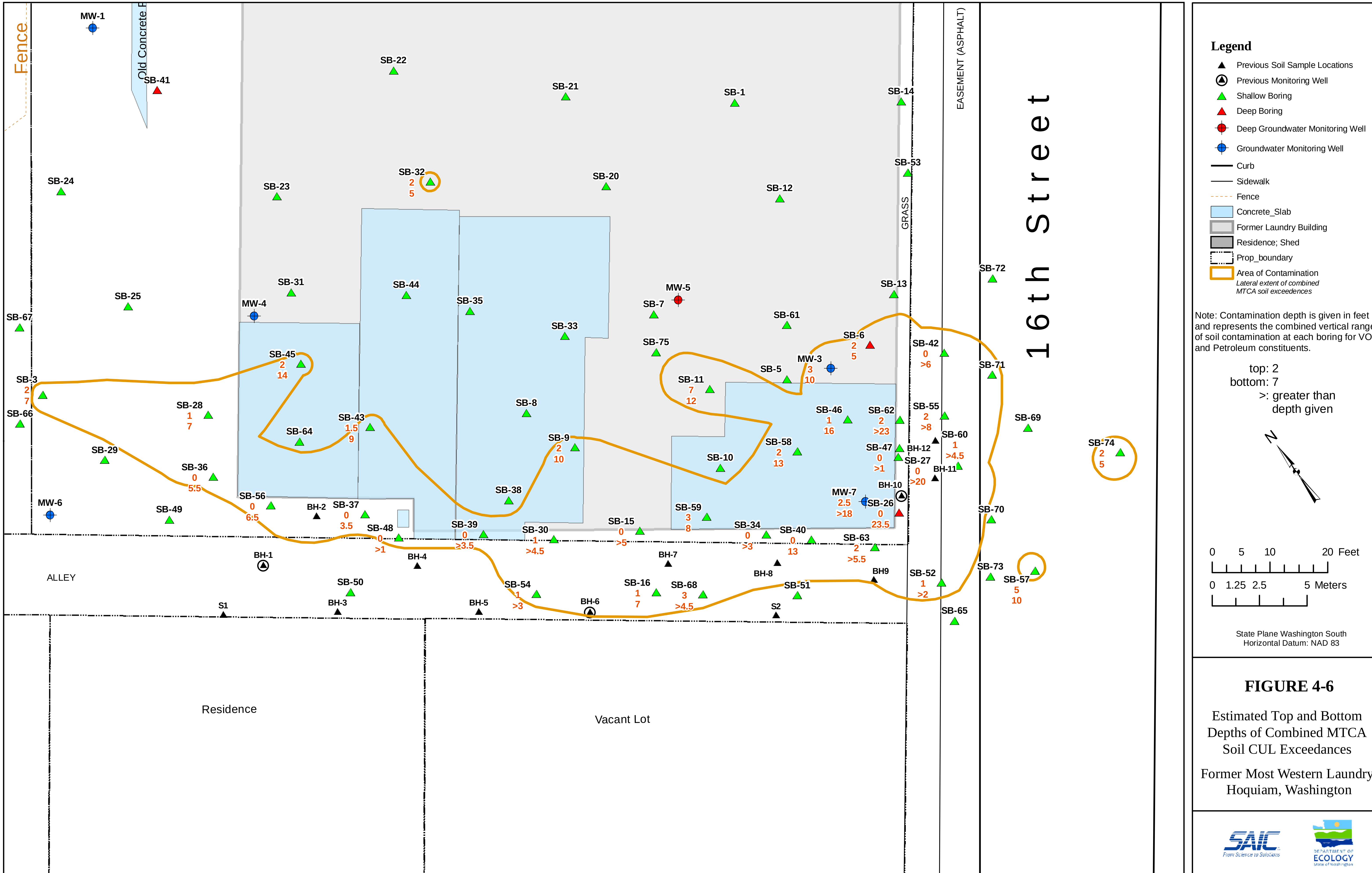


FIGURE 4-6

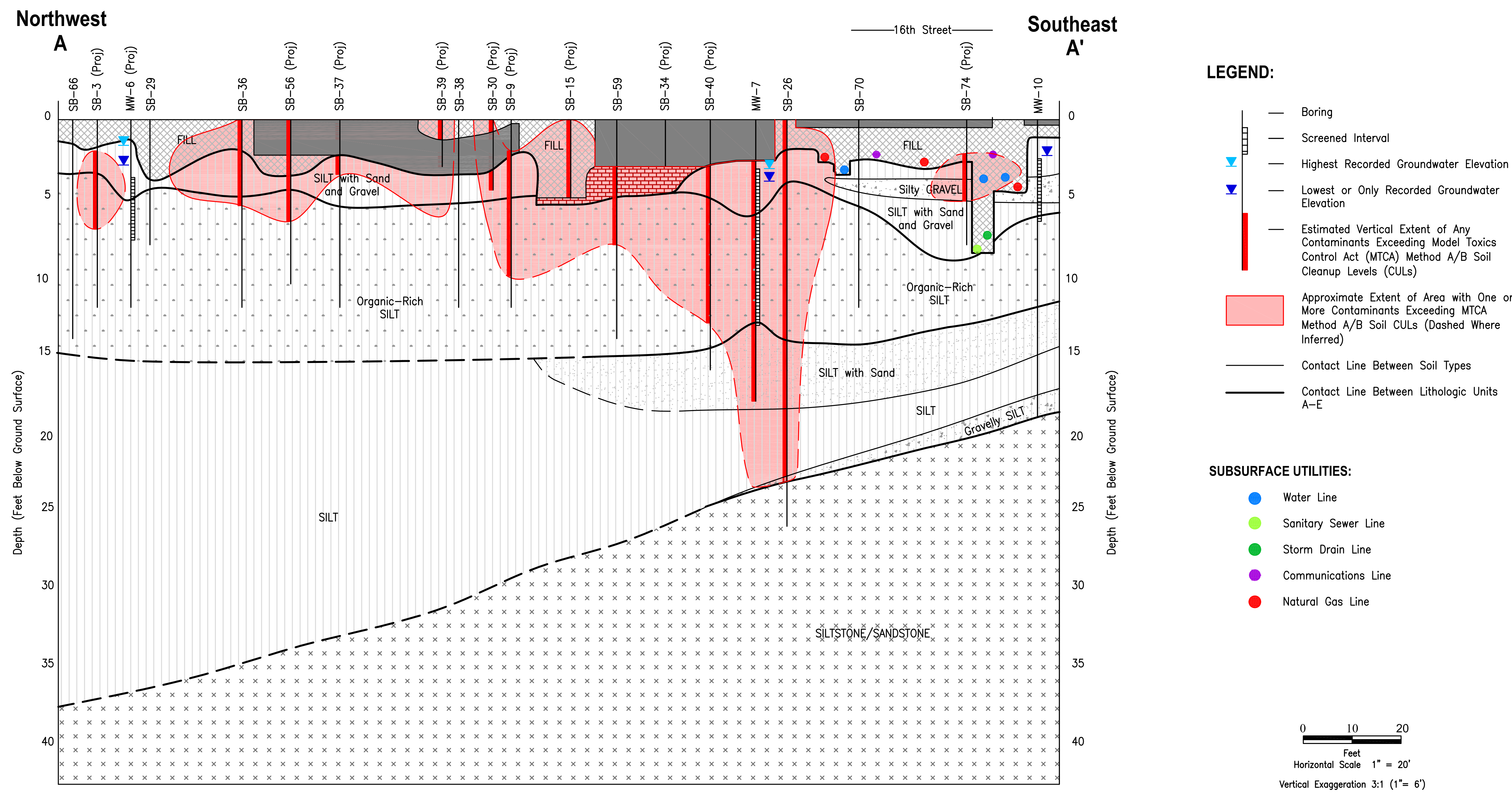
Estimated Top and Bottom Depths of Combined MTCA Soil CUL Exceedences

Former Most Western Laundry
Hoquiam, Washington

SAIC From Science to Solutions

DEPARTMENT OF ECOLOGY State of Washington

MW_Cont_thickness_working.mxd January 26, 2010

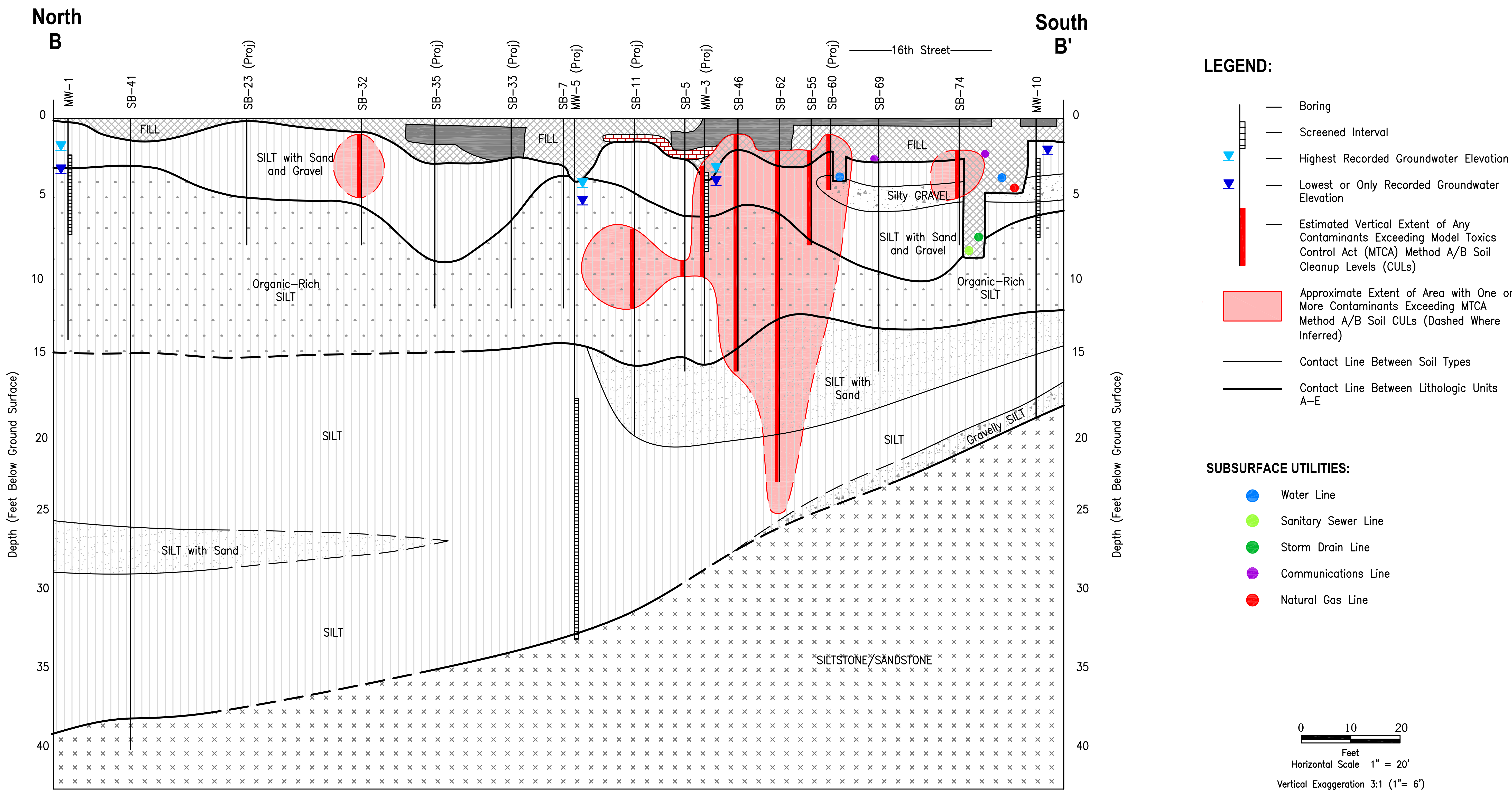


SAIC
From Science to Solutions

Former Most Western Laundry
16th & B Street
Hoquiam, Washington

FIGURE 4-7
Combined MTCA Soil CUL Exceedance Area in Geologic Cross-Section A-A'

DATE: 02/01/2010 | DRAWING: MWL_MTCA_X-Sect.dwg



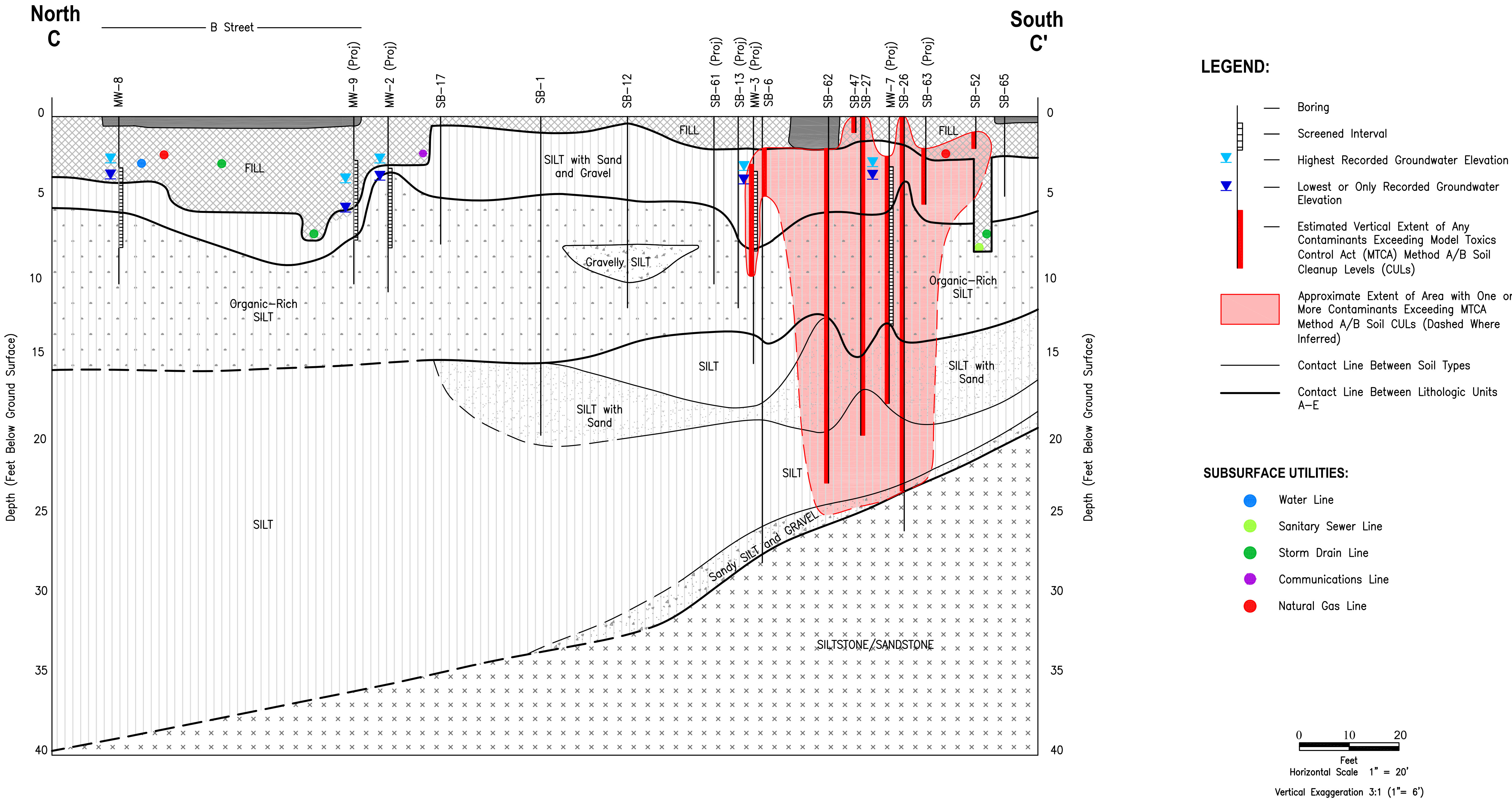
SAIC
From Science to Solutions

Former Most Western Laundry
16th & B Street
Hoquiam, Washington

FIGURE 4-8
Combined MTCA Soil CUL Exceedance Area in Geologic Cross-Section B-B'

DATE: 02/01/2010 | DRAWING: MWL_MTCA_X-Sect.dwg

Drawn By H. Lee
Path: Bothell168-2k(Z:/Ecology/MWL/MWL_MTCA_X-Sect.dwg



SAIC
From Science to Solutions

Former Most Western Laundry
16th & B Street
Hoquiam, Washington

FIGURE 4-9
Combined MTCA Soil CUL Exceedance Area in Geologic Cross-Section C-C'

DATE: 02/01/2010 | DRAWING: MWL_MTCA_X-Sect.dwg

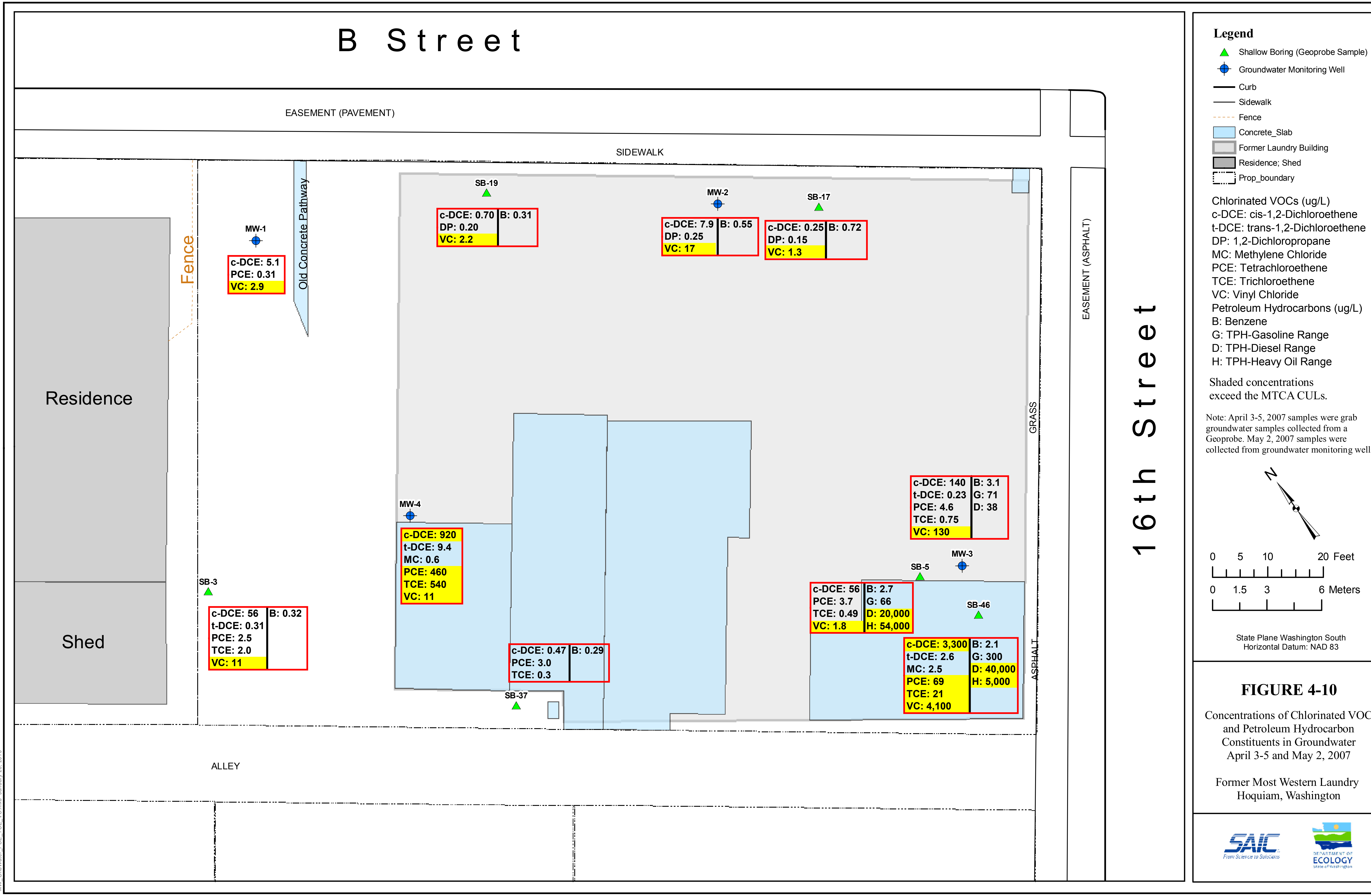


FIGURE 4-10

Concentrations of Chlorinated VOC and Petroleum Hydrocarbon Constituents in Groundwater April 3-5 and May 2, 2007

Former Most Western Laundry
Hoquiam, Washington

SAIC From Science to Solutions

Department of Ecology State of Washington

MW_GndWater_PCE_TCE_VC.mxd January 26, 2010

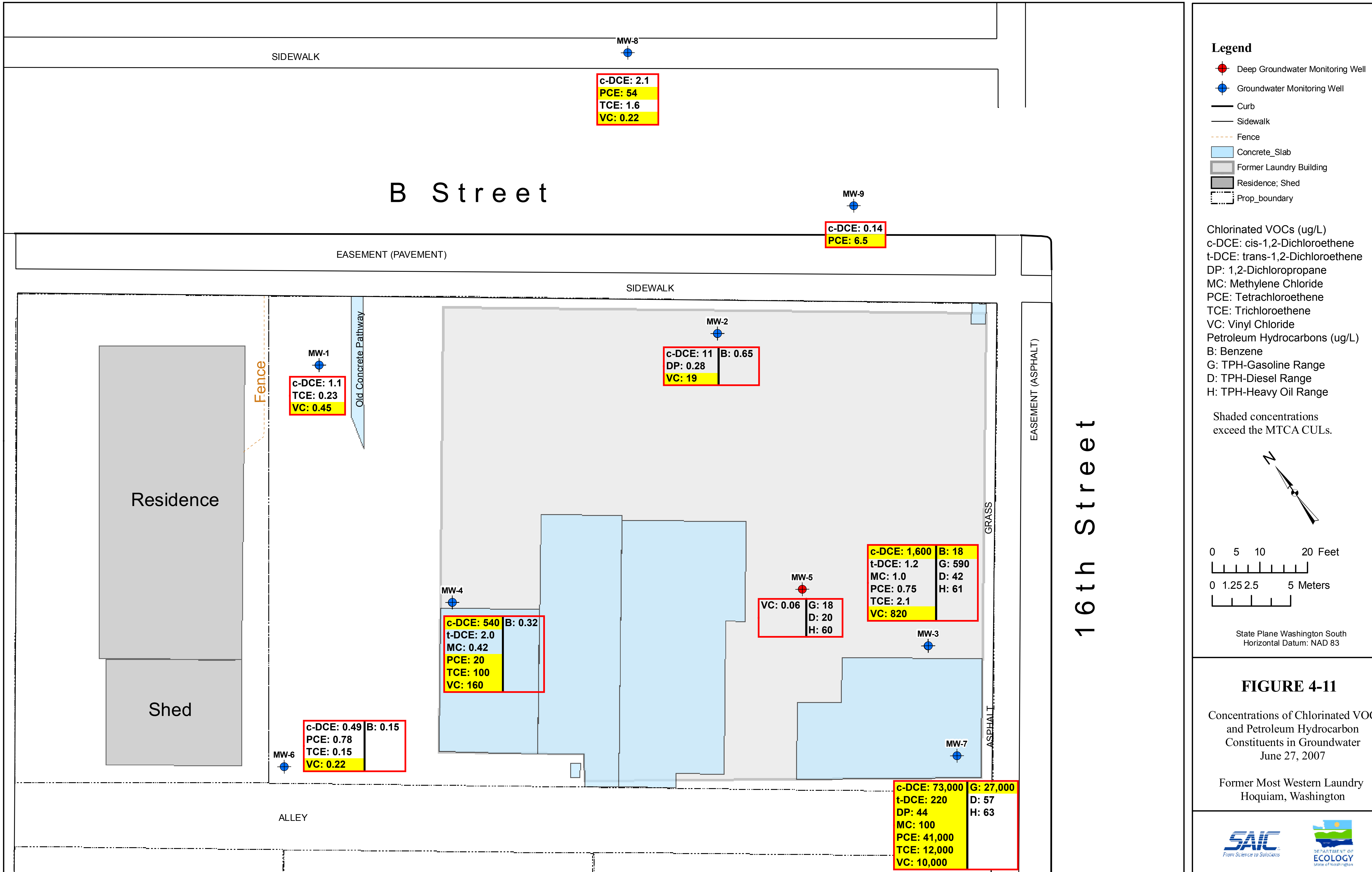


FIGURE 4-11

Concentrations of Chlorinated VOC and Petroleum Hydrocarbon Constituents in Groundwater
June 27, 2007

Former Most Western Laundry
Hoquiam, Washington

SAIC From Science to Solutions

Department of Ecology State of Washington

MW_GndWater_PCE_TCE_VC.mxd January 26, 2010

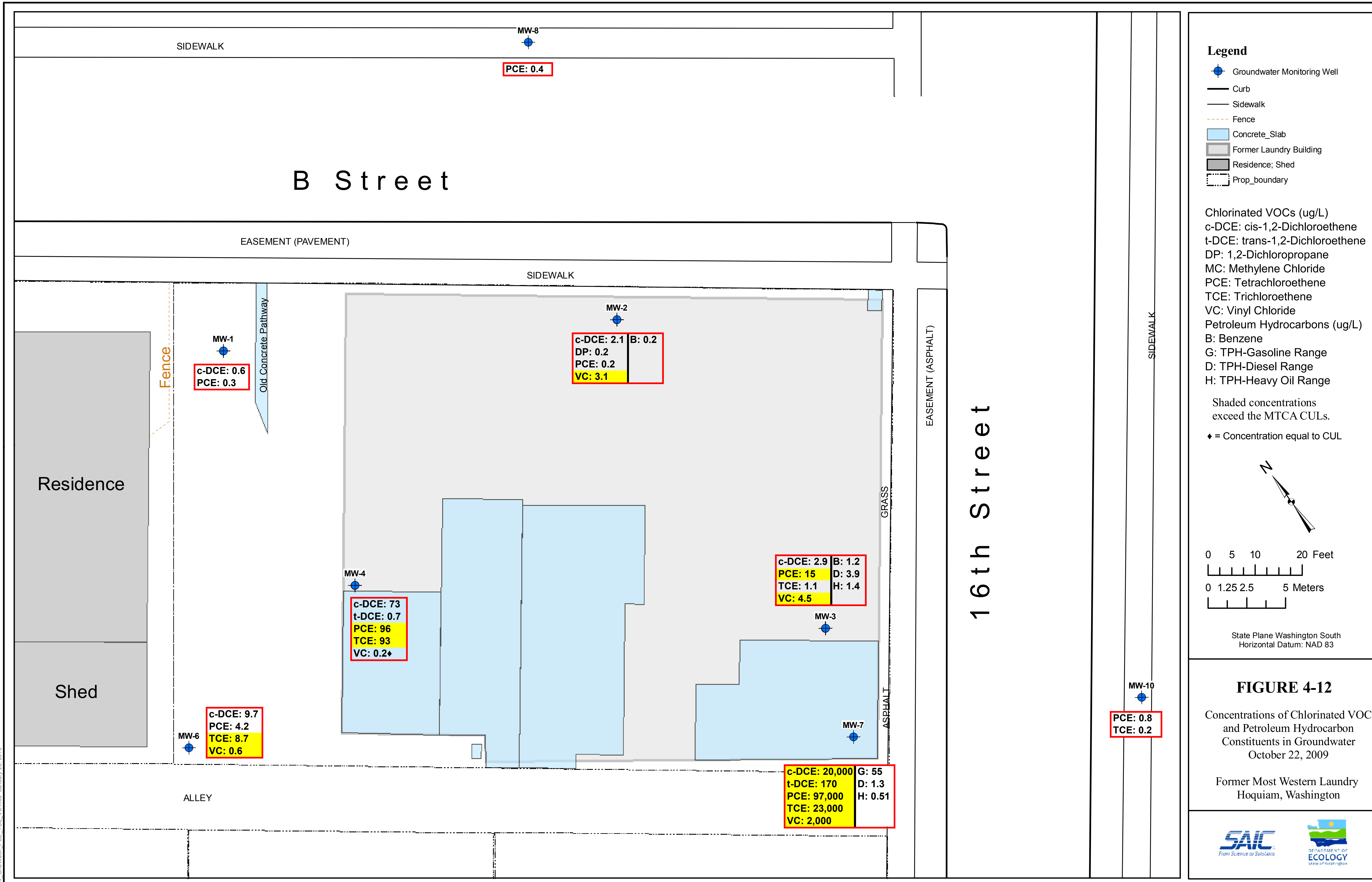


FIGURE 4-12

Concentrations of Chlorinated VOC and Petroleum Hydrocarbon Constituents in Groundwater October 22, 2009

Former Most Western Laundry Hoquiam, Washington

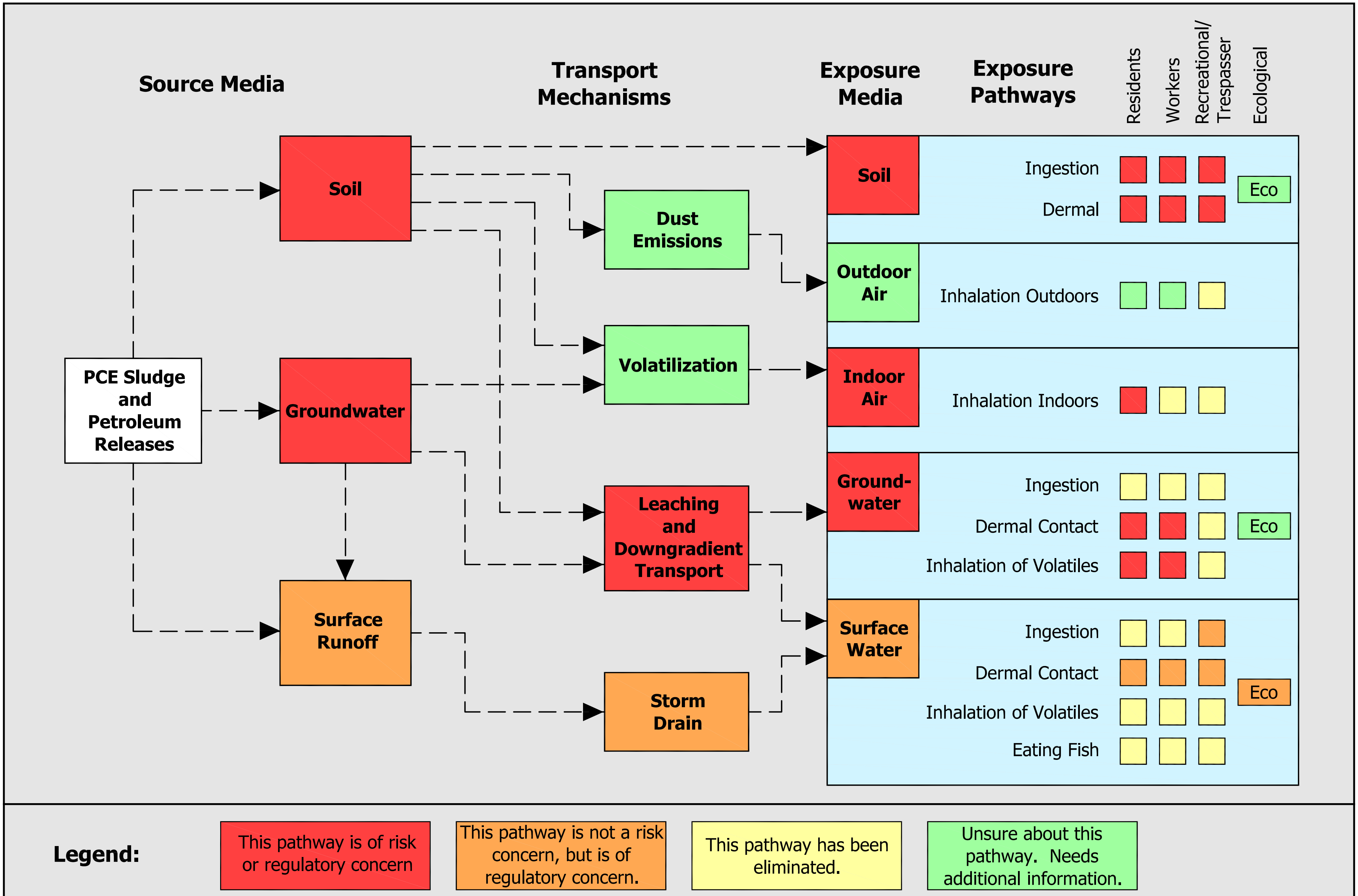


FIGURE 4–13
Site Conceptual Model
Most Western Laundry, Hoquiam, Washington

Appendix A
Pre-RI Analytical Results Tables

Table A-1
Pre-RI Analytical Data for Soil Samples
Most Western Laundry, Hoquiam, Washington

Ecology Sample ID	Sample Date	Depth (feet bgs)	Description	Units	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Dichloromethane (Methylene Chloride)	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	Benzene	TPH-Gasoline Range	TPH-Diesel Range	TPH-Heavy Oil Range
Additional MWL Sludge and Soil Sample Collection, October 1986 – June 1988 (AT AM Test Inc. 1988)															
809711	6/16/88	Surface	Dumpster area	mg/kg	--	--	--	--	**0.501**	--	--	--	--	--	--
809712	6/16/88	4	Dumpster area	mg/kg	--	--	--	--	0.082	--	--	--	--	--	--
Ecology Consent Order DE 86-S149 associated Environmental Investigation, April 1987 (Howard Edde 1987)															
BH-1	8/24/87	1		mg/kg	--	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	--	--	--	--
	8/24/87	3		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	0.005 U	--	--	--	--
	8/24/87	5		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	0.005 U	--	--	--	--
BH-2	8/24/87	1		mg/kg	--	**0.0058**	--	0.005 U	**0.112**	0.005 U	**0.282**	--	--	--	--
	8/24/87	3		mg/kg	--	**0.0149**	--	0.005 U	**0.087**	0.005 U	**11.771**	--	--	--	--
	8/24/87	5		mg/kg	--	**0.051**	--	0.005 U	**2.071**	0.005 U	**0.847**	--	--	--	--
BH-3	8/24/87	1		mg/kg	--	0.005 U	--	0.005 U	**0.036**	**0.0166**	0.005 U	--	--	--	--
	8/24/87	3		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	0.005 U	--	--	--	--
	8/24/87	5		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	0.005 U	--	--	--	--
BH-4	8/24/87	1		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	0.005 U	--	--	--	--
	8/24/87	3		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	0.005 U	--	--	--	--
	8/24/87	5		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	0.005 U	--	--	--	--
BH-5	8/24/87	1		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	0.005 U	--	--	--	--
	8/24/87	3		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	**0.012**	--	--	--	--
	8/24/87	5		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	**0.0161**	--	--	--	--
BH-6	8/24/87	1		mg/kg	--	0.005 U	--	0.005 U	**0.1380**	**0.0152**	0.005 U	--	--	--	--
	8/24/87	3		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	**0.041**	--	--	--	--
	8/24/87	5		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	**0.022**	--	--	--	--

Table A-1
Pre-RI Analytical Data for Soil Samples
Most Western Laundry, Hoquiam, Washington

Ecology Sample ID	Sample Date	Depth (feet bgs)	Description	Units	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Dichloromethane (Methylene Chloride)	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	Benzene	TPH-Gasoline Range	TPH-Diesel Range	TPH-Heavy Oil Range
BH-7	8/24/87	1		mg/kg	--	0.005 U	--	0.005 U	**0.0127**	0.005 U	0.005 U	--	--	--	--
	8/24/87	3		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	**0.024**	--	--	--	--
	8/24/87	5		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	**0.095**	--	--	--	--
BH-8	8/24/87	1		mg/kg	--	0.005 U	--	0.005 U	**0.083**	**0.005**	0.005 U	--	--	--	--
BH-8 Dup	8/24/87	1		mg/kg	--	0.005 U	--	0.005 U	**0.0690**	**0.0057**	0.005 U	--	--	--	--
	8/24/87	3		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	0.005 U	--	--	--	--
	8/24/87	5		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	0.005 U	--	--	--	--
BH-9	8/24/87	1		mg/kg	--	0.005 U	--	0.005 U	**0.0164**	0.005 U	0.005 U	--	--	--	--
	8/24/87	3		mg/kg	--	0.005 U	--	0.005 U	0.005 U	0.005 U	0.005 U	--	--	--	--
	8/24/87	5		mg/kg	--	0.005 U	--	0.005 U	**0.031**	0.005 U	0.005 U	--	--	--	--
BH-10	8/24/87	1		mg/kg	--	2.1 U	--	2.1 U	**9410.90**	**30.970**	4.2 U	--	--	--	--
	8/24/87	3		mg/kg	--	2.1 U	--	2.1 U	**773.40**	**5.430**	4.2 U	--	--	--	--
	8/24/87	5		mg/kg	--	2.1 U	--	2.1 U	**2664.60**	**16.960**	4.2 U	--	--	--	--
BH-11	8/24/87	1		mg/kg	--	2.1 U	--	2.1 U	**1924.50**	**30.690**	4.2 U	--	--	--	--
	8/24/87	3		mg/kg	--	2.1 U	--	2.1 U	**4819.00**	**7.565**	4.2 U	--	--	--	--
	8/24/87	5		mg/kg	--	2.1 U	--	2.1 U	**4314.45**	**88.110**	4.2 U	--	--	--	--
BH-12	8/24/87	1		mg/kg	--	0.1 U	--	0.1 U	**3.225**	**0.271**	**0.903**	--	--	--	--
	8/24/87	3		mg/kg	--	0.1 U	--	0.1 U	**1.220**	**0.442**	**6.580**	--	--	--	--
	8/24/87	5		mg/kg	--	0.1 U	--	0.1 U	**1.875**	**0.373**	**3.340**	--	--	--	--
S1	8/24/87	0	Surface	mg/kg	--	0.005 U	--	0.005 U	**0.0139**	0.0035 U	0.01 U	--	--	--	--
S2	8/24/87	0	Surface	mg/kg	--	0.005 U	--	0.005 U	**0.0118**	0.0035 U	0.01 U	--	--	--	--

Table A-1
Pre-RI Analytical Data for Soil Samples
Most Western Laundry, Hoquiam, Washington

Ecology Sample ID	Sample Date	Depth (feet bgs)	Description	Units	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Dichloromethane (Methylene Chloride)	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	Benzene	TPH-Gasoline Range	TPH-Diesel Range	TPH-Heavy Oil Range
B1	8/24/87	--	Background	mg/kg	--	0.005 U	--	0.005 U	**0.0107**	0.0035 U	0.01 U	--	--	--	--
B2	8/24/87	--	Background	mg/kg	--	0.005 U	--	0.005 U	**0.0097**	0.0035 U	0.01 U	--	--	--	--
Department of Ecology MWL Site Inspections and Sample Collection, September – October 1984 (Ecology 1984g)															
409031	10/03/84	--	Soil Adjacent to Laundry	mg/kg	--	--	--	--	**1000**	**180**	--	--	--	--	--
Previous Remedial Actions (CES 1988)															
West 2	7/12/88		West Side Wall	mg/kg	--	--	--	--	**3,600**	--	--	--	--	--	--
Bottom 5	7/12/88	At Ground Water	Bottom of Excavation	mg/kg	--	--	--	--	**820**	--	--	--	--	--	--
South 4	7/12/88		South Side Wall	mg/kg	--	--	--	--	**200**	--	--	--	--	--	--
North 1	7/12/88		North Side Wall	mg/kg	--	--	--	--	**33**	--	--	--	--	--	--
East 3	7/12/88		East Side Wall	mg/kg	--	--	--	--	**19**	--	--	--	--	--	--
MTCA Method A Soil CUL:				mg/kg	--	**--**	**--**	**0.02**	**0.05**	**0.03**	--	**0.03**	**30**	**2,000**	**2,000**
MTCA Method B Soil CUL:				mg/kg	**800**	**1,600**	**15**	**130**	**1.9**	**11**	**0.67**	**18**	--	--	--

Yellow highlighted detections are those values exceeding the appropriate MTCA cleanup levels (2009)
Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.
U = Reporting Limit
M = quantification limit
-- = Not Analyzed
All units are in mg/kg

Table A-2
Pre-RI Analytical Data for Storm Drain Solids Samples
Most Western Laundry, Hoquiam, Washington

Ecology Sample ID	Sample Date	Description	Units	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Methylene Chloride (Dichloromethane)	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	Benzene	TPH - Gasoline Range Organics	TPH - Diesel Range Organics	TPH - Residual Range Organics
Department of Ecology MWL Site Inspections and Sample Collection, September – October 1984. (Ecology 1984g)														
409029	10/3/84	Inside Storm Drain adjacent to Laundry (Sludge)	mg/kg	--	--	--	--	**22,000**	4000 U	--	--	--	--	--
419007	10/9/84	Sludge in Storm Drain Adjacent to Laundry	mg/kg	--	--	--	--	**36**	**13**	--	--	--	--	--
MTCA Method A Soil CUL:			mg/kg	--	**--**	**--**	**0.02**	**0.05**	**0.03**	--	**0.03**	**30**	**2,000**	**2,000**
MTCA Method B Soil CUL:			mg/kg	**800**	**1,600**	**15**	**130**	**1.9**	**11**	**0.67**	**18**	--	--	--

Yellow highlighted detections are those values exceeding the appropriate MTCA cleanup levels (2009), applying soil CULs to this material
Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.
U = Reporting Limit
M = quantification limit
-- = Not Analyzed
All units are in mg/kg

Table A-3
Pre-RI Analytical Data for Miscellaneous Solids and Sludge Samples
Most Western Laundry, Hoquiam, Washington

Ecology Sample ID	Sample Date	Description	Units	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Methylene Chloride (Dichloromethane)	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	Benzene	TPH - Gasoline Range Organics	TPH - Diesel Range Organics	TPH - Residual Range Organics
Additional MWL Sludge and Soil Sample Collection, October 1986 – June 1988 (Ecology 1986)														
437862	12/21/86	Drain nearest MWL	mg/kg	--	**20.7**	0.4 U	0.4 U	**3.6**	**0.440**	--	--	--	--	--
437863	12/21/86	Drain across street from MWL	mg/kg	--	**3.0**	0.04 U	0.04 U	0.04 U	0.04 U	--	--	--	--	--
437863 (Dup)	12/21/86	Drain across street from MWL	mg/kg	--	**2.9**	0.05 U	0.02 U	0.02 U	0.02 U	--	--	--	--	--
437864	12/21/86	Sludge Behind Building	mg/kg	--	0.002 U	0.002 U	0.002 U	0.004 U	0.002 U	--	--	--	--	--
Department of Ecology MWL Site Inspections and Sample Collection, September – October 1984 (Ecology 1984g)														
409030	10/3/84	Lint/Soils adjacent to Laundry (Dumpster Area)	mg/kg	--	--	--	--	**65,000**	200 U	--	--	--	--	--
409032	10/3/84	Inside Dumpster (Sludge)	mg/kg	--	**20** M	**20**	--	**210**	20 M	--	--	--	--	--
Department of Ecology MWL Site Inspections and Sample Collection, September – October 1984 (Ecology 1984f)														
39558	9/27/84	Dark Spilled Material at Laundry	mg/L (ppm)	--	**--**	--	--	**65**	**0.039**	--	--	--	--	--
Department of Ecology Follow-up Site Inspection and Sludge Sample Collection, October 30, 1984 (Ecology 1984h)														
449036	10/30/84	Inside Dumpster (Sludge)	mg/L (ppm)	--	--	--	--	**1,000**	--	--	--	--	--	--
MTCA Method A Soil CUL:			mg/kg	--	**--**	**--**	**0.02**	**0.05**	**0.03**	--	**0.03**	**30**	**2,000**	**2,000**
MTCA Method B Soil CUL:			mg/kg	**800**	**1,600**	**15**	**130**	**1.9**	**11**	**0.67**	**18**	--	--	--

Yellow highlighted detections are those values exceeding the appropriate MTCA cleanup levels (2009), applying soil CULs to this material

Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.

U = Reporting Limit -- = Not Analyzed

M = quantification limit J = estimated value

Table A-4
Pre-RI Analytical Data for Storm Drain and Sanitary Sewer Liquid Samples
Most Western Laundry, Hoquiam, Washington

Ecology Sample ID	Sample Date	Description	Units	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Dichloromethane (Methylene Chloride)	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	Benzene	TPH-Gasoline Range	TPH-Diesel Range	TPH-Heavy Oil Range
Department of Ecology MWL Site Inspections and Sample Collection, September – October 1984 (Ecology 1984g)														
419007	10/9/84	Water Discharge to River from Storm Drain at 15th and Riverside (turbid sample)	ug/L	--	**950**	--	--	**36**	**13**	--	--	--	--	--
419008	10/9/84	Water Discharge to River from Storm Drain at 15th and Riverside	ug/L	--	**310**	--	--	**2**	**2**	--	--	--	--	--
Department of Ecology MWL Site Inspections and Sample Collection, September – October 1984 (Ecology 1984f)														
39559	9/27/84	Head Works (Treatment Plant)	ug/L	--	10 U	--	--	10 U	10 U	--	--	--	--	--
39560	9/27/84	Riverside Pump Station, West Well (Sanitary Sewer serving Most Western)	ug/L	--	10 U	--	--	**40**	10 U	--	--	--	--	--
Department of Ecology Hoquiam River Outfall and Sediment Sampling, December 1984 – April 1985 (Ecology 1985c)														
519008	12/17/84	Hoquiam River Outfall	ug/L	--	--	5 U	5 U	**3.1**	**2**	10 U	5 U	--	--	--
Organic Analysis of Hoquiam Sanitary Pump Station, May 1985 (Ecology 1985d)														
199044	5/9/85	Riverside Pump Station (liquids only, solids separated out)	ug/L	**18**	--	5 U	2 UJ	**6**	1 J	6 J	5 U	--	--	--
199045	5/9/85	28th Street Pump Station	ug/L	3 J	--	5 U	2 UJ	1 J	5 U	10 U	5 U	--	--	--

Yellow highlighted detections are those outfall values exceeding the 2009 MTCA Method B cleanup levels for surface water (PCE = 0.39 ug/L, TCE = 6.7 ug/L, 1,2-DCE = NA)
Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.
U = Reporting Limit
-- = Not Analyzed or reporting limits were unavailable
All units are in ug/L

Table A-5
Pre-RI Analytical Data for Groundwater and Seeps Samples
Most Western Laundry, Hoquiam, Washington

Ecology Sample ID	Sample Date	Description	Units	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Dichloromethane (Methylene Chloride)	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Vinyl Chloride	Benzene	TPH-Gasoline Range	TPH-Diesel Range	TPH-Heavy Oil Range
Howard Edde 1987														
11-C	8/24/87	Groundwater from boring	ug/L	--	0.35 U	0.35 U	0.35 U	**209,060**	**6,350**	**2,195**	--	--	--	--
MTCA Method A Groundwater CUL:			ug/L	**--**	**--**	**--**	**5**	**5**	**5**	**0.2**	**5**	**800**	**500**	**500**
MTCA Method B Groundwater CUL:			ug/L	**80**	**160**	**0.64**	**5.8**	**0.081**	**0.49**	**0.029**	**0.8**	**--**	**--**	**--**

Yellow highlighted detections are those values exceeding the appropriate MTCA cleanup levels (2009)
Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.
U = Reporting Limit
-- = Not Analyzed or reporting limits were unavailable
All units are in ug/L

Appendix B
RI Boring Logs and Field Information

Appendix C
RI Laboratory Analytical Reports
(Provided only electronically)

Appendix D
RI Analytical Results Tables

Table D-1
RI Soil Analytical Results for VOCs (mg/kg)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/Sample	Sampling Date	Acetone	Benzene	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	Bromomethane	2-Butanone (MEK)	n-Butylbenzene	sec-Butylbenzene	tert-Butylbenzene	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene
SB-1-4	4/2/2007	**0.031**	0.000077 U	0.00022 U	0.00021 U	0.00012 U	0.00021 U	0.00059 U	0.0026 U	0.00019 U	0.00015 U	0.00017 U	**0.0023**	0.00021 U	0.000079 U
SB-2-3	4/2/2007	**0.031**	0.000085 U	0.00024 U	0.00023 U	0.00013 U	0.00023 U	0.00065 U	0.0028 U	0.00021 U	0.00017 U	0.00018 U	**0.0022**	0.00023 U	0.000087 U
SB-3-4	4/2/2007	0.41 U	0.019 U	0.018 U	0.023 U	0.015 U	0.050 U	0.039 U	0.57 U	0.040 U	0.023 U	0.022 U	0.029 U	0.022 U	0.017 U
SB-4-4	4/2/2007	**0.031**	0.000074 U	0.00021 U	0.0002 U	0.00012 U	0.0002 U	0.00056 U	0.0024 U	0.00018 U	0.00014 U	0.00016 U	**0.0055**	0.0002 U	0.000075 U
SB-5-0	4/2/2007	**0.31**	**0.0012**	0.00019 U	0.00018 U	0.00011 U	0.00018 U	0.00051 U	**0.019**	0.00016 U	0.00013 U	0.00014 U	**0.0025**	0.00018 U	0.000069 U
SB-5-3.5	4/2/2007	**0.033**	0.000075 U	0.00022 U	0.0002 U	0.00012 U	0.0002 U	0.00057 U	0.0025 U	0.00018 U	0.00015 U	0.00016 U	**0.0011**	0.0002 U	0.000076 U
SB-5-8	4/2/2007	**0.17**	**0.016**	0.00025 U	0.00023 U	0.00014 U	0.00023 U	0.00067 U	**0.031**	0.00021 U	0.00017 U	0.00019 U	**0.0052**	0.00023 U	0.00009 U
SB-6-3	4/2/2007	0.42 U	**0.023**	0.018 U	0.023 U	0.016 U	0.051 U	0.040 U	0.59 U	0.041 U	**0.037**	0.023 U	**0.033**	0.023 U	0.017 U
SB-7-4	4/2/2007	**0.056**	0.000075 U	0.00022 U	0.0002 U	0.00012 U	0.0002 U	0.00057 U	0.0025 U	0.00018 U	0.00015 U	0.00016 U	**0.0180**	0.0002 U	0.000076 U
SB-8-4	4/2/2007	**0.041**	0.000053 U	0.00015 U	0.00014 U	0.000081 U	0.00014 U	0.00041 U	**0.0037**	0.00013 U	0.0001 U	0.00012 U	**0.0033**	0.00014 U	0.000054 U
SB-9-4	4/3/2007	0.27 U	0.012 U	0.012 U	0.015 U	0.0097 U	0.032 U	0.025 U	0.37 U	**0.081**	**0.14**	0.014 U	**0.020**	0.015 U	0.011 U
SB-10-9	4/3/2007	**0.095**	0.000085 U	0.00025 U	0.00023 U	0.00013 U	0.00023 U	0.00065 U	**0.011**	0.00021 U	0.00017 U	0.00018 U	**0.0029**	0.00023 U	0.000087 U
SB-11-0	4/3/2007	**0.27**	0.000064 U	0.00018 U	0.00017 U	0.000097 U	0.00017 U	0.00049 U	**0.016**	0.00016 U	0.00012 U	0.00014 U	**0.0017**	0.00017 U	0.000065 U
SB-11-5	4/3/2007	**0.037**	**0.0030**	0.00022 U	0.0002 U	0.00012 U	0.0002 U	0.00058 U	0.0025 U	0.00019 U	0.00015 U	0.00016 U	**0.0016**	0.0002 U	0.000078 U
SB-11-9	4/3/2007	**0.11**	**0.0039**	0.00041 U	0.00038 U	0.00022 U	0.00038 U	0.0011 U	**0.012**	0.00034 U	0.00027 U	0.0003 U	**0.0032**	0.00038 U	0.00015 U
SB-11-15	4/3/2007	**0.038**	0.000070 U	0.0002 U	0.00019 U	0.00011 U	0.00019 U	0.00053 U	**0.0046**	0.00017 U	0.00014 U	0.00015 U	**0.0011**	0.00019 U	0.000071 U
SB-12-4	4/3/2007	**0.044**	0.000073 U	0.00021 U	0.00019 U	0.00012 U	0.00019 U	0.00056 U	0.0024 U	0.00018 U	0.00014 U	0.00016 U	**0.0024**	0.00019 U	0.000074 U
SB-13-10	4/3/2007	**0.03**	**0.024**	0.00021 U	0.0002 U	0.00012 U	0.0002 U	0.00056 U	0.0024 U	0.00018 U	0.00014 U	0.00016 U	**0.0021**	0.0002 U	0.000075 U
SB-14-4	4/3/2007	**0.044**	**0.0013**	0.00021 U	0.00019 U	0.00011 U	0.00019 U	0.00055 U	**0.004**	0.00018 U	0.00014 U	0.00016 U	**0.0078**	0.00019 U	0.000074 U
SB-15-0	4/3/2007	0.27 U	0.013 U	0.012 U	0.015 U	0.0098 U	0.033 U	0.026 U	0.38 U	0.026 U	0.015 U	0.015 U	0.019 U	0.015 U	0.011 U
SB-15-4	4/3/2007	**0.062**	**0.0022**	0.00015 U	0.00014 U	0.000077 U	0.00014 U	0.00039 U	**0.013**	0.00013 U	0.000095 U	0.00011 U	**0.0024**	0.00014 U	0.000052 U
SB-16-3.5	4/3/2007	**0.025**	**0.00055**	0.00016 U	0.00015 U	0.000082 U	0.00015 U	0.00041 U	0.0018 U	0.00013 U	0.00011 U	0.00012 U	**0.0026**	0.00015 U	0.000055 U
SB-16-9	4/3/2007	**0.12**	**0.0021**	0.00029 U	0.00027 U	0.00016 U	0.00027 U	0.00078 U	0.0034 U	0.00025 U	**0.0024**	0.00022 U	**0.005**	0.00027 U	0.00011 U
SB-17-4	4/3/2007	**0.03**	**0.0014**	0.00021 U	0.00019 U	0.00011 U	0.00019 U	0.00055 U	0.0024 U	0.00018 U	0.00014 U	0.00015 U	**0.0026**	0.00019 U	0.000074 U
SB-18-4	4/3/2007	**0.045**	**0.0011**	0.00022 U	0.00021 U	0.00012 U	0.00021 U	0.00059 U	0.0026 U	0.00019 U	0.00015 U	0.00017 U	**0.0012**	0.00021 U	0.000079 U
SB-19-3	4/3/2007	**0.1**	**0.0018**	0.00037 U	0.00035 U	0.0002 U	0.00035 U	0.001 U	**0.012**	0.00032 U	0.00025 U	0.00028 U	**0.0024**	0.00035 U	0.00014 U
SB-20-4	4/3/2007	**0.025**	0.000083 U	0.00024 U	0.00022 U	0.00013 U	0.00022 U	0.00063 U	0.0027 U	0.0002 U	0.00016 U	0.00018 U	0.00016 U	0.00022 U	0.000084 U
SB-21-4	4/3/2007	**0.094**	**0.00097**	0.00026 U	0.00024 U	0.00014 U	0.00024 U	0.00068 U	**0.014**	0.00022 U	0.00017 U	0.00019 U	**0.0037**	0.00024 U	0.000091 U
SB-22-4	4/3/2007	**0.048**	0.000067 U	0.00019 U	0.00018 U	0.00011 U	0.00018 U	0.00051 U	0.0022 U	0.00016 U	0.00013 U	0.00014 U	**0.0071**	0.00018 U	0.000068 U
SB-23-4	4/3/2007	**0.024**	0.00007 U	0.00020 U	0.00019 U	0.00011 U	0.00019 U	0.00054 U	0.0023 U	0.00017 U	0.00014 U	0.00015 U	**0.0015**	0.00019 U	0.000072 U
SB-24-4	4/3/2007	**0.044**	0.000089 U	0.00026 U	0.00024 U	0.00014 U	0.00024 U	0.00068 U	0.003 U	0.00022 U	0.00017 U	0.00019 U	**0.00089**	0.00024 U	0.000091 U
SB-25-4	4/3/2007	**0.032**	0.000074 U	0.00021 U	0.0002 U	0.00012 U	0.0002 U	0.00056 U	0.0024 U	0.00018 U	0.00014 U	0.00016 U	**0.0014**	0.0002 U	0.000075 U
SB-26-0	4/4/2007	3.9 U	*0.18 U*	0.17 U	0.22 U	0.15 U	0.47 U	0.37 U	5.4 U	0.37 U	0.22 U	0.21 U	0.27 U	0.21 U	**0.20**
SB-26-2	4/4/2007	16 U	*0.73 U*	0.68 U	0.88 U	0.59 U	2.0 U	1.6 U	23 U	1.6 U	0.89 U	0.85 U	1.2 U	0.86 U	0.65 U
SB-26-10	4/4/2007	100 U	*4.6 U*	4.3 U	5.5 U	3.7 U	13 U	9.4 U	140 U	9.6 U	5.5 U	5.3 U	6.9 U	5.4 U	4.1 U
FD-1 (SB-26-10)	4/4/2007	13 U	*0.58 U*	0.54 U	0.69 U	0.47 U	1.6 U	1.2 U	18 U	1.3 U	0.70 U	0.67 U	0.87 U	0.68 U	0.51 U
SB-26-17	4/4/2007	51 U	*2.4 U*	2.2 U	2.9 U	1.9 U	6.3 U	4.9 U	72 U	5.0 U	2.9 U	2.8 U	3.6 U	2.8 U	2.1 U
SB-26-23	4/4/2007	1.6 U	*0.073 U*	0.067 U	0.087 U	0.059 U	0.20 U	0.15 U	2.3 U	0.16 U	**0.096**	0.084 U	0.11 U	0.085 U	0.065 U
SB-27-0	4/4/2007	2.1 U	*0.096 U*	0.089 U	0.12 U	0.077 U	0.26 U	0.20 U	3.0 U	0.21 U	0.12 U	0.12 U	0.15 U	0.12 U	0.085 U
SB-27-8	4/4/2007	1.3 U	**0.31**	0.053 U	0.069 U	0.046 U	0.16 U	0.12 U	1.8 U	**0.80**	**0.53**	0.067 U	0.087 U	0.067 U	**0.054**
SB-27-12	4/4/2007	0.92 U	**0.51**	0.039 U	0.051 U	0.034 U	0.12 U	0.088 U	1.3 U	0.089 U	0.051 U	0.049 U	0.064 U	0.050 U	0.038 U
SB-28-4	4/4/2007	0.34 U	0.016 U	0.015 U	0.019 U	0.013 U	0.041 U	0.032 U	0.48 U	0.033 U	**0.025**	0.018 U	0.024 U	0.019 U	0.014 U
SB-28-8	4/4/2007	**0.097**	0.000078 U	0.00022 U	0.00021 U	0.00012 U	0.00021 U	0.00059 U	0.0026 U	0.00019 U	0.00015 U	0.00017 U	**0.0049**	0.00021 U	0.00008 U
SB-29-4	4/4/2007	**0.077**	**0.00077**	0.00019 U	0.00018 U	0.00011 U	0.00018 U	0.00051 U	0.0022 U	0.00016 U	0.00013 U	0.00014 U	**0.015**	0.00018 U	0.000068 U
SB-30-0	4/4/2007	**0.17**	**0.0018**	0.00016 U	0.00015 U	0.000085 U	0.00015 U	0.00043 U	**0.014**	0.00014 U	0.00011 U	0.00012 U	**0.0013**	0.00015 U	0.000057 U
SB-30-4	4/4/2007	**0.056**	0.000068 U	0.00020 U	0.00018 U	0.00011 U	0.00018 U	0.00052 U	0.0023 U	0.00017 U	0.00013 U	0.00015 U	**0.0025**	0.00018 U	0.00007 U
SB-31-3	4/4/2007	**0.034**	0.000072 U	0.00021 U	0.00019 U	0.00011 U	0.00019 U	0.00055 U	0.0024 U	0.00018 U	**0.0081**	0.00015 U	**0.0027**	0.00019 U	0.000073 U
SB-32-4	4/4/2007	**0.046**	0.000069 U	0.00020 U	0.00018 U	0.00011 U	0.00018 U	0.00052 U	0.0023 U	0.00017 U	0.00013 U	0.00015 U	**0.016**	0.00018 U	0.00007 U
SB-33-3.5	4/4/2007	**0.018**	0.000059 U	0.00017 U	0.00016 U	0.000089 U	0.00016 U	0.00045 U	0.002 U	0.00014 U	0.00012 U	0.00013 U	**0.0056**	0.00016 U	0.00006 U
SB-34-0	4/4/2007	0.34 U	**0.016**	0.015 U	0.019 U	0.013 U	0.042 U	0.032 U	0.48 U	0.033 U	0.019 U	0.018 U	0.24 U	0.019 U	0.014 U
SB-35-4	4/4/2007	**0.016**	0.000073 U	0.00021 U	0.00019 U	0.00011 U	0.00019 U	0.00055 U	0.0024 U	0.00018 U	0.00014 U	0.00016 U	**0.001**	0.00019 U	0.000074 U

Table D-1
RI Soil Analytical Results for VOCs (mg/kg)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/Sample	Sampling Date	Acetone	Benzene	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	Bromomethane	2-Butanone (MEK)	n-Butylbenzene	sec-Butylbenzene	tert-Butylbenzene	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene
SB-36-0	4/4/2007	**0.16**	**0.0025**	0.0002 U	0.00018 U	0.00011 U	0.00018 U	0.00052 U	**0.015**	0.00017 U	0.00013 U	0.00015 U	**0.0015**	0.00018 U	0.000069 U
SB-36-4	4/4/2007	0.34 U	0.016 U	0.015 U	0.019 U	0.013 U	0.042 U	0.032 U	0.48 U	**0.067**	**0.048**	0.018 U	0.024 U	0.019 U	0.014 U
SB-37-0	4/4/2007	**0.34**	**0.0012**	0.00015 U	0.00014 U	0.000079 U	0.00014 U	0.0004 U	**0.053**	0.00013 U	0.000098 U	0.00011 U	**0.019**	0.00014 U	0.000053 U
SB-37-4	4/4/2007	**0.029**	0.000074 U	0.00021 U	0.0002 U	0.00012 U	0.0002 U	0.00056 U	0.0024 U	0.00018 U	0.00014 U	0.00016 U	**0.0006**	0.0002 U	0.000075 U
SB-37-8	4/4/2007	**0.12**	**0.0018**	0.00026 U	0.00024 U	0.00014 U	0.00024 U	0.0007 U	0.003 U	0.00022 U	0.00018 U	0.0002 U	**0.0029**	0.00024 U	0.000094 U
SB-38-0	4/4/2007	**0.26**	0.000054 U	0.00016 U	0.00014 U	0.000082 U	0.00014 U	0.00041 U	**0.021**	0.00013 U	0.00011 U	0.00012 U	**0.00058**	0.00014 U	0.000055 U
SB-38-4	4/4/2007	**0.14**	0.000075 U	0.00022 U	0.0002 U	0.00012 U	0.0002 U	0.00057 U	**0.018**	0.00018 U	0.00015 U	0.00016 U	**0.0023**	0.0002 U	0.000077 U
SB-39-0	4/4/2007	**0.26**	**0.0018**	0.00017 U	0.00016 U	0.000091 U	0.00016 U	0.00046 U	**0.042**	0.00015 U	0.00012 U	0.00013 U	**0.0013**	0.00016 U	0.000061 U
SB-39-2.5	4/4/2007	**0.2**	**0.0021**	0.00017 U	0.00016 U	0.000089 U	0.00016 U	0.00045 U	**0.034**	0.00014 U	0.00011 U	0.00013 U	**0.0033**	0.00016 U	0.00006 U
SB-40-2	4/4/2007	3.7 U	*0.17 U*	0.16 U	0.21 U	0.14 U	0.46 U	0.36 U	5.2 U	0.36 U	0.21 U	0.20 U	0.26 U	0.20 U	0.16 U
SB-40-4	4/4/2007	0.95 U	*0.044 U*	0.041 U	0.053 U	0.036 U	0.12 U	0.090 U	1.4 U	0.092 U	0.53 U	0.051 U	0.066 U	0.051 U	0.039 U
SB-40-8	4/5/2007	**0.089**	**0.0020**	0.00028 U	0.00026 U	0.00015 U	0.00026 U	0.00074 U	0.0032 U	0.00024 U	0.00019 U	0.00021 U	**0.003**	0.00026 U	0.000099 U
SB-41-4	4/5/2007	**0.097**	**0.0012**	0.00028 U	0.00026 U	0.00016 U	0.00026 U	0.00076 U	**0.012**	0.00024 U	0.00019 U	0.00021 U	**0.0029**	0.00026 U	0.00011 U
SB-42-0	4/5/2007	**0.12**	**0.087**	0.00017 U	0.00016 U	0.000089 U	0.00016 U	0.00045 U	**0.0077**	0.00014 U	0.00011 U	0.00013 U	**0.0038**	0.00016 U	0.00006 U
SB-42-4	4/5/2007	0.30 U	**0.056**	0.013 U	0.017 U	0.012 U	0.037 U	0.029 U	0.43 U	0.029 U	**0.025**	0.016 U	0.021 U	0.017 U	0.013 U
SB-43-4	4/5/2007	**0.13**	**0.0043**	0.0003 U	0.00027 U	0.00016 U	0.00027 U	0.00079 U	**0.022**	0.00025 U	**0.0021**	0.00022 U	**0.0046**	0.00027 U	0.00011 U
SB-44-4	4/5/2007	**0.041**	**0.0017**	0.00021 U	0.00019 U	0.00011 U	0.00019 U	0.00055 U	0.0024 U	0.00018 U	0.00014 U	0.00015 U	**0.0038**	0.00019 U	0.000074 U
SB-45-3	4/5/2007	0.32 U	0.015 U	0.014 U	0.018 U	0.012 U	0.039 U	0.031 U	0.45 U	**2.5**	**1.8**	**0.13**	0.023 U	0.018 U	0.013 U
SB-45-5	4/5/2007	**0.04**	**0.0025**	0.00026 U	0.00024 U	0.00014 U	0.00024 U	0.00069 U	0.003 U	0.00022 U	0.00017 U	0.00019 U	**0.00093**	0.00024 U	0.000092 U
SB-45-12	4/5/2007	0.42 U	0.020 U	0.018 U	0.024 U	0.016 U	0.051 U	0.040 U	0.59 U	**0.16**	**0.097**	0.023 U	0.030 U	0.023 U	0.018 U
SB-46-4	4/5/2007	0.40 U	0.019 U	0.017 U	0.022 U	0.015 U	0.048 U	0.038 U	0.56 U	**0.35**	**0.11**	0.021 U	0.028 U	0.022 U	0.016 U
FD-2 (SB-46-4)	4/5/2007	0.35 U	0.017 U	0.015 U	0.02 U	0.013 U	0.043 U	0.034 U	0.50 U	**0.17**	**0.13**	0.019 U	0.025 U	0.019 U	0.015 U
SB-46-8	4/5/2007	**0.096**	**0.013**	0.00026 U	0.00024 U	0.00014 U	0.00024 U	0.00068 U	**0.012**	0.00022 U	0.00017 U	0.00019 U	**0.0037**	0.00024 U	0.000092 U
SB-47-0	4/5/2007	3.7 U	*0.17 U*	0.16 U	0.21 U	0.14 U	0.45 U	0.35 U	5.2 U	0.36 U	0.21 U	0.20 U	0.26 U	0.20 U	**0.24**
FD-3 (SB-47-0)	4/5/2007	2.9 U	*0.13 U*	0.12 U	0.16 U	0.11 U	0.35 U	0.27 U	4.0 U	0.28 U	0.16 U	0.15 U	0.20 U	0.16 U	0.12 U
SB-48-0	4/5/2007	**0.13**	**0.00098**	0.00015 U	0.00014 U	0.00008 U	0.00014 U	0.0004 U	**0.012**	0.00013 U	0.000099 U	0.00011 U	**0.0017**	0.00014 U	0.000054 U
SB-49-0	4/5/2007	**0.066**	0.000066 U	0.00019 U	0.00018 U	0.00011 U	0.00018 U	0.00051 U	**0.0064**	0.00016 U	0.00013 U	0.00014 U	**0.0046**	0.00018 U	0.000068 U
SB-50-4	4/23/2007	**0.016**	0.000061 U	0.00018 U	0.00016 U	0.000092 U	0.00016 U	0.00046 U	0.002 U	0.00015 U	0.00012 U	0.00013 U	**0.00038**	0.00016 U	**0.00048**
SB-51-2	4/23/2007	**0.029**	0.000064 U	0.00019 U	0.00017 U	0.000098 U	0.00017 U	0.00049 U	0.0021 U	0.00016 U	0.00013 U	0.00014 U	**0.00076**	0.00017 U	0.000066 U
SB-51-4.5	4/23/2007	**0.038**	0.000098 U	0.00028 U	0.00026 U	0.00015 U	0.00026 U	0.00075 U	0.0032 U	0.00024 U	0.00019 U	0.00021 U	**0.00037**	0.00026 U	0.0001 U
SB-52-2	4/23/2007	0.40 U	**0.055**	0.017 U	0.022 U	0.015 U	0.048 U	0.038 U	0.56 U	**0.19**	**0.24**	0.021 U	**0.033**	0.022 U	0.017 U
SB-53-3	4/23/2007	**0.037**	**0.0046**	0.00024 U	0.00022 U	0.00013 U	0.00022 U	0.00064 U	**0.0076**	0.00021 U	0.00016 U	0.00018 U	**0.0034**	0.00022 U	0.000086 U
SB-54-1.5	4/24/2007	**0.058**	**0.0043**	0.00017 U	0.00016 U	0.000091 U	0.00016 U	0.00046 U	**0.0087**	0.00015 U	0.00012 U	0.00013 U	**0.0026**	0.00016 U	0.000061 U
SB-55-1.5*	6/13/2007	**0.016**	**0.025**	0.00026 U	0.00034 U	0.00021 U	0.00035 U	0.00094 U	0.0021 U	0.00018 U	0.00014 U	0.00013 U	**0.00072**	0.00014 U	0.000094 U
SB-55-3	6/13/2007	0.41 U	**0.32**	0.018 U	0.023 U	0.016 U	0.050 U	0.039 U	0.58 U	**0.11**	**0.29**	0.022 U	0.029 U	0.022 U	0.017 U
SB-55-7.5	6/13/2007	**0.70**	**0.84**	0.028 U	0.036 U	0.025 U	0.080 U	0.062 U	0.92 U	0.063 U	**0.082**	0.035 U	0.046 U	0.035 U	0.027 U
SB-56-4	6/13/2007	9.3 U	**1.1**	0.40 U	0.51 U	0.35 U	1.2 U	0.88 U	14 U	16 U	**0.57**	0.50 U	0.65 U	0.50 U	**800**
SB-56-7.5	6/13/2007	**0.12**	**0.0041**	0.00032 U	0.0004 U	0.00025 U	0.00043 U	0.0012 U	**0.016**	0.00022 U	0.00016 U	0.00016 U	**0.015**	0.00016 U	**0.0066**
SB-57-4	6/14/2007	**0.07**	**0.013**	0.00025 U	0.00032 U	0.0002 U	0.00034 U	0.0009 U	**0.011**	0.00017 U	0.00013 U	0.00013 U	**0.003**	0.00013 U	0.00009 U
SB-57-7	6/14/2007	**0.11**	**0.021**	0.00027 U	0.00035 U	0.00022 U	0.00037 U	0.00099 U	**0.015**	0.00019 U	0.00014 U	0.00014 U	**0.011**	0.00014 U	0.000099 U
SB-58-4	6/14/2007	0.28 U	0.013 U	0.012 U	0.016 U	0.011 U	0.034 U	0.027 U	0.39 U	0.027 U	0.016 U	0.015 U	0.020 U	0.015 U	0.012 U
SB-58-7	6/14/2007	**0.036**	**0.0019**	0.00026 U	0.00034 U	0.00021 U	0.00035 U	0.00094 U	**0.0046**	0.00018 U	0.00014 U	0.00013 U	**0.00072**	0.00014 U	0.000094 U
SB-58-13	6/14/2007	**0.018**	0.00012 U	0.00021 U	0.00027 U	0.00017 U	0.00029 U	0.00076 U	0.0017 U	0.00015 U	0.00011 U	0.00011 U	**0.0014**	0.00011 U	0.000076 U
SB-59-4	6/14/2007	0.86 U	*0.040 U*	0.037 U	0.048 U	0.032 U	0.11 U	0.082 U	1.3 U	0.083 U	0.048 U	0.046 U	0.06 U	0.047 U	0.036 U
SB-60-4	6/14/2007	2.9 U	*0.14 U*	0.13 U	0.16 U	0.11 U	0.36 U	0.28 U	4.1 U	0.28 U	**0.26**	0.16 U	0.21 U	0.16 U	0.12 U
SB-61-4	6/14/2007	**0.041**	0.00013 U	0.00023 U	0.0003 U	0.00018 U	0.00031 U	0.00083 U	0.0018 U	0.00016 U	0.00012 U	0.00012 U	**0.0095**	0.00012 U	0.000083 U
SB-61-7	6/14/2007	**0.15**	**0.0015**	0.00031 U	0.0004 U	0.00025 U	0.00042 U	0.0012 U	0.0025 U	0.00022 U	0.00016 U	0.00016 U	**0.02**	0.00016 U	0.00012 U
SB-62-4	6/14/2007	0.74 U	**0.14**	0.032 U	0.041 U	0.028 U	0.09 U	0.070 U	1.1 U	**3.0**	**3.2**	**0.17**	**0.089**	0.040 U	0.030 U
SB-62-11.5	6/14/2007	0.45 U	**0.37**	0.019 U	0.025 U	0.017 U	0.055 U	0.043 U	0.63 U	0.044 U	0.025 U	0.024 U	**0.049**	0.024 U	0.019 U
DUP-1-0614-7 (SB-62-11.5)	6/14/2007	**0.53**	**0.77**	0.23 U	0.029 U	0.02 U	0.065 U	0.050 U	0.75 U	0.051 U	**0.034**	0.029 U	**0.039**	0.029 U	0.022 U

Table D-1
RI Soil Analytical Results for VOCs (mg/kg)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/Sample	Sampling Date	Acetone	Benzene	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	Bromomethane	2-Butanone (MEK)	n-Butylbenzene	sec-Butylbenzene	tert-Butylbenzene	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene
SB-62-17	6/14/2007	**0.039**	**0.024**	0.00023 U	0.00029 U	0.00018 U	0.00031 U	0.00082 U	0.0008 U	**0.029**	**0.024**	0.00012 U	**0.0025**	0.00012 U	0.000082 U
SB-62-20	6/14/2007	**0.085**	**0.0076**	0.00022 U	0.00028 U	0.00017 U	0.00029 U	0.00078 U	0.0017 U	0.00015 U	0.00011 U	0.00011 U	**0.02**	0.00011 U	0.000078 U
SB-63-3.5	6/14/2007	24 U	*1.1 U*	0.99 U	1.3 U	0.86 U	2.9 U	2.2 U	33 U	2.3 U	**2.3**	1.3 U	1.7 U	1.3 U	0.95 U
SB-63-5	6/14/2007	15 U	*0.69 U*	0.64 U	0.83 U	0.56 U	1.9 U	1.5 U	22 U	**9.5**	**7.1**	0.80 U	1.1 U	0.81 U	0.61 U
SB-64-7	6/14/2007	**0.06**	0.00018 U	0.00031 U	0.0004 U	0.00025 U	0.00042 U	0.0012 U	**0.0071**	0.00022 U	0.00016 U	0.00016 U	**0.0042**	0.00016 U	0.00012 U
SB-65-4	6/15/2007	**0.018**	**0.0025**	0.00026 U	0.00033 U	0.0002 U	0.00035 U	0.00093 U	0.002 U	0.00018 U	0.00014 U	0.00013 U	**0.0013**	0.00014 U	0.000093 U
SB-66-3.5	6/15/2007	**0.021**	0.00014 U	0.00024 U	0.00031 U	0.00019 U	0.00032 U	0.00086 U	0.0019 U	0.00017 U	0.00013 U	0.00012 U	**0.0014**	0.00013 U	0.000086 U
SB-67-3	6/15/2007	**0.016**	0.00013 U	0.00023 U	0.00029 U	0.00018 U	0.00031 U	0.00082 U	0.0018 U	0.00016 U	0.00012 U	0.00012 U	**0.0075**	0.00012 U	0.000082 U
SB-68-4	6/27/2007	**0.028**	**0.0025**	0.00018 U	0.00023 U	0.00014 U	0.00025 U	0.00065 U	0.0014 U	0.00013 U	0.000092 U	0.000089 U	**0.0045**	0.000092 U	0.000065 U
SB-69-3	10/20/2009	--	**0.0044**	--	--	--	--	--	--	--	--	--	--	--	--
SB-70-4	10/20/2009	--	**0.0019**	--	--	--	--	--	--	--	--	--	--	--	--
SB-70-4-R	10/20/2009	--	**0.0016**	--	--	--	--	--	--	--	--	--	--	--	--
SB-71-3.5	10/20/2009	--	**0.0070**	--	--	--	--	--	--	--	--	--	--	--	--
SB-72-3.5	10/20/2009	--	**0.0034**	--	--	--	--	--	--	--	--	--	--	--	--
SB-73-3.5	10/21/2009	--	**0.0076**	--	--	--	--	--	--	--	--	--	--	--	--
SB-73-3.5-R	10/21/2009	--	**0.0088**	--	--	--	--	--	--	--	--	--	--	--	--
SB-74-3.5	10/21/2009	--	**0.0078**	--	--	--	--	--	--	--	--	--	--	--	--
SB-75-6.5	10/21/2009	--	**0.0066**	--	--	--	--	--	--	--	--	--	--	--	--
MW-1-4	4/23/2007	**0.082**	0.000095 U	0.00027 U	0.00025 U	0.00015 U	0.00025 U	0.00072 U	**0.012**	0.00023 U	0.00018 U	0.0002 U	**0.0015**	0.00025 U	0.000097 U
MW-2-4	4/23/2007	**0.14**	0.000099 U	0.00028 U	0.00026 U	0.00015 U	0.00026 U	0.00075 U	**0.022**	0.00024 U	0.00019 U	0.00021 U	**0.003**	0.00026 U	0.00011 U
MW-3-4	4/23/2007	**0.024**	**0.036**	0.00025 U	0.00023 U	0.00014 U	0.00023 U	0.00066 U	0.0028 U	0.00021 U	0.00017 U	0.00018 U	**0.00061**	0.00023 U	0.000088 U
MW-3-9	4/23/2007	**1**	**0.033**	0.00033 U	0.00030 U	0.00018 U	0.0003 U	0.00087 U	**0.029**	**0.00035**	0.00022 U	0.00024 U	**0.012**	0.00030 U	0.00012 U
MW-4-4	4/23/2007	**0.043**	0.000093 U	0.00027 U	0.00025 U	0.00015 U	0.00025 U	0.00071 U	0.0031 U	0.00023 U	**0.0059**	0.0002 U	**0.0043**	0.00025 U	0.000095 U
MW-5-5	4/24/2007	**0.23**	**0.0014**	0.00024 U	0.00022 U	0.00013 U	0.00022 U	0.00063 U	**0.043**	0.0002 U	0.00016 U	0.00018 U	**0.042**	0.00022 U	0.000084 U
MW-5-20	4/24/2007	**0.062**	0.000069 U	0.00020 U	0.00018 U	0.00011 U	0.00018 U	0.00053 U	**0.0081**	0.00017 U	0.00014 U	0.00015 U	**0.0027**	0.00018 U	0.000071 U
MW-6-3	6/13/2007	**0.075**	0.00015 U	0.00027 U	0.00034 U	0.00021 U	0.00036 U	0.00097 U	0.0021 U	0.00019 U	0.00014 U	0.00014 U	**0.0059**	0.00014 U	0.000097 U
MW-7-4	6/13/2007	0.42 U	0.019 U	0.018 U	0.023 U	0.016 U	0.051 U	0.040 U	0.58 U	0.040 U	**0.46**	0.022 U	0.029 U	0.023 U	0.017 U
MW-7-9	6/13/2007	28 U	*1.3 U*	1.2 U	1.6 U	1.1 U	3.4 U	2.7 U	40 U	**3.0**	**2.1**	1.5 U	2.0 U	1.5 U	1.2 U
MW-7-12	6/13/2007	4.5 U	**0.29**	0.19 U	0.25 U	0.17 U	0.54 U	0.42 U	6.3 U	0.43 U	0.25 U	0.24 U	0.31 U	0.24 U	0.19 U
MW-8-5	6/13/2007	**0.034**	0.00013 U	0.00023 U	0.00029 U	0.00018 U	0.00031 U	0.00081 U	0.0018 U	0.00016 U	0.00012 U	0.00012 U	**0.0015**	0.00012 U	0.000081 U
MW-9-4	6/14/2007	**0.05**	**0.0013**	0.00019 U	0.00024 U	0.00015 U	0.00025 U	0.00067 U	**0.0083**	0.00013 U	0.000095 U	0.000092 U	**0.0034**	0.000095 U	**0.00053**
MW-10-4	10/21/2009	--	0.0018 U	--	--	--	--	--	--	--	--	--	--	--	--
MTCA Method A CUL (mg/kg)		**--**	**0.03**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
MTCA Method B CUL (mg/kg)		**8,000**	**18**	**--**	**--**	**16**	**130**	**110**	**48,000**	**--**	**--**	**--**	**8,000**	**7.7**	**1,600**

Yellow highlighted detections are those values exceeding the appropriate MTCA cleanup levels (Method B CULs were accessed in October 2009).

Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.

Italicized non-detected values are detection or reporting limits that exceed the appropriate MTCA cleanup level.

U = Not detected at or above the reporting limit.

-- = Not Analyzed or Not Applicable

All units are in mg/kg (ppm)

* This sample (SB-55-1.5) was inadvertently labeled MW-7-1.5 when delivered to the laboratory for analysis.

Table D-1
RI Soil Analytical Results for VOCs (mg/kg)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/Sample	Sampling Date	Chloroethane (Ethyl Chloride)	Chloroform	Chloromethane (Methyl Chloride)	2-Chlorotoluene	4-Chlorotoluene	1,2-Dibromo-3-chloropropane (DBCP)	Dibromochloromethane	1,2-Dibromoethane (EDB)	Dibromomethane (Methylene Bromide)	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane (CFC 12)	1,1-Dichloroethane (1,1-DCA)	1,2-Dichloroethane (1,2-DCA; EDC)	1,1-Dichloroethene (1,1-DCE)	cis-1,2-Dichloroethene (cis-1,2-DCE)
SB-1-4	4/2/2007	0.00034 U	0.00014 U	0.00032 U	0.00013 U	0.00017 U	0.00062 U	0.00017 U	0.00016 U	0.00032 U	0.00021 U	**0.00058**	**0.00084**	0.00019 U	0.00011 U	0.00017 U	0.00069 U	0.00064 U
SB-2-3	4/2/2007	0.00037 U	0.00015 U	0.00036 U	0.00014 U	0.00018 U	0.00069 U	0.00019 U	0.00018 U	0.00036 U	0.00023 U	0.00034 U	**0.00041**	**0.0031**	0.00012 U	0.00018 U	0.00076 U	**0.00091**
SB-3-4	4/2/2007	0.031 U	0.017 U	0.025 U	0.020 U	0.016 U	0.18 U	0.015 U	*0.013 U*	0.018 U	0.015 U	0.019 U	0.016 U	0.030 U	0.017 U	0.021 U	0.022 U	**8.6**
SB-4-4	4/2/2007	0.00032 U	0.00013 U	0.00031 U	0.00012 U	0.00016 U	0.00059 U	0.00016 U	0.00015 U	0.00031 U	0.00020 U	0.00029 U	**0.00038**	0.00018 U	0.000097 U	0.00016 U	0.00066 U	0.00061 U
SB-5-0	4/2/2007	0.00029 U	0.00012 U	0.00028 U	0.00011 U	0.00015 U	0.00054 U	0.00015 U	0.00014 U	0.00028 U	0.00018 U	0.00027 U	0.00028 U	**0.00059**	0.000089 U	0.00014 U	0.0006 U	0.00055 U
SB-5-3.5	4/2/2007	0.00033 U	0.00013 U	0.00031 U	0.00012 U	0.00016 U	0.0006 U	0.00017 U	0.00016 U	0.00031 U	0.0002 U	0.0003 U	0.00031 U	0.00018 U	0.000099 U	0.00016 U	0.00067 U	0.00062 U
SB-5-8	4/2/2007	0.00039 U	0.00016 U	0.00037 U	0.00015 U	0.00019 U	0.00071 U	0.0002 U	0.00018 U	0.00037 U	0.00023 U	0.00035 U	0.00037 U	0.00021 U	0.00012 U	0.00019 U	0.00079 U	**0.0047**
SB-6-3	4/2/2007	0.032 U	0.018 U	0.025 U	0.021 U	0.017 U	0.18 U	0.015 U	*0.014 U*	0.018 U	0.016 U	0.019 U	0.016 U	0.031 U	0.017 U	0.021 U	0.022 U	**11**
SB-7-4	4/2/2007	0.00033 U	0.00013 U	0.00031 U	0.00012 U	0.00016 U	0.0006 U	0.00017 U	0.00016 U	0.00031 U	0.0002 U	0.0003 U	**0.00044**	**0.00072**	**0.00036**	0.00016 U	0.00067 U	0.00062 U
SB-8-4	4/2/2007	0.00023 U	0.000091 U	0.00022 U	0.000085 U	0.00012 U	0.00043 U	0.00012 U	0.00011 U	0.00022 U	**0.00045**	**0.00046**	0.00022 U	**0.00057**	**0.001**	0.00012 U	0.00048 U	**0.00062**
SB-9-4	4/3/2007	0.020 U	0.011 U	0.016 U	0.013 U	0.011 U	0.12 U	0.0094 U	*0.0084 U*	0.012 U	**0.018**	0.012 U	0.0099 U	0.019 U	0.011 U	0.013 U	0.014 U	0.014 U
SB-10-9	4/3/2007	0.00037 U	0.00015 U	0.00036 U	0.00014 U	0.00018 U	0.00069 U	0.00019 U	0.00018 U	0.00036 U	0.00023 U	0.00034 U	0.00036 U	**0.00042**	0.00012 U	0.00018 U	0.00076 U	**0.0025**
SB-11-0	4/3/2007	0.00028 U	0.00011 U	0.00027 U	0.00011 U	0.00014 U	0.00052 U	0.00014 U	0.00013 U	0.00027 U	0.00017 U	0.00025 U	0.00027 U	**0.00038**	0.000085 U	0.00014 U	0.00057 U	0.00053 U
SB-11-5	4/3/2007	0.00034 U	0.00014 U	0.00032 U	0.00013 U	0.00017 U	0.00062 U	0.00017 U	0.00016 U	0.00032 U	0.00020 U	0.0003 U	0.00032 U	0.00019 U	0.00011 U	0.00016 U	0.00068 U	0.00063 U
SB-11-9	4/3/2007	0.00062 U	0.00025 U	0.00059 U	0.00023 U	0.0003 U	0.0012 U	0.00031 U	0.0003 U	0.00059 U	0.00038 U	0.00056 U	0.00059 U	0.00034 U	0.00019 U	0.0003 U	0.0013 U	0.0012 U
SB-11-15	4/3/2007	0.00031 U	0.00012 U	0.00029 U	0.00012 U	0.00015 U	0.00056 U	0.00016 U	0.00015 U	0.00029 U	0.00019 U	0.00028 U	0.00029 U	0.00017 U	0.000092 U	0.00015 U	0.00062 U	0.00058 U
SB-12-4	4/3/2007	0.00032 U	0.00013 U	0.0003 U	0.00012 U	0.00016 U	0.00059 U	0.00016 U	0.00015 U	0.00030 U	0.00019 U	0.00029 U	0.0003 U	**0.00052**	0.000096 U	0.00016 U	0.00065 U	0.0006 U
SB-13-10	4/3/2007	0.00032 U	0.00013 U	0.00031 U	0.00012 U	0.00016 U	0.00059 U	0.00016 U	0.00015 U	0.00031 U	0.0002 U	0.00029 U	0.00031 U	0.00018 U	0.000097 U	0.00016 U	**0.00069**	**2.50**
SB-14-4	4/3/2007	0.00032 U	0.00013 U	0.0003 U	0.00012 U	0.00016 U	0.00059 U	0.00016 U	0.00015 U	0.00030 U	0.00019 U	0.00029 U	0.0003 U	0.00018 U	0.000096 U	0.00016 U	0.00065 U	0.0006 U
SB-15-0	4/3/2007	0.020 U	0.012 U	0.016 U	0.013 U	0.011 U	0.12 U	0.0095 U	*0.0085 U*	0.012 U	**0.030**	0.012 U	0.011 U	0.020 U	0.011 U	0.014 U	0.014 U	**0.26**
SB-15-4	4/3/2007	0.00022 U	**0.0018**	0.00021 U	0.000081 U	0.00011 U	0.00041 U	0.00011 U	0.00011 U	0.00021 U	**0.00053**	0.0002 U	**0.0004**	0.00013 U	0.000067 U	0.00011 U	0.00045 U	**0.061**
SB-16-3.5	4/3/2007	0.00024 U	0.000093 U	0.00023 U	0.000087 U	0.00012 U	0.00044 U	0.00012 U	0.00011 U	0.00023 U	0.00015 U	0.00022 U	0.00023 U	0.00013 U	0.000072 U	0.00012 U	0.00048 U	**0.0092**
SB-16-9	4/3/2007	0.00045 U	0.00018 U	0.00043 U	0.00017 U	0.00022 U	0.00083 U	0.00023 U	0.00021 U	0.00043 U	0.00027 U	0.0004 U	0.00043 U	0.00025 U	0.00014 U	0.00022 U	0.00092 U	**0.0047**
SB-17-4	4/3/2007	0.00032 U	0.00013 U	0.0003 U	0.00012 U	0.00016 U	0.00058 U	0.00016 U	0.00015 U	0.0003 U	0.00019 U	0.00029 U	0.0003 U	0.00018 U	0.000096 U	0.00015 U	0.00064 U	**0.0036**
SB-18-4	4/3/2007	0.00034 U	0.00014 U	0.00032 U	0.00013 U	0.00017 U	0.00062 U	0.00017 U	0.00016 U	0.00032 U	0.00021 U	0.00031 U	0.00032 U	0.00019 U	0.00011 U	0.00017 U	0.00069 U	**0.0026**
SB-19-3	4/3/2007	0.00057 U	0.00023 U	0.00054 U	0.00021 U	0.00028 U	0.0011 U	0.00029 U	0.00027 U	0.00054 U	0.00035 U	0.00052 U	0.00054 U	0.00032 U	0.00018 U	0.00028 U	0.0012 U	**0.0033**
SB-20-4	4/3/2007	0.00036 U	0.00015 U	0.00034 U	0.00014 U	0.00018 U	0.00067 U	0.00018 U	0.00017 U	0.00034 U	0.00022 U	0.00033 U	0.00034 U	0.0002 U	0.00011 U	0.00018 U	0.00074 U	0.00068 U
SB-21-4	4/3/2007	0.00039 U	0.00016 U	0.00037 U	0.00015 U	0.00019 U	0.00072 U	0.0002 U	0.00019 U	0.00037 U	0.00024 U	0.00035 U	0.00037 U	0.00022 U	0.00012 U	0.00019 U	0.0008 U	**0.028**
SB-22-4	4/3/2007	0.00029 U	0.00012 U	0.00028 U	0.00011 U	0.00014 U	0.00054 U	0.00015 U	0.00014 U	0.00028 U	0.00018 U	0.00026 U	0.00028 U	0.00016 U	0.000088 U	0.00014 U	0.00059 U	**0.0012**
SB-23-4	4/3/2007	0.00031 U	0.00012 U	0.00029 U	0.00012 U	0.00015 U	0.00057 U	0.00016 U	0.00015 U	0.00029 U	0.00019 U	0.00028 U	0.00029 U	0.00017 U	0.000093 U	0.00015 U	0.00063 U	**0.00072**
SB-24-4	4/3/2007	0.00039 U	0.00016 U	0.00037 U	0.00015 U	0.00019 U	0.00072 U	0.0002 U	0.00019 U	0.00037 U	0.00024 U	0.00035 U	0.00037 U	0.00022 U	0.00012 U	0.00019 U	0.0008 U	**0.0011**
SB-25-4	4/3/2007	0.00032 U	0.00013 U	0.00031 U	0.00012 U	0.00016 U	0.00059 U	0.00016 U	0.00015 U	0.00031 U	0.0002 U	0.00029 U	0.00031 U	0.00018 U	0.000097 U	0.00016 U	0.00066 U	**0.049**
SB-26-0	4/4/2007	0.29 U	0.17 U	0.23 U	0.19 U	0.15 U	*1.7 U*	0.14 U	*0.13 U*	0.17 U	0.15 U	0.18 U	0.15 U	0.28 U	0.16 U	0.20 U	0.20 U	**4.8**
SB-26-2	4/4/2007	1.3 U	0.67 U	0.95 U	0.78 U	0.62 U	*6.9 U*	0.57 U	*0.51 U*	0.68 U	0.59 U	0.71 U	0.61 U	1.2 U	0.63 U	0.80 U	0.83 U	0.81 U
SB-26-10	4/4/2007	7.5 U	4.2 U	5.9 U	4.9 U	3.9 U	*43 U*	3.6 U	*3.2 U*	4.3 U	3.7 U	4.5 U	3.8 U	7.2 U	4.0 U	5.0 U	5.2 U	**1200**
FD-1 (SB-26-10)	4/4/2007	0.95 U	0.53 U	0.75 U	0.61 U	0.49 U	*5.5 U*	0.45 U	*0.40 U*	0.54 U	0.47 U	0.56 U	0.48 U	0.91 U	0.50 U	0.63 U	**1.0**	**780**
SB-26-17	4/4/2007	3.9 U	2.2 U	3.1 U	2.5 U	2.0 U	*23 U*	1.9 U	*1.7 U*	2.2 U	1.9 U	2.3 U	2.0 U	3.7 U	2.1 U	2.6 U	2.7 U	**790**
SB-26-23	4/4/2007	0.12 U	0.066 U	0.094 U	0.077 U	0.061 U	0.69 U	0.057 U	*0.051 U*	0.067 U	0.059 U	0.071 U	0.060 U	0.12 U	0.063 U	0.079 U	0.082 U	**22**
SB-27-0	4/4/2007	0.16 U	0.087 U	0.13 U	0.11 U	0.081 U	*0.90 U*	0.075 U	*0.067 U*	0.089 U	0.077 U	0.093 U	0.079 U	0.16 U	0.083 U	0.11 U	0.11 U	**4.4**
SB-27-8	4/4/2007	0.094 U	0.052 U	0.074 U	0.061 U	0.048 U	0.54 U	0.045 U	*0.040 U*	0.053 U	0.046 U	0.056 U	0.048 U	0.091 U	0.050 U	0.062 U	**0.098**	**200**
SB-27-12	4/4/2007	0.070 U	0.039 U	0.055 U	0.045 U	0.036 U	0.40 U	0.033 U	*0.030 U*	0.040 U	0.034 U	0.041 U	0.035 U	0.067 U	**0.040**	0.046 U	**0.072**	**160**
SB-28-4	4/4/2007	0.026 U	0.15 U	0.020 U	0.017 U	0.013 U	0.15 U	0.012 U	*0.011 U*	0.015 U	0.013 U	0.015 U	0.013 U	0.025 U	0.014 U	0.017 U	0.018 U	**0.037**
SB-28-8	4/4/2007	0.00034 U	0.00014 U	0.00033 U	0.00013 U	0.00017 U	0.00063 U	0.00017 U	0.00016 U	0.00033 U	0.00021 U	0.00031 U	0.00033 U	0.00019 U	0.00011 U	0.00017 U	0.0007 U	**0.0028**
SB-29-4	4/4/2007	0.00029 U	0.00012 U	0.00028 U	0.00011 U	0.00015 U	0.00054 U	0.00015 U	0.00014 U	0.00028 U	0.00018 U	0.00027 U	0.00028 U	**0.00033**	0.00089 U	0.00014 U	0.0006 U	**0.68**
SB-30-0	4/4/2007	0.00025 U	**0.00044**	0.00024 U	0.00009 U	0.00012 U	0.00045 U	0.00013 U	0.00012 U	0.00024 U	0.00015 U	0.00022 U	0.00024 U	0.00014 U	0.000074 U	0.00012 U	0.0005 U	**0.007**
SB-30-4	4/4/2007	0.0003 U	**0.0004**	0.00028 U	0.00011 U	0.00015 U	0.00055 U	0.00015 U	0.00014 U	0.00028 U	0.00018 U	0.00027 U	0.00028 U	0.00017 U	0.00009 U	0.00015 U	0.00061 U	**0.05**
SB-31-3	4/4/2007	0.00032 U	0.00013 U	0.0003 U	0.00012 U	0.00016 U	0.00058 U	0.00016 U	0.00015 U	0.0003 U	0.00019 U	0.00028 U	0.0003 U	0.00018 U	0.000095 U	0.00015 U	0.00064 U	**0.11**
SB-32-4	4/4/2007	0.0003 U	0.00012 U	0.00029 U	0.00011 U	0.00015 U	0.00055 U	0.00015 U	0.00014 U	0.00029 U	0.00018 U	0.00027 U	0.00029 U	0.00017 U	0.000091 U	0.00015 U	0.00061 U	**0.011**
SB-33-3.5	4/4/2007	0.00026 U	0.00011 U	0.00025 U	0.000094 U	0.00013 U	0.00047 U	0.00013 U	0.00012 U	0.00025 U	**0.00044**	0.00023 U	0.00025 U	0.00014 U	0.000078 U	0.00013 U	0.00053 U	**0.0031**
SB-34-0	4/4/2007	0.026 U	**0.021**	0.025 U	0.017 U	0.014 U	0.013 U	0.013 U	*0.011 U*	0.015 U	0.013 U	0.016 U	0.013 U	**0.04**	0.014 U	0.017 U	0.018 U	**5.8**
SB-35-4	4/4/2007	0.00032 U	0.00013 U	0.0003 U	0.00012 U	0.00016 U	0.00058 U	0.00016 U	0.00015 U	0.0003 U	0.00019 U	0.00029 U	0.0003 U	0.00018 U	0.000096 U	0.00016 U	0.00065 U	**0.00066**

Table D-1
RI Soil Analytical Results for VOCs (mg/kg)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/Sample	Sampling Date	Chloroethane (Ethyl Chloride)	Chloroform	Chloromethane (Methyl Chloride)	2-Chlorotoluene	4-Chlorotoluene	1,2-Dibromo-3-chloropropane (DBCP)	Dibromochloromethane	1,2-Dibromoethane (EDB)	Dibromomethane (Methylene Bromide)	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane (CFC 12)	1,1-Dichloroethane (1,1-DCA)	1,2-Dichloroethane (1,2-DCA; EDC)	1,1-Dichloroethene (1,1-DCE)	cis-1,2-Dichloroethene (cis-1,2-DCE)
SB-36-0	4/4/2007	0.0003 U	0.00012 U	0.00028 U	0.00011 U	0.00015 U	0.00055 U	0.00015 U	0.00014 U	0.00028 U	0.00018 U	0.00027 U	0.00028 U	**0.0076**	**0.0059**	0.00015 U	0.00061 U	**0.033**
SB-36-4	4/4/2007	0.026 U	0.015 U	0.021 U	0.017 U	0.014 U	0.15 U	0.013 U	*0.011 U*	0.015 U	0.013 U	0.016 U	0.013 U	0.025 U	0.014 U	0.017 U	0.018 U	**0.031**
SB-37-0	4/4/2007	0.00023 U	0.00009 U	0.00022 U	0.000083 U	0.00011 U	0.00042 U	0.00012 U	0.00011 U	0.00022 U	0.00014 U	0.00021 U	0.00022 U	0.00013 U	0.000069 U	0.00011 U	**0.001**	**0.027**
SB-37-4	4/4/2007	0.00032 U	0.00013 U	0.00031 U	0.00012 U	0.00016 U	0.00059 U	0.00016 U	0.00015 U	0.00031 U	0.0002 U	0.00029 U	0.00031 U	0.00018 U	**0.0013**	0.00016 U	0.00066 U	**0.0016**
SB-37-8	4/4/2007	0.0004 U	0.00016 U	0.00038 U	0.00015 U	0.0002 U	0.00074 U	0.0002 U	0.00019 U	0.00038 U	**0.0084**	0.00036 U	0.00038 U	0.00022 U	**0.0026**	0.0002 U	0.00082 U	**0.014**
SB-38-0	4/4/2007	0.00024 U	0.00009 U	0.00023 U	0.000086 U	0.00012 U	0.00043 U	0.00012 U	0.00011 U	0.00023 U	0.00014 U	0.00021 U	0.00023 U	0.00013 U	0.000071 U	0.00012 U	0.00048 U	0.00045 U
SB-38-4	4/4/2007	0.00033 U	0.00013 U	0.00031 U	0.00012 U	0.00016 U	0.0006 U	0.00017 U	0.00016 U	0.00031 U	0.0002 U	0.0003 U	0.00031 U	0.00018 U	**0.00034**	0.00016 U	0.00067 U	**0.009**
SB-39-0	4/4/2007	0.00026 U	0.00011 U	0.00025 U	0.000096 U	0.00013 U	0.00048 U	0.00013 U	0.00013 U	0.00025 U	0.00016 U	0.00024 U	0.00025 U	0.00015 U	0.000079 U	0.00013 U	0.00053 U	**0.011**
SB-39-2.5	4/4/2007	0.00026 U	**0.00093**	0.00024 U	0.000094 U	0.00013 U	0.00047 U	0.00013 U	0.00012 U	0.00024 U	0.00016 U	0.00023 U	0.00024 U	0.00014 U	0.000078 U	0.00013 U	0.00052 U	**0.007**
SB-40-2	4/4/2007	0.28 U	0.16 U	0.22 U	0.18 U	0.15 U	*1.6 U*	0.14 U	*0.12 U*	0.16 U	0.14 U	0.17 U	0.15 U	0.27 U	0.15 U	0.19 U	0.20 U	**5.7**
SB-40-4	4/4/2007	0.072 U	0.040 U	0.057 U	0.047 U	0.037 U	0.42 U	0.034 U	*0.031 U*	0.041 U	0.036 U	0.043 U	0.037 U	0.069 U	0.038 U	0.048 U	0.050 U	**30**
SB-40-8	4/5/2007	**0.002**	0.00017 U	0.0004 U	0.00016 U	0.00021 U	0.00078 U	0.00021 U	0.0002 U	0.0004 U	**0.00038**	0.00038 U	0.0004 U	0.00024 U	**0.00061**	0.00021 U	**0.0031**	**2.6**
SB-41-4	4/5/2007	0.00043 U	0.00017 U	0.00041 U	0.00016 U	0.00021 U	0.0008 U	0.00022 U	0.00021 U	0.00041 U	0.00026 U	0.00039 U	0.00041 U	0.00024 U	0.00014 U	0.00021 U	0.00088 U	**0.00094**
SB-42-0	4/5/2007	0.00026 U	0.0001 U	0.00024 U	0.000094 U	0.00013 U	0.00047 U	0.00013 U	0.00012 U	0.00024 U	0.00016 U	0.00023 U	0.00024 U	0.00014 U	0.000077 U	0.00013 U	0.00052 U	0.00048 U
SB-42-4	4/5/2007	0.023 U	0.013 U	0.018 U	0.015 U	0.012 U	0.13 U	0.011 U	*0.0096 U*	0.013 U	0.012 U	0.014 U	0.012 U	0.022 U	0.012 U	0.015 U	0.016 U	**9.8**
SB-43-4	4/5/2007	0.00045 U	0.00018 U	0.00043 U	0.00017 U	0.00022 U	0.00083 U	0.00023 U	0.00022 U	0.00043 U	0.00027 U	0.00041 U	0.00043 U	0.00025 U	**0.0011**	0.00022 U	0.00092 U	**0.044**
SB-44-4	4/5/2007	0.00032 U	0.00013 U	0.0003 U	0.00012 U	0.00016 U	0.00058 U	0.00016 U	0.00015 U	0.0003 U	0.00019 U	0.00029 U	0.0003 U	**0.0058**	0.000096 U	0.00015 U	**0.0007**	**0.014**
SB-45-3	4/5/2007	0.025 U	0.014 U	0.019 U	0.016 U	0.013 U	0.14 U	0.012 U	*0.011 U*	0.014 U	0.012 U	0.015 U	0.013 U	0.024 U	0.013 U	0.016 U	0.017 U	**0.11**
SB-45-5	4/5/2007	0.00039 U	0.00016 U	0.00037 U	0.00015 U	0.00019 U	0.00072 U	0.0002 U	0.00019 U	0.00037 U	0.00024 U	0.00035 U	0.00037 U	0.00022 U	**0.00087**	0.00019 U	0.0008 U	**0.0011**
SB-45-12	4/5/2007	0.032 U	0.018 U	0.025 U	0.021 U	0.017 U	0.19 U	0.015 U	*0.014 U*	0.018 U	0.016 U	0.019 U	0.016 U	0.031 U	0.017 U	0.021 U	0.022 U	**0.027**
SB-46-4	4/5/2007	0.030 U	0.017 U	0.024 U	0.020 U	0.016 U	0.17 U	0.015 U	*0.013 U*	0.017 U	0.015 U	0.018 U	0.015 U	0.029 U	0.016 U	0.020 U	0.021 U	**2.6**
FD-2 (SB-46-4)	4/5/2007	0.027 U	**0.015**	0.021 U	0.017 U	0.014 U	0.16 U	0.013 U	*0.012 U*	0.015 U	0.013 U	0.016 U	0.014 U	0.026 U	0.014 U	0.018 U	0.019 U	**7.7**
SB-46-8	4/5/2007	0.00039 U	0.00016 U	0.00037 U	0.00015 U	0.00019 U	0.00072 U	0.0002 U	0.00019 U	0.00037 U	0.00024 U	0.00035 U	0.00037 U	0.00022 U	0.00012 U	0.00019 U	0.0008 U	**0.0034**
SB-47-0	4/5/2007	0.28 U	0.16 U	0.22 U	0.18 U	0.15 U	*1.6 U*	0.13 U	*0.12 U*	0.16 U	0.14 U	0.17 U	0.14 U	0.27 U	0.15 U	0.19 U	0.19 U	**15**
FD-3 (SB-47-0)	4/5/2007	0.22 U	0.12 U	0.17 U	0.14 U	0.11 U	*1.3 U*	0.11 U	*0.090 U*	0.12 U	0.11 U	0.13 U	0.11 U	0.21 U	0.12 U	0.14 U	0.15 U	**6.4**
SB-48-0	4/5/2007	0.00023 U	0.00009 U	0.00022 U	0.000085 U	0.00012 U	0.00043 U	0.00012 U	0.00011 U	0.00022 U	0.00014 U	0.00021 U	0.00022 U	**0.00047**	0.00007 U	0.00011 U	0.00047 U	**0.0052**
SB-49-0	4/5/2007	0.00029 U	0.00012 U	0.00028 U	0.00011 U	0.00014 U	0.00054 U	0.00015 U	0.00014 U	0.00028 U	0.00018 U	0.00026 U	0.00028 U	0.00016 U	0.000088 U	0.00014 U	0.00059 U	**0.0039**
SB-50-4	4/23/2007	0.00027 U	0.00011 U	0.00025 U	0.000098 U	0.00013 U	0.00049 U	0.00014 U	0.00013 U	0.00025 U	0.00016 U	0.00024 U	0.00025 U	0.00015 U	0.000081 U	0.00013 U	0.00054 U	**0.00051**
SB-51-2	4/23/2007	0.00028 U	0.00011 U	0.00027 U	0.00011 U	0.00014 U	0.00052 U	0.00014 U	0.00014 U	0.00027 U	0.00017 U	0.00025 U	0.00027 U	0.00016 U	0.000085 U	0.00014 U	0.00057 U	**0.0015**
SB-51-4.5	4/23/2007	0.00043 U	0.00017 U	0.00041 U	0.00016 U	0.00021 U	0.00079 U	0.00022 U	0.0002 U	0.00041 U	0.00026 U	0.00039 U	0.00041 U	0.00024 U	0.00013 U	0.00021 U	0.00087 U	**0.0016**
SB-52-2	4/23/2007	0.030 U	0.017 U	0.024 U	0.020 U	**0.022**	0.18 U	0.015 U	*0.013 U*	0.017 U	**0.024**	0.018 U	0.015 U	**0.081**	0.016 U	0.020 U	0.021 U	**0.11**
SB-53-3	4/23/2007	0.00037 U	0.00015 U	0.00035 U	0.00014 U	0.00018 U	0.00068 U	0.00019 U	0.00018 U	0.00035 U	0.00022 U	0.00033 U	0.00035 U	0.00021 U	0.00012 U	0.00018 U	0.00075 U	**0.016**
SB-54-1.5	4/24/2007	0.00026 U	0.00011 U	0.00025 U	0.000096 U	0.00013 U	0.00048 U	0.00013 U	0.00013 U	0.00025 U	0.00016 U	0.00024 U	0.00025 U	0.00015 U	0.000079 U	0.00013 U	0.00053 U	**0.019**
SB-55-1.5*	6/13/2007	0.00045 U	0.00012 U	**0.00021**	0.000094 U	0.00016 U	0.00063 U	0.00018 U	0.00018 U	0.00028 U	0.00012 U	0.00011 U	**0.00028**	0.00013 U	0.00013 U	0.00011 U	0.00011 U	**0.00064**
SB-55-3	6/13/2007	0.031 U	0.018 U	0.025 U	0.020 U	0.016 U	0.18 U	0.015 U	*0.014 U*	0.018 U	0.016 U	0.019 U	0.016 U	0.030 U	**0.017**	0.021 U	0.022 U	0.021 U
SB-55-7.5	6/13/2007	0.050 U	0.028 U	0.039 U	0.032 U	0.026 U	0.29 U	0.024 U	*0.021 U*	0.028 U	0.025 U	0.029 U	0.025 U	0.048 U	0.026 U	0.033 U	0.034 U	**4.2**
SB-56-4	6/13/2007	0.70 U	0.39 U	0.55 U	**1.7**	**1.4**	*4.1 U*	0.34 U	*0.30 U*	0.40 U	**4.2**	**8.7**	**320**	0.68 U	0.37 U	0.47 U	0.49 U	0.47 U
SB-56-7.5	6/13/2007	0.00054 U	0.00014 U	**0.00089**	0.00012 U	0.00019 U	0.00076 U	0.00022 U	0.00021 U	0.00034 U	0.00015 U	0.00013 U	0.00023 U	0.00015 U	0.00016 U	0.00013 U	0.00013 U	**0.0033**
SB-57-4	6/14/2007	0.00043 U	0.00012 U	0.0002 U	0.00009 U	0.00015 U	0.0006 U	0.00017 U	0.00017 U	0.00027 U	0.00012 U	0.000099 U	0.00018 U	0.00012 U	0.00012 U	0.00011 U	0.00011 U	**0.0083**
SB-57-7	6/14/2007	0.00047 U	0.00013 U	0.00022 U	0.000099 U	0.00016 U	0.00066 U	0.00019 U	0.00018 U	0.00029 U	0.00013 U	0.00011 U	0.0002 U	0.00013 U	0.00014 U	0.00011 U	0.00011 U	**0.00089**
SB-58-4	6/14/2007	0.021 U	0.012 U	0.017 U	0.014 U	0.011 U	0.12 U	0.0099 U	*0.0088 U*	0.012 U	0.011 U	0.013 U	0.011 U	0.020 U	0.011 U	**0.014**	0.015 U	**0.028**
SB-58-7	6/14/2007	0.00045 U	0.00012 U	0.00021 U	0.000094 U	0.00016 U	0.00063 U	0.00018 U	0.00018 U	0.00028 U	0.00012 U	0.00011 U	0.00019 U	0.00013 U	0.00013 U	0.00011 U	0.00011 U	**0.0022**
SB-58-13	6/14/2007	0.00036 U	0.000094 U	0.00017 U	0.000076 U	0.00013 U	0.00051 U	0.00015 U	0.00014 U	0.00023 U	0.000097 U	0.000083 U	0.00015 U	0.000098 U	0.00011 U	0.000085 U	0.000085 U	0.00015 U
SB-59-4	6/14/2007	0.065 U	0.036 U	0.19 U	0.042 U	0.034 U	0.38 U	0.031 U	*0.028 U*	0.037 U	0.032 U	0.039 U	0.033 U	0.19 U	0.035 U	0.043 U	0.045 U	**36**
SB-60-4	6/14/2007	0.22 U	0.13 U	0.18 U	0.14 U	0.12 U	*1.3 U*	0.11 U	*0.093 U*	0.13 U	0.11 U	0.13 U	0.11 U	0.21 U	0.12 U	0.15 U	0.16 U	**16**
SB-61-4	6/14/2007	0.00039 U	0.00011 U	0.00018 U	0.000083 U	0.00014 U	0.00056 U	0.00016 U	0.00016 U	0.00025 U	0.00011 U	0.000091 U	**0.00018**	0.00011 U	0.00012 U	0.000093 U	0.000093 U	**0.00039**
SB-61-7	6/14/2007	0.00054 U	0.00014 U	0.00025 U	0.00012 U	0.00019 U	0.00076 U	0.00022 U	0.00021 U	0.00034 U	0.00015 U	0.00013 U	0.00023 U	0.00015 U	0.00016 U	0.00013 U	0.00013 U	0.00023 U
SB-62-4	6/14/2007	0.056 U	0.031 U	**0.044**	0.036 U	0.029 U	0.32 U	0.027 U	*0.024 U*	0.032 U	**0.051**	0.033 U	**0.035**	**0.053**	0.029 U	0.037 U	0.038 U	**26**
SB-62-11.5	6/14/2007	0.034 U	0.019 U	0.027 U	0.022 U	0.018 U	0.20 U	0.016 U	*0.015 U*	0.019 U	0.017 U	0.020 U	0.017 U	0.033 U	0.018 U	0.023 U	0.024 U	**36**
DUP-1-0614-7 (SB-62-11.5)	6/14/2007	0.026 U	0.023 U	0.032 U	0.026 U	0.021 U	0.23 U	0.019 U	*0.017 U*	0.023 U	0.020 U	0.024 U	0.020 U	0.039 U	0.021 U	0.027 U	0.028 U	**69**

Table D-1
RI Soil Analytical Results for VOCs (mg/kg)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/Sample	Sampling Date	Chloroethane (Ethyl Chloride)	Chloroform	Chloromethane (Methyl Chloride)	2-Chlorotoluene	4-Chlorotoluene	1,2-Dibromo-3-chloropropane (DBCP)	Dibromochloromethane	1,2-Dibromoethane (EDB)	Dibromomethane (Methylene Bromide)	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane (CFC 12)	1,1-Dichloroethane (1,1-DCA)	1,2-Dichloroethane (1,2-DCA; EDC)	1,1-Dichloroethene (1,1-DCE)	cis-1,2-Dichloroethene (cis-1,2-DCE)
SB-62-17	6/14/2007	0.00039 U	0.00011 U	0.00018 U	0.000082 U	0.00014 U	0.00055 U	0.00016 U	0.00015 U	0.00024 U	0.00011 U	0.00009 U	0.00016 U	0.00011 U	**0.0015**	0.000091 U	0.000091 U	**0.38**
SB-62-20	6/14/2007	0.00037 U	0.000096 U	0.00017 U	0.000078 U	0.00013 U	0.00052 U	0.00015 U	0.00015 U	0.00023 U	**0.00045**	0.000085 U	**0.0003**	0.00010 U	**0.00099**	0.000087 U	**0.0083**	**2.8**
SB-63-3.5	6/14/2007	1.8 U	0.97 U	1.4 U	1.2 U	0.90 U	*11 U*	0.83 U	*0.74 U*	0.99 U	0.86 U	1.1 U	0.88 U	1.7 U	0.92 U	1.2 U	1.3 U	**56**
SB-63-5	6/14/2007	1.2 U	0.63 U	0.89 U	0.73 U	0.58 U	*6.5 U*	0.54 U	*0.48 U*	0.64 U	**0.72**	0.67 U	0.57 U	1.1 U	0.60 U	0.75 U	0.78 U	**160**
SB-64-7	6/14/2007	0.00053 U	0.00014 U	0.00025 U	0.00012 U	0.00018 U	0.00075 U	0.00022 U	0.00021 U	0.00033 U	0.00015 U	0.00013 U	0.00022 U	0.00015 U	0.00015 U	0.00013 U	0.00013 U	**0.00061**
SB-65-4	6/15/2007	0.00044 U	0.00012 U	0.0002 U	0.000093 U	0.00015 U	0.00062 U	0.00018 U	0.00017 U	0.00028 U	0.00012 U	0.00011 U	0.00019 U	0.00012 U	0.00013 U	0.00011 U	0.00011 U	**0.0037**
SB-66-3.5	6/15/2007	0.00041 U	0.00011 U	0.00019 U	0.000086 U	0.00014 U	0.00057 U	0.00017 U	0.00016 U	0.00026 U	0.00011 U	0.000094 U	0.00017 U	0.00012 U	0.00012 U	0.000096 U	0.000096 U	**0.025**
SB-67-3	6/15/2007	0.00039 U	0.00011 U	0.00018 U	0.000082 U	0.00014 U	0.00055 U	0.00016 U	0.00015 U	0.00024 U	0.00011 U	0.00009 U	0.00016 U	0.00011 U	0.00011 U	0.000092 U	0.000092 U	**0.049**
SB-68-4	6/27/2007	0.00031 U	0.00008 U	0.00014 U	0.000065 U	0.00011 U	0.00044 U	0.00013 U	0.00012 U	0.00019 U	0.000083 U	0.000071 U	0.00013 U	0.000084 U	0.00009 U	0.000073 U	0.000073 U	**0.25**
SB-69-3	10/20/2009	--	--	--	--	--	--	--	--	--	--	--	0.0016 U	--	0.0016 U	--	0.0016 U	0.0016 U
SB-70-4	10/20/2009	--	--	--	--	--	--	--	--	--	--	--	0.0014 U	--	0.0014 U	--	0.0014 U	**0.025**
SB-70-4-R	10/20/2009	--	--	--	--	--	--	--	--	--	--	--	0.0012 U	--	0.0012 U	--	0.0012 U	**0.002**
SB-71-3.5	10/20/2009	--	--	--	--	--	--	--	--	--	--	--	0.0014 U	--	0.0014 U	--	0.0014 U	**0.0016**
SB-72-3.5	10/20/2009	--	--	--	--	--	--	--	--	--	--	--	0.0014 U	--	0.0014 U	--	0.0014 U	0.0014 U
SB-73-3.5	10/21/2009	--	--	--	--	--	--	--	--	--	--	--	0.0018 U	--	0.0018 U	--	0.0018 U	**0.0046**
SB-73-3.5-R	10/21/2009	--	--	--	--	--	--	--	--	--	--	--	0.0019 U	--	0.0019 U	--	0.0019 U	**0.0041**
SB-74-3.5	10/21/2009	--	--	--	--	--	--	--	--	--	--	--	0.0017 U	--	0.0017 U	--	0.0017 U	0.0017 U
SB-75-6.5	10/21/2009	--	--	--	--	--	--	--	--	--	--	--	0.0026 U	--	0.0026 U	--	0.0026 U	0.0026 U
MW-1-4	4/23/2007	0.00042 U	0.00017 U	0.00039 U	0.00016 U	0.0002 U	0.00076 U	0.00021 U	0.0002 U	0.00039 U	0.00025 U	0.00037 U	0.00039 U	0.00023 U	0.00013 U	0.0002 U	0.00085 U	0.00078 U
MW-2-4	4/23/2007	0.00043 U	0.00017 U	0.00041 U	0.00016 U	0.00021 U	0.0008 U	0.00022 U	0.00021 U	0.00041 U	0.00026 U	0.00039 U	0.00041 U	0.00024 U	0.00014 U	0.00021 U	0.00088 U	0.00082 U
MW-3-4	4/23/2007	0.00038 U	0.00015 U	0.00036 U	0.00014 U	0.00019 U	0.00069 U	0.00019 U	0.00018 U	0.00036 U	0.00023 U	0.00034 U	0.00036 U	0.00021 U	0.00012 U	0.00018 U	0.00077 U	0.00071 U
MW-3-9	4/23/2007	0.0005 U	0.0002 U	0.00048 U	0.00019 U	0.00025 U	0.00092 U	0.00025 U	0.00024 U	0.00048 U	0.0003 U	0.00045 U	0.00048 U	0.00028 U	0.00016 U	0.00024 U	0.0011 U	**0.038**
MW-4-4	4/23/2007	0.00041 U	0.00016 U	0.00039 U	0.00015 U	0.0002 U	0.00075 U	0.00021 U	0.00019 U	0.00039 U	0.00025 U	0.00037 U	0.00039 U	0.00023 U	0.00013 U	0.0002 U	0.00083 U	**0.033**
MW-5-5	4/24/2007	0.00036 U	0.00015 U	0.00034 U	0.00014 U	0.00018 U	0.00066 U	0.00018 U	0.00017 U	0.00034 U	0.00022 U	0.00033 U	0.00034 U	0.0002 U	0.00011 U	0.00018 U	0.00073 U	0.00068 U
MW-5-20	4/24/2007	0.0003 U	0.00012 U	0.00029 U	0.00012 U	0.00015 U	0.00056 U	0.00015 U	0.00015 U	0.00029 U	0.00018 U	0.00027 U	0.00029 U	0.00017 U	0.000092 U	0.00015 U	0.00062 U	0.00057 U
MW-6-3	6/13/2007	0.00046 U	0.00012 U	0.00021 U	0.000097 U	0.00016 U	0.00065 U	0.00019 U	0.00018 U	0.00029 U	0.00013 U	0.00011 U	**0.00034**	0.00013 U	0.00013 U	0.00011 U	0.00011 U	**0.042**
MW-7-4	6/13/2007	0.032 U	0.018 U	0.025 U	0.020 U	0.016 U	0.18 U	0.015 U	*0.014 U*	0.018 U	**0.023**	0.019 U	0.016 U	0.030 U	0.017 U	0.021 U	0.022 U	**18**
MW-7-9	6/13/2007	2.2 U	1.2 U	1.7 U	1.4 U	1.1 U	*13 U*	1.0 U	*0.89 U*	1.2 U	1.1 U	1.3 U	1.1 U	2.1 U	1.2 U	1.4 U	**1.6**	**1700**
MW-7-12	6/13/2007	0.34 U	0.19 U	0.27 U	0.22 U	0.18 U	*2.0 U*	0.16 U	*0.15 U*	0.19 U	0.17 U	0.20 U	0.17 U	0.33 U	0.18 U	0.23 U	**0.66**	**580**
MW-8-5	6/13/2007	0.00038 U	0.0001 U	0.00018 U	0.000081 U	**0.00021**	0.00054 U	0.00016 U	0.00015 U	0.00024 U	0.00011 U	**0.00023**	**0.00033**	0.00011 U	0.00011 U	0.000091 U	0.000091 U	**0.0015**
MW-9-4	6/14/2007	0.00032 U	0.000083 U	0.00015 U	0.000067 U	0.00011 U	0.00045 U	0.00610 U	*0.025 U*	0.0002 U	0.000086 U	0.000074 U	0.00014 U	0.000087 U	0.00009 U	0.000075 U	0.000075 U	**0.00095**
MW-10-4	10/21/2009	--	--	--	--	--	--	--	--	--	--	--	0.0018 U	--	0.0018 U	--	0.0018 U	0.0018 U
MTCA Method A CUL (mg/kg)		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0.005**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
MTCA Method B CUL (mg/kg)		**350**	**160**	**77**	**1,600**	**--**	**0.71**	**12**	**0.012**	**800**	**7,200**	**--**	**42**	**16,000**	**16,000**	**11**	**4,000**	**800**

Yellow highlighted detections are those values exceeding the appropriate MTCA cleanup levels (Method B CULs were accessed in October 2009).

Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.

Italicized non-detected values are detection or reporting limits that exceed the appropriate MTCA cleanup level.

U = Not detected at or above the reporting limit.

-- = Not Analyzed or Not Applicable

All units are in mg/kg (ppm)

* This sample (SB-55-1.5) was inadvertently labeled MW-7-1.5 when delivered to the laboratory for analysis.

Location/Sample	Sampling Date	trans-1,2-Dichloroethene (trans-1,2-DCE)	Dichloromethane (Methylene Chloride)	1,2-Dichloropropane	1,3-Dichloropropane	2,2-Dichloropropane	1,1-Dichloropropene	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene	Ethylbenzene	Hexachlorobutadiene	2-Hexanone	Isopropylbenzene (Cumene)	4-Isopropyltoluene	4-Methyl-2-pentanone (MIBK)	Naphthalene	n-Propylbenzene
SB-1-4	4/2/2007	0.00074 U	**0.00091**	0.00017 U	0.00015 U	0.00034 U	0.00012 U	0.00016 U	0.00021 U	0.000091 U	0.00026 U	0.0059 U	0.00015 U	0.00069 U	0.00084 U	0.00067 U	0.00013 U
SB-2-3	4/2/2007	0.00082 U	**0.0015**	0.00019 U	0.00017 U	0.00037 U	0.00014 U	0.00017 U	0.00023 U	0.0001 U	0.00028 U	0.0065 U	0.00016 U	0.00076 U	0.00093 U	0.00074 U	0.00014 U
SB-3-4	4/2/2007	**0.085**	**0.062**	0.034 U	0.014 U	0.031 U	0.023 U	0.015 U	0.016 U	0.018 U	0.068 U	0.71 U	0.013 U	0.023 U	0.50 U	0.051 U	0.018 U
SB-4-4	4/2/2007	0.0007 U	**0.0013**	0.00016 U	0.00014 U	0.00032 U	0.00012 U	0.00015 U	0.0002 U	0.000086 U	0.00024 U	0.0056 U	0.00014 U	0.00066 U	0.0008 U	0.00064 U	0.00012 U
SB-5-0	4/2/2007	0.00064 U	**0.00069**	0.00015 U	0.00013 U	0.00029 U	0.00011 U	0.00014 U	0.00018 U	0.000079 U	0.00022 U	0.0051 U	0.00013 U	0.0006 U	0.00073 U	0.00058 U	0.00011 U
SB-5-3.5	4/2/2007	0.00072 U	**0.00088**	0.00017 U	0.00015 U	0.00033 U	0.00012 U	0.00015 U	0.0002 U	0.000088 U	0.00025 U	0.0057 U	0.00014 U	0.00067 U	0.00081 U	0.00065 U	0.00012 U
SB-5-8	4/2/2007	0.00084 U	**0.0014**	0.0002 U	0.00017 U	0.00039 U	0.00014 U	0.00018 U	0.00023 U	0.00011 U	0.00029 U	0.0067 U	0.00017 U	0.00079 U	0.00096 U	0.00077 U	0.00014 U
SB-6-3	4/2/2007	0.026 U	**0.058**	0.035 U	0.014 U	0.032 U	0.024 U	0.015 U	0.016 U	**0.021**	0.069 U	0.72 U	**0.014**	0.024 U	0.51 U	0.052 U	0.018 U
SB-7-4	4/2/2007	0.00072 U	**0.0012**	0.00017 U	0.00015 U	0.00033 U	0.00012 U	0.00015 U	0.0002 U	0.000088 U	0.00025 U	0.0057 U	0.00014 U	0.00067 U	0.00081 U	0.00065 U	0.00012 U
SB-8-4	4/2/2007	0.00051 U	**0.00081**	0.00012 U	0.00011 U	0.00023 U	0.000082 U	0.00011 U	0.00014 U	0.000062 U	0.00018 U	0.0041 U	0.000098 U	0.00048 U	0.00058 U	0.00046 U	0.00008 U
SB-9-4	4/3/2007	0.016 U	**0.027**	0.022 U	0.0087 U	0.020 U	0.015 U	0.0093 U	0.0099 U	0.012 U	0.044 U	0.46 U	0.0078 U	**0.077**	0.32 U	0.033 U	**0.016**
SB-10-9	4/3/2007	0.00082 U	**0.00076**	0.00019 U	0.00017 U	0.00037 U	0.00014 U	0.00017 U	0.00023 U	0.0001 U	0.00028 U	0.0065 U	0.00016 U	0.00076 U	0.00093 U	0.00074 U	0.00014 U
SB-11-0	4/3/2007	0.00061 U	**0.00063**	0.00014 U	0.00013 U	0.00028 U	0.000098 U	0.00013 U	0.00017 U	0.000075 U	0.00021 U	0.0049 U	0.00012 U	0.00057 U	0.00069 U	0.00056 U	0.0001 U
SB-11-5	4/3/2007	0.00073 U	**0.00073**	0.00017 U	0.00015 U	0.00034 U	0.00012 U	0.00016 U	0.0002 U	0.00009 U	0.00025 U	0.0058 U	0.00015 U	0.00068 U	0.00083 U	0.00067 U	0.00012 U
SB-11-9	4/3/2007	0.0014 U	**0.0012**	0.00031 U	0.00028 U	0.00062 U	0.00022 U	0.00029 U	0.00038 U	0.00017 U	0.00047 U	0.011 U	0.00027 U	0.0013 U	0.0016 U	0.0013 U	0.00023 U
SB-11-15	4/3/2007	0.00067 U	**0.00066**	0.00016 U	0.00014 U	0.00031 U	0.00011 U	0.00014 U	0.00019 U	0.000082 U	0.00023 U	0.0053 U	0.00013 U	0.00062 U	0.00076 U	0.00061 U	0.00011 U
SB-12-4	4/3/2007	0.0007 U	**0.00082**	0.00016 U	0.00014 U	0.00032 U	0.00012 U	0.00015 U	0.00019 U	0.000085 U	0.00024 U	0.0056 U	0.00014 U	0.00065 U	0.00079 U	0.00063 U	0.00012 U
SB-13-10	4/3/2007	**0.0017**	**0.00072**	0.00016 U	0.00014 U	0.00032 U	0.00012 U	0.00015 U	0.0002 U	**0.00032**	0.00024 U	0.0056 U	0.00014 U	0.00066 U	0.0008 U	0.00064 U	0.00012 U
SB-14-4	4/3/2007	0.0007 U	**0.00078**	0.00016 U	0.00014 U	0.00032 U	0.00012 U	0.00015 U	0.00019 U	0.000085 U	0.00024 U	0.0055 U	0.00014 U	0.00065 U	0.00079 U	0.00063 U	0.00012 U
SB-15-0	4/3/2007	0.017 U	**0.034**	0.022 U	0.0088 U	0.021 U	0.015 U	0.0094 U	0.010 U	0.012 U	0.044 U	0.46 U	0.0079 U	0.015 U	0.33 U	0.033 U	0.012 U
SB-15-4	4/3/2007	0.00049 U	**0.00095**	0.00011 U	0.000097 U	0.00022 U	0.000078 U	0.00011 U	0.00014 U	0.000059 U	0.00017 U	0.0039 U	0.000093 U	0.00045 U	0.00055 U	0.00044 U	0.000079 U
SB-16-3.5	4/3/2007	0.00052 U	**0.00023**	0.00012 U	0.00011 U	0.00024 U	0.000083 U	0.00011 U	0.00015 U	0.000064 U	0.00018 U	0.0041 U	0.00010 U	0.00048 U	0.00059 U	0.00047 U	0.000085 U
SB-16-9	4/3/2007	0.00098 U	**0.0015**	0.00023 U	0.0002 U	0.00045 U	0.00016 U	0.00021 U	0.00027 U	0.00012 U	0.00034 U	0.0078 U	0.00019 U	0.00092 U	0.0012 U	0.00089 U	0.00016 U
SB-17-4	4/3/2007	0.00069 U	**0.00086**	0.00016 U	0.00014 U	0.00032 U	0.00012 U	0.00015 U	0.00019 U	0.000085 U	0.00024 U	0.0055 U	0.00014 U	0.00064 U	0.00078 U	0.00063 U	0.00012 U
SB-18-4	4/3/2007	0.00074 U	**0.00090**	0.00017 U	0.00015 U	0.00034 U	0.00012 U	0.00016 U	0.00021 U	0.000091 U	0.00026 U	0.0059 U	0.00015 U	0.00069 U	0.00084 U	0.00067 U	0.00013 U
SB-19-3	4/3/2007	0.0013 U	**0.0015**	**0.00088**	0.00025 U	0.00057 U	0.00021 U	0.00027 U	0.00035 U	0.00016 U	0.00043 U	0.01 U	0.00025 U	0.0012 U	0.0015 U	0.0012 U	0.00021 U
SB-20-4	4/3/2007	0.00079 U	**0.00052**	0.00018 U	0.00016 U	0.00036 U	0.00013 U	0.00017 U	0.00022 U	0.000097 U	0.00027 U	0.0063 U	0.00016 U	0.00074 U	0.0009 U	0.00072 U	0.00013 U
SB-21-4	4/3/2007	**0.0016**	**0.0020**	0.0002 U	0.00017 U	0.00039 U	0.00014 U	0.00018 U	0.00024 U	0.00011 U	0.00029 U	0.0068 U	0.00017 U	0.0008 U	0.00097 U	0.00078 U	0.00014 U
SB-22-4	4/3/2007	0.00064 U	**0.00050**	0.00015 U	0.00013 U	0.00029 U	0.00011 U	0.00014 U	0.00018 U	0.000078 U	0.00022 U	0.0051 U	0.00013 U	0.00059 U	0.00072 U	0.00058 U	0.00011 U
SB-23-4	4/3/2007	0.00067 U	**0.0012**	0.00016 U	0.00014 U	0.00031 U	0.00011 U	0.00014 U	0.00019 U	0.000082 U	0.00023 U	0.0054 U	0.00013 U	0.00063 U	0.00076 U	0.00061 U	0.00011 U
SB-24-4	4/3/2007	0.00086 U	**0.00072**	0.00020 U	0.00018 U	0.00039 U	0.00014 U	0.00018 U	0.00024 U	0.00011 U	0.0003 U	0.0068 U	0.00017 U	0.0008 U	0.00097 U	0.00078 U	0.00014 U
SB-25-4	4/3/2007	**0.00087**	**0.00075**	0.00016 U	0.00014 U	0.00032 U	0.00012 U	0.00015 U	0.0002 U	0.000086 U	0.00024 U	0.0056 U	0.00014 U	0.00066 U	0.0008 U	0.00064 U	0.00012 U
SB-26-0	4/4/2007	0.24 U	**0.57**	0.32 U	0.13 U	0.30 U	0.22 U	0.14 U	0.15 U	0.17 U	0.64 U	6.7 U	0.12 U	0.22 U	4.7 U	0.48 U	0.17 U
SB-26-2	4/4/2007	0.97 U	**2.0**	1.4 U	0.53 U	1.3 U	0.89 U	0.57 U	0.60 U	0.68 U	2.7 U	28 U	0.48 U	0.89 U	20 U	2.0 U	0.68 U
SB-26-10	4/4/2007	6.1 U	**13**	8.3 U	3.3 U	7.6 U	5.6 U	3.5 U	3.8 U	4.3 U	*17 U*	180 U	3.0 U	5.6 U	130 U	*13 U*	4.2 U
FD-1 (SB-26-10)	4/4/2007	**2.5**	**1.6**	**1.4**	0.42 U	0.95 U	0.70 U	0.45 U	0.48 U	0.54 U	2.1 U	22 U	0.38 U	0.70 U	16 U	1.6 U	**0.76**
SB-26-17	4/4/2007	**3.3**	**7.3**	4.3 U	1.7 U	3.9 U	2.9 U	1.8 U	2.0 U	2.2 U	8.5 U	89 U	1.6 U	2.9 U	63 U	*6.4 U*	**3.1**
SB-26-23	4/4/2007	0.096 U	**0.18**	0.14 U	0.053 U	0.12 U	0.088 U	0.056 U	0.060 U	0.067 U	0.27 U	2.8 U	0.047 U	0.088 U	2.0 U	0.20 U	**0.12**
SB-27-0	4/4/2007	0.13 U	**0.28**	0.18 U	0.069 U	0.16 U	0.12 U	0.074 U	0.079 U	0.089 U	0.35 U	3.6 U	0.062 U	0.12000 U	2.6 U	0.26 U	0.088 U
SB-27-8	4/4/2007	**0.42**	**0.18**	0.11 U	0.042 U	0.095 U	0.070 U	0.044 U	0.047 U	**0.14**	0.21 U	2.2 U	**0.25**	**1.0**	1.6 U	**0.35**	**0.56**
SB-27-12	4/4/2007	**0.51**	**0.13**	**0.21**	0.031 U	0.070 U	0.052 U	0.033 U	0.035 U	0.040 U	0.16 U	1.6 U	0.028 U	0.052 U	1.2 U	0.12 U	0.039 U
SB-28-4	4/4/2007	0.021 U	**0.061**	0.028 U	0.012 U	0.026 U	0.019 U	0.012 U	0.013 U	0.015 U	0.056 U	0.59 U	0.010 U	0.019 U	0.42 U	0.042 U	0.015 U
SB-28-8	4/4/2007	0.00075 U	**0.00094**	0.00017 U	0.00015 U	0.00034 U	0.00012 U	0.00016 U	0.00021 U	0.000091 U	0.00026 U	0.0059 U	0.00015 U	0.0007 U	0.00085 U	0.00068 U	0.00013 U
SB-29-4	4/4/2007	**0.0062**	**0.00069**	0.00015 U	0.00013 U	0.00029 U	0.00011 U	0.00014 U	0.00018 U	0.000079 U	0.00022 U	0.0051 U	0.00013 U	0.0006 U	0.00073 U	0.00058 U	0.00011 U
SB-30-0	4/4/2007	0.00054 U	**0.0012**	0.00013 U	0.00011 U	0.00025 U	0.000086 U	0.00012 U	0.00015 U	0.000066 U	0.00019 U	0.0043 U	0.00011 U	0.0005 U	0.00061 U	0.00049 U	0.000088 U
SB-30-4	4/4/2007	**0.00091**	**0.00085**	0.00015 U	0.00013 U	0.0003 U	0.00011 U	0.00014 U	0.00018 U	0.00008 U	0.00023 U	0.0052 U	0.00013 U	0.00061 U	0.00074 U	0.00059 U	0.00011 U
SB-31-3	4/4/2007	0.00069 U	**0.0011**	0.00016 U	0.00014 U	0.00032 U	0.00012 U	0.00015 U	0.00019 U	**0.00064**	0.00024 U	0.0055 U	**0.0056**	0.00064 U	0.00078 U	0.00063 U	0.00012 U
SB-32-4	4/4/2007	0.00066 U	**0.00099**	0.00015 U	0.00014 U	0.0003 U	0.00011 U	0.00014 U	0.00018 U	0.00008 U	0.00023 U	0.0052 U	0.00013 U	0.00061 U	0.00074 U	0.0006 U	0.00011 U
SB-33-3.5	4/4/2007	0.00056 U	**0.00071**	0.00013 U	0.00012 U	0.00026 U	0.000091 U	0.00012 U	0.00016 U	0.000069 U	0.0002 U	0.0045 U	0.00011 U	0.00053 U	0.00064 U	0.00051 U	0.000092 U
SB-34-0	4/4/2007	**0.097**	**0.13**	0.029 U	0.012 U	0.026 U	0.019 U	0.012 U	0.013 U	0.015 U	0.057 U	0.59 U	0.011 U	0.019 U	0.42 U	0.043 U	0.015 U
SB-35-4	4/4/2007	0.00069 U	**0.00089**	0.00016 U	0.00014 U	0.00032 U	0.00012 U	0.00015 U	0.00019 U	0.000085 U	0.00024 U	0.0055 U	0.00014 U	0.00065 U	0.00079 U	0.00063 U	0.00012 U

Location/Sample	Sampling Date	trans-1,2-Dichloroethene (trans-1,2-DCE)	Dichloromethane (Methylene Chloride)	1,2-Dichloropropane	1,3-Dichloropropane	2,2-Dichloropropane	1,1-Dichloropropene	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene	Ethylbenzene	Hexachlorobutadiene	2-Hexanone	Isopropylbenzene (Cumene)	4-Isopropyltoluene	4-Methyl-2-pentanone (MIBK)	Naphthalene	n-Propylbenzene
SB-36-0	4/4/2007	0.00065 U	**0.0012**	**0.028**	0.00013 U	0.0003 U	0.00011 U	0.00014 U	0.00018 U	0.00008 U	0.00023 U	0.0052 U	0.00013 U	0.00061 U	0.00074 U	**0.0014**	0.00011 U
SB-36-4	4/4/2007	0.021 U	**0.050**	0.028 U	0.012 U	0.026 U	0.019 U	0.012 U	0.013 U	0.015 U	0.056 U	0.59 U	**0.028**	0.019 U	0.42 U	**0.12**	**0.030**
SB-37-0	4/4/2007	**0.0012**	**0.00098**	0.00012 U	0.000099 U	0.00023 U	0.00008 U	0.00011 U	0.00014 U	0.000061 U	0.00017 U	0.004 U	0.000095 U	0.00046 Y	0.00056 U	0.00045 U	0.000081 U
SB-37-4	4/4/2007	0.00071 U	**0.00093**	0.00016 U	0.00015 U	0.00032 U	0.00012 U	0.00015 U	0.0002 U	0.000086 U	0.00024 U	0.0056 U	0.00014 U	0.00066 U	0.0008 U	0.00064 U	0.00012 U
SB-37-8	4/4/2007	0.00088 U	**0.0017**	0.0002 U	0.00018 U	0.0004 U	0.00015 U	0.00019 U	0.00024 U	0.00011 U	0.0003 U	0.007 U	0.00017 U	0.00082 U	0.001 U	0.0008 U	0.00015 U
SB-38-0	4/4/2007	0.00051 U	**0.00038**	0.00012 U	0.00011 U	0.00024 U	0.000083 U	0.00011 U	0.00014 U	0.000063 U	0.00018 U	0.0041 U	0.000099 U	0.00048 U	0.00058 U	0.00047 U	0.000084 U
SB-38-4	4/4/2007	0.00072 U	**0.0012**	0.00017 U	0.00015 U	0.00033 U	0.00012 U	0.00015 U	0.0002 U	0.000088 U	0.00025 U	0.0057 U	0.00014 U	0.00067 U	0.00082 U	0.00065 U	0.00012 U
SB-39-0	4/4/2007	0.00057 U	**0.0027**	0.00013 U	0.00012 U	0.00026 U	0.000092 U	0.00012 U	0.00016 U	0.00007 U	0.0002 U	0.0046 U	0.00011 U	0.00053 U	0.00065 U	0.00052 U	0.000094 U
SB-39-2.5	4/4/2007	0.00056 U	**0.0027**	0.00013 U	0.00012 U	0.00026 U	0.00009 U	0.00012 U	0.00016 U	0.000069 U	0.00019 U	0.0045 U	0.00011 U	0.00052 U	0.00064 U	0.00051 U	0.000091 U
SB-40-2	4/4/2007	0.23 U	**0.69**	0.31 U	0.13 U	0.29 U	0.21 U	0.14 U	0.14 U	0.16 U	0.62 U	6.4 U	0.11 U	0.21 U	4.6 U	0.46 U	0.16 U
SB-40-4	4/4/2007	**0.25**	**0.18**	0.079 U	0.032 U	0.073 U	0.054 U	0.034 U	0.036 U	0.041 U	0.16 U	1.7 U	0.029 U	**0.29**	1.2 U	0.12 U	0.041 U
SB-40-8	4/5/2007	**0.06**	**0.0016**	**0.0025**	0.00019 U	0.00042 U	0.00015 U	0.0002 U	0.00026 U	0.00012 U	0.00032 U	0.0074 U	0.00018 U	**0.0055**	0.0011 U	0.00084 U	0.00016 U
SB-41-4	4/5/2007	0.00095 U	**0.0045**	0.00022 U	0.00019 U	0.00043 U	0.00016 U	0.0002 U	0.00026 U	0.00012 U	0.00033 U	0.0076 U	0.00019 U	0.00088 U	0.0011 U	0.00086 U	0.00016 U
SB-42-0	4/5/2007	0.00056 U	**0.00098**	0.00013 U	0.00012 U	0.00026 U	0.00009 U	0.00012 U	0.00016 U	**0.00029**	0.00019 U	0.0045 U	0.00011 U	0.00052 U	0.00063 U	0.00051 U	0.000091 U
SB-42-4	4/5/2007	**0.024**	**0.057**	0.025 U	0.010 U	0.023 U	0.017 U	0.011 U	0.012 U	**0.059**	0.050 U	0.52 U	**0.01**	0.017 U	0.37 U	0.038 U	0.013 U
SB-43-4	4/5/2007	0.00099 U	**0.0012**	0.00023 U	0.0002 U	0.00045 U	0.00016 U	0.00021 U	0.00027 U	0.00013 U	0.00034 U	0.0079 U	0.0002 U	0.00092 U	0.0012 U	0.0009 U	0.00017 U
SB-44-4	4/5/2007	0.00069 U	**0.00097**	0.00016 U	0.00014 U	0.00032 U	0.00012 U	0.00015 U	0.00019 U	0.000085 U	0.00024 U	0.0055 U	0.00014 U	0.00065 U	0.00079 U	0.00063 U	0.00012 U
SB-45-3	4/5/2007	0.020 U	**0.057**	0.027 U	0.011 U	0.025 U	0.018 U	0.012 U	0.013 U	0.014 U	0.053 U	0.56 U	**1.5**	**0.60**	0.39 U	**0.42**	**1.6**
SB-45-5	4/5/2007	0.00086 U	**0.00082**	0.0002 U	0.00018 U	0.00039 U	0.00014 U	0.00018 U	0.00024 U	0.00011 U	0.0003 U	0.0069 U	**0.0055**	0.0008 U	0.00098 U	**0.005**	0.00014 U
SB-45-12	4/5/2007	0.026 U	*0.036 U*	0.035 U	0.014 U	0.032 U	0.024 U	0.015 U	0.016 U	0.018 U	0.070 U	0.73 U	**0.037**	**0.037**	0.52 U	**0.12**	**0.073**
SB-46-4	4/5/2007	0.024 U	**0.081**	0.033 U	0.014 U	0.030 U	0.022 U	0.014 U	0.015 U	**0.027**	0.066 U	0.68 U	**0.033**	**0.16**	0.49 U	**0.2**	**0.051**
FD-2 (SB-46-4)	4/5/2007	0.022 U	**0.079**	0.029 U	0.012 U	0.027 U	0.020 U	0.013 U	0.014 U	**0.052**	0.058 U	0.61 U	**0.053**	**0.16**	0.43 U	**0.084**	**0.031**
SB-46-8	4/5/2007	0.00086 U	0.0011 U	**0.0029**	0.00018 U	0.00039 U	0.00014 U	0.00018 U	0.00024 U	0.00011 U	**0.0003**	0.0068 U	0.00017 U	**0.00081**	0.00097 U	0.00078 U	0.00014 U
SB-47-0	4/5/2007	**0.30**	*0.31 U*	0.31 U	0.13 U	0.28 U	0.21 U	0.13 U	0.14 U	0.16 U	0.61 U	6.3 U	0.11 U	0.21 U	4.5 U	0.46 U	0.16 U
FD-3 (SB-47-0)	4/5/2007	0.18 U	*0.24 U*	0.24 U	0.094 U	0.22 U	0.16 U	0.10 U	0.11 U	0.12 U	0.47 U	4.9 U	0.084 U	0.16 U	3.5 U	0.35 U	0.12 U
SB-48-0	4/5/2007	0.00051 U	**0.00044**	0.00012 U	0.00011 U	0.00023 U	0.000081 U	0.00011 U	0.00014 U	0.000062 U	0.00018 U	0.004 U	0.000097 U	0.00047 U	0.00057 U	**0.00068**	0.000082 U
SB-49-0	4/5/2007	0.00064 U	**0.0080**	0.00015 U	0.00013 U	0.00029 U	0.00011 U	0.00014 U	0.00018 U	0.000078 U	0.00022 U	0.0051 U	0.00013 U	0.00059 U	0.00072 U	0.00058 U	0.00011 U
SB-50-4	4/23/2007	0.00058 U	**0.00049**	0.00014 U	0.00012 U	0.00027 U	0.000094 U	0.00013 U	0.00016 U	0.000071 U	0.0002 U	0.0046 U	0.00012 U	0.00054 U	0.00066 U	**0.00061**	0.000095 U
SB-51-2	4/23/2007	0.00062 U	**0.00053**	0.00014 U	0.00013 U	0.00028 U	0.000099 U	0.00013 U	0.00017 U	0.000075 U	0.00021 U	0.0049 U	0.00012 U	0.00057 U	0.0007 U	0.00056 U	0.0001 U
SB-51-4.5	4/23/2007	0.00094 U	**0.00086**	0.00022 U	0.00019 U	0.00043 U	0.00016 U	0.0002 U	0.00026 U	0.00012 U	0.00032 U	0.0075 U	0.00019 U	0.00087 U	0.0011 U	0.00085 U	0.00016 U
SB-52-2	4/23/2007	0.024 U	**0.039**	0.033 U	0.014 U	0.030 U	0.022 U	0.014 U	0.015 U	**0.017**	0.066 U	0.69 U	**0.046**	**0.19**	0.49 U	**0.058**	**0.065**
SB-53-3	4/23/2007	0.00081 U	**0.0011**	0.00019 U	0.00017 U	0.00037 U	0.00013 U	0.00017 U	0.00022 U	0.000099 U	0.00028 U	0.0064 U	0.00016 U	0.00075 U	0.00092 U	**0.001**	0.00014 U
SB-54-1.5	4/24/2007	**0.00067**	**0.00063**	0.00013 U	0.00012 U	0.00026 U	0.000092 U	0.00012 U	0.00016 U	0.00007 U	0.0002 U	0.0046 U	0.00011 U	0.00053 U	0.00065 U	**0.00068**	0.000093 U
SB-55-1.5*	6/13/2007	0.00016 U	**0.00066**	0.00018 U	0.00016 U	0.00017 U	0.00012 U	0.00011 U	0.00018 U	0.0017	0.00021 U	0.0011 U	0.000092 U	0.00013 U	0.00041 U	0.00026 U	0.0001 U
SB-55-3	6/13/2007	0.025 U	*0.035 U*	0.034 U	0.014 U	0.032 U	0.023 U	0.015 U	0.016 U	**0.24**	0.068 U	0.71 U	**0.062**	0.023 U	0.50 U	0.051 U	**0.066**
SB-55-7.5	6/13/2007	0.040 U	*0.055 U*	0.054 U	0.022 U	0.050 U	0.037 U	0.023 U	0.025 U	**0.33**	0.11 U	1.2 U	**0.077**	**0.18**	0.8 U	0.081 U	**0.12**
SB-56-4	6/13/2007	0.57 U	*0.79 U*	0.77 U	0.31 U	0.71 U	0.52 U	0.33 U	0.35 U	**0.40**	1.6 U	17 U	**0.36**	**6.9**	12 U	**38**	**0.69**
SB-56-7.5	6/13/2007	**0.003**	**0.0017**	**0.0013**	0.00019 U	0.0002 U	0.00014 U	0.00013 U	0.00021 U	0.00015 U	0.00025 U	0.0014 U	0.00012 U	0.00015 U	0.00049 U	0.00032 U	0.00012 U
SB-57-4	6/14/2007	0.00015 U	**0.00069**	0.00017 U	0.00015 U	0.00016 U	0.00011 U	0.000099 U	0.00017 U	0.00012 U	0.0002 U	0.0011 U	0.000088 U	0.00012 U	0.00039 U	0.00025 U	0.000095 U
SB-57-7	6/14/2007	0.00017 U	**0.0031**	0.00019 U	0.00017 U	0.00017 U	**0.00012**	0.00011 U	0.00018 U	0.00013 U	0.00022 U	0.0012 U	0.000097 U	0.00013 U	0.00043 U	0.00027 U	0.00011 U
SB-58-4	6/14/2007	0.017 U	*0.024 U*	0.023 U	0.0092 U	0.021 U	0.016 U	0.0097 U	0.011 U	0.012 U	0.046 U	0.48 U	0.0082 U	0.016 U	0.34 U	0.035 U	0.012 U
SB-58-7	6/14/2007	**0.00029**	**0.00066**	**0.00057**	0.00016 U	0.00017 U	0.00012 U	0.00011 U	0.00018 U	0.00012 U	0.00021 U	0.0011 U	0.000092 U	0.00013 U	0.00041 U	0.00026 U	0.0001 U
SB-58-13	6/14/2007	0.00013 U	**0.00045**	0.00014 U	0.00013 U	0.00014 U	0.000092 U	0.000083 U	0.00014 U	0.000097 U	0.00017 U	0.00088 U	0.000075 U	0.000098 U	0.00033 U	0.00021 U	0.00008 U
SB-59-4	6/14/2007	0.053 U	**0.29**	0.072 U	0.029 U	0.066 U	0.049 U	0.031 U	0.033 U	0.037 U	0.15 U	1.5 U	0.026 U	0.049 U	1.1 U	0.11 U	0.037 U
SB-60-4	6/14/2007	0.18 U	**1.1**	0.24 U	0.096 U	22 U	0.17 U	0.11 U	0.11 U	0.13 U	0.48 U	5.0 U	**0.14**	0.17 U	3.6 U	0.36 U	**0.26**
SB-61-4	6/14/2007	0.00014 U	**0.00055**	0.00016 U	0.00014 U	0.00015 U	0.00011 U	0.000091 U	0.00016 U	0.00011 U	0.00018 U	0.00096 U	0.000081 U	0.00011 U	0.00036 U	0.00023 U	0.000088 U
SB-61-7	6/14/2007	0.00019 U	**0.00080**	0.00021 U	0.00019 U	0.0002 U	0.00014 U	0.00013 U	0.00021 U	0.00015 U	0.00025 U	0.0014 U	0.00012 U	0.00015 U	0.00049 U	0.00031 U	0.00012 U
SB-62-4	6/14/2007	**0.083**	**0.26**	0.061 U	0.025 U	0.056 U	0.041 U	0.026 U	0.028 U	**0.19**	0.13 U	1.3 U	**0.40**	**1.3**	0.90 U	**0.34**	**0.68**
SB-62-11.5	6/14/2007	**0.060**	**0.16**	**0.059**	0.015 U	0.034 U	0.025 U	0.016 U	0.017 U	**0.029**	0.075 U	0.78 U	**0.018**	0.025 U	0.55 U	0.056 U	0.019 U
DUP-1-0614-7 (SB-62-11.5)	6/14/2007	**0.18**	**0.18**	**0.12**	0.018 U	0.041 U	0.030 U	0.019 U	0.020 U	**0.078**	0.88 U	**0.92**	**0.044**	**0.044**	0.65 U	0.066 U	**0.048**

Table D-1
RI Soil Analytical Results for VOCs (mg/kg)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/Sample	Sampling Date	trans-1,2-Dichloroethene (trans-1,2-DCE)	Dichloromethane (Methylene Chloride)	1,2-Dichloropropane	1,3-Dichloropropane	2,2-Dichloropropane	1,1-Dichloropropene	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene	Ethylbenzene	Hexachlorobutadiene	2-Hexanone	Isopropylbenzene (Cumene)	4-Isopropyltoluene	4-Methyl-2-pentanone (MIBK)	Naphthalene	n-Propylbenzene
SB-62-17	6/14/2007	**0.0026**	**0.0014**	**0.0047**	0.00014 U	0.00015 U	0.000099 U	0.00009 U	0.00015 U	0.00011 U	0.00018 U	0.00095 U	**0.008**	**0.028**	0.00036 U	**0.0037**	**0.015**
SB-62-20	6/14/2007	**0.023**	**0.0017**	**0.034**	0.00013 U	0.00014 U	0.000094 U	0.00009 U	0.00015 U	**0.00084**	0.00017 U	0.0009 U	**0.0005**	0.0001 U	0.00034 U	0.00022 U	**0.00037**
SB-63-3.5	6/14/2007	1.5 U	**8.2**	2.0 U	0.77 U	1.8 U	1.3 U	0.82 U	0.88 U	0.99 U	3.9 U	41 U	0.69 U	1.3 U	29 U	2.9 U	**1.0**
SB-63-5	6/14/2007	**1.6**	**6.1**	1.3 U	0.50 U	1.2 U	0.84 U	0.53 U	0.57 U	0.64 U	2.5 U	26 U	**2.1**	**4.1**	19 U	**2.1**	**6.2**
SB-64-7	6/14/2007	0.00019 U	**0.00050**	0.00021 U	0.019 U	0.0002 U	0.00014 U	0.00013 U	0.00021 U	0.00015 U	0.00025 U	0.0013 U	0.00011 U	0.00015 U	0.00049 U	0.00031 U	0.00012 U
SB-65-4	6/15/2007	0.00016 U	**0.00056**	0.00017 U	0.00015 U	0.00016 U	0.00012 U	0.00011 U	0.00017 U	0.00012 U	0.0002 U	0.0011 U	0.000091 U	0.00012 U	0.0004 U	0.00026 U	0.000098 U
SB-66-3.5	6/15/2007	**0.00087**	**0.00049**	0.00016 U	0.00014 U	0.00015 U	0.00011 U	0.000094 U	0.00016 U	0.00011 U	0.00019 U	0.00099 U	0.000084 U	0.00012 U	0.00037 U	0.00024 U	0.000091 U
SB-67-3	6/15/2007	**0.00088**	**0.00041**	0.00016 U	0.00014 U	0.00015 U	0.0001 U	0.00009 U	0.00015 U	0.00011 U	0.00018 U	0.00095 U	0.00008 U	0.00011 U	0.00036 U	0.00023 U	0.000087 U
SB-68-4	6/27/2007	**0.0025**	**0.00021**	0.00012 U	0.00011 U	0.00012 U	0.000079 U	0.000071 U	0.00012 U	0.000083 U	0.00014 U	0.00075 U	**0.00023**	0.000084 U	0.00028 U	0.00018 U	0.000069 U
SB-69-3	10/20/2009	0.0016 U	0.0031 U	0.0016 U	--	--	--	--	--	0.0016 U	--	--	--	--	--	0.0077 U	--
SB-70-4	10/20/2009	0.0014 U	0.0028 U	0.0014 U	--	--	--	--	--	0.0014 U	--	--	--	--	--	0.007 U	--
SB-70-4-R	10/20/2009	0.0012 U	0.0025 U	0.0012 U	--	--	--	--	--	0.0012 U	--	--	--	--	--	0.0062 U	--
SB-71-3.5	10/20/2009	0.0014 U	0.0028 U	0.0014 U	--	--	--	--	--	**0.0017**	--	--	--	--	--	0.0071 U	--
SB-72-3.5	10/20/2009	0.0014 U	0.0028 U	0.0014 U	--	--	--	--	--	0.0014 U	--	--	--	--	--	0.007 U	--
SB-73-3.5	10/21/2009	0.0018 U	0.0036 U	0.0018 U	--	--	--	--	--	0.0018 U	--	--	--	--	--	0.009 U	--
SB-73-3.5-R	10/21/2009	0.0019 U	0.0038 U	0.0019 U	--	--	--	--	--	0.0019 U	--	--	--	--	--	0.0094 U	--
SB-74-3.5	10/21/2009	0.0017 U	0.0035 U	0.0017 U	--	--	--	--	--	0.0017 U	--	--	--	--	--	0.0086 U	--
SB-75-6.5	10/21/2009	0.0026 U	0.0053 U	0.0026 U	--	--	--	--	--	0.0026 U	--	--	--	--	--	0.013 U	--
MW-1-4	4/23/2007	0.00091 U	**0.0012**	0.00021 U	0.00019 U	0.00042 U	0.00015 U	0.00019 U	0.00025 U	0.00012 U	0.00031 U	0.0072 U	0.00018 U	0.00085 U	0.0011 U	**0.0013**	0.00015 U
MW-2-4	4/23/2007	0.00095 U	**0.0014**	0.00022 U	0.00019 U	0.00043 U	0.00016 U	0.0002 U	0.00026 U	0.00012 U	0.00033 U	0.0075 U	0.00019 U	0.00088 U	0.0011 U	0.00086 U	0.00016 U
MW-3-4	4/23/2007	0.00082 U	**0.00086**	0.00019 U	0.00017 U	0.00038 U	0.00014 U	0.00018 U	0.00023 U	0.00011 U	0.00028 U	0.0066 U	0.00016 U	**0.0008**	0.00094 U	0.00075 U	0.00014 U
MW-3-9	4/23/2007	0.0011 U	**0.0014**	0.00025 U	0.00022 U	0.00050 U	0.00018 U	0.00023 U	0.0003 U	0.00014 U	0.00038 U	0.0087 U	0.00022 U	**0.21**	0.0013 U	0.001 U	0.00018 U
MW-4-4	4/23/2007	0.00089 U	**0.00064**	0.00021 U	0.00018 U	0.00041 U	0.00015 U	0.00019 U	0.00025 U	0.00011 U	0.00031 U	0.0071 U	**0.0065**	**0.0038**	0.0011 U	**0.0011**	0.00015 U
MW-5-5	4/24/2007	0.00079 U	**0.0014**	0.00018 U	0.00016 U	0.00036 U	0.00013 U	0.00017 U	0.00022 U	0.000097 U	0.00027 U	0.0063 U	0.00016 U	0.00073 U	0.0009 U	0.00072 U	0.00013 U
MW-5-20	4/24/2007	0.00066 U	**0.00079**	0.00015 U	0.00014 U	0.0003 U	0.00011 U	0.00014 U	0.00018 U	0.000081 U	0.00023 U	0.0053 U	0.00013 U	0.00062 U	0.00075 U	0.0006 U	0.00011 U
MW-6-3	6/13/2007	**0.0013**	**0.0023**	0.00018 U	0.00016 U	0.00017 U	0.00012 U	0.00011 U	0.00018 U	0.00013 U	0.00021 U	0.0012 U	0.000095 U	0.00013 U	0.00042 U	0.00027 U	0.00011 U
MW-7-4	6/13/2007	**0.079**	*0.035 U*	0.035 U	0.014 U	0.032 U	0.024 U	0.015 U	0.016 U	0.018 U	0.069 U	0.72 U	**0.092**	0.024 U	0.51 U	0.052 U	0.018 U
MW-7-9	6/13/2007	**9.2**	**9.7**	**3.0**	0.93 U	2.2 U	1.6 U	0.99 U	1.1 U	1.2 U	4.7 U	49 U	**0.97**	**1.7**	35 U	3.5 U	**2.6**
MW-7-12	6/13/2007	**2.6**	**1.5**	**1.0**	0.15 U	0.34 U	0.25 U	0.16 U	0.17 U	0.19 U	0.74 U	7.7 U	0.14 U	0.25 U	5.5 U	0.56 U	0.19 U
MW-8-5	6/13/2007	0.00014 U	**0.0016**	0.00015 U	0.00014 U	0.00014 U	0.000098 U	0.000089 U	**0.00015**	0.00011 U	0.00018 U	0.00094 U	0.000079 U	0.00011 U	0.00035 U	0.00023 U	0.000086 U
MW-9-4	6/14/2007	0.00011 U	**0.0015**	0.00013 U	0.00011 U	0.00012 U	0.000082 U	0.000074 U	0.00013 U	0.00029	0.00015 U	0.00078 U	0.000066 U	0.000087 U	0.00029 U	0.00019 U	**0.00032**
MW-10-4	10/21/2009	0.0018 U	0.0036 U	0.0018 U	--	--	--	--	--	0.0018 U	--	--	--	--	--	0.0091 U	--
MTCA Method A CUL (mg/kg)		--	0.02	--	--	--	--	--	--	6	--	--	--	--	--	5	--
MTCA Method B CUL (mg/kg)		1,600	130	15	--	--	--	5.6 (both cis/trans)		8,000	13	--	8,000	--	6,400	1,600	--

Yellow highlighted detections are those values exceeding the appropriate MTCA cleanup levels (Method B CULs were accessed in October 2009).

Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.

Italicized non-detected values are detection or reporting limits that exceed the appropriate MTCA cleanup level.

U = Not detected at or above the reporting limit.

-- = Not Analyzed or Not Applicable

All units are in mg/kg (ppm)

* This sample (SB-55-1.5) was inadvertently labeled MW-7-1.5 when delivered to the laboratory for analysis.

Table D-1
RI Soil Analytical Results for VOCs (mg/kg)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/Sample	Sampling Date	Styrene	1,1,1,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	Tetrachloroethene (PCE)	Toluene	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene	1,1,2-Trichloroethane (1,1,2-TCA)	1,1,1-Trichloroethane (TCA)	Trichloroethene (TCE)	Trichlorofluoromethane (CFC 11)	1,2,3-Trichloropropane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Vinyl Chloride	m,p-Xylenes	o-Xylene
SB-1-4	4/2/2007	**0.00022**	0.00021 U	0.00021 U	**0.012**	**0.00028**	0.00049 U	0.00039 U	0.00029 U	0.00021 U	0.00017 U	0.0013 U	0.00031 U	0.00021 U	0.00014 U	0.00024 U	0.00019 U	0.00014 U
SB-2-3	4/2/2007	0.00017 U	0.00023 U	0.00023 U	**0.0067**	0.00021 U	0.00054 U	0.00043 U	0.00032 U	0.00023 U	0.00019 U	0.0014 U	0.00034 U	0.00023 U	0.00015 U	**0.00066**	0.00021 U	0.00016 U
SB-3-4	4/2/2007	0.017 U	0.020 U	0.025 U	**0.14**	0.018 U	0.058 U	0.039 U	0.018 U	0.020 U	**0.088**	0.024 U	0.038 U	0.025 U	0.022 U	**0.067**	0.033 U	0.014 U
SB-4-4	4/2/2007	0.00015 U	0.0002 U	0.0002 U	**0.0052**	**0.00032**	0.00047 U	0.00037 U	0.00027 U	0.0002 U	0.00016 U	0.0012 U	0.00029 U	0.0002 U	0.00013 U	0.00023 U	0.00018 U	0.00014 U
SB-5-0	4/2/2007	0.00014 U	0.00018 U	0.00018 U	**0.011**	**0.00084**	0.00042 U	0.00034 U	0.00025 U	0.00018 U	**0.00046**	0.0011 U	0.00027 U	0.00018 U	0.00012 U	0.00021 U	**0.00027**	0.00012 U
SB-5-3.5	4/2/2007	0.00015 U	0.0002 U	0.0002 U	**0.018**	**0.00026**	0.00047 U	0.00038 U	0.00028 U	0.0002 U	**0.0016**	0.0012 U	0.0003 U	0.0002 U	0.00013 U	0.00023 U	0.00018 U	0.00014 U
SB-5-8	4/2/2007	0.00018 U	0.00023 U	0.00023 U	**0.022**	**0.0014**	0.00056 U	0.00044 U	0.00033 U	0.00023 U	**0.0011**	0.0014 U	0.00035 U	0.00023 U	0.00016 U	**0.0092**	**0.00072**	**0.00082**
SB-6-3	4/2/2007	0.018 U	0.021 U	0.026 U	0.020 U	**0.019**	0.060 U	0.040 U	0.019 U	0.021 U	*0.035 U*	0.024 U	0.039 U	0.026 U	0.022 U	**1.6**	0.034 U	**0.031**
SB-7-4	4/2/2007	0.00015 U	0.0002 U	0.0002 U	**0.0023**	**0.0005**	0.00047 U	0.00038 U	0.00028 U	0.00020 U	0.00017 U	0.0012 U	0.0003 U	0.0002 U	0.00013 U	0.00023 U	0.00018 U	0.00014 U
SB-8-4	4/2/2007	0.00011 U	0.00014 U	0.00014 U	**0.0062**	**0.00039**	0.00034 U	0.00027 U	0.0002 U	0.00014 U	**0.00061**	0.00084 U	0.00021 U	**0.003**	**0.0025**	**0.00047**	0.00013 U	0.000095 U
SB-9-4	4/3/2007	0.011 U	0.013 U	0.016 U	**0.17**	0.012 U	0.038 U	0.025 U	0.012 U	0.013 U	0.022 U	0.015 U	0.025 U	**0.043**	**0.015**	0.025 U	0.022 U	0.0090 U
SB-10-9	4/3/2007	0.00017 U	0.00023 U	0.00023 U	0.00016 U	0.00021 U	0.00054 U	0.00043 U	0.00032 U	0.00023 U	0.00019 U	0.0014 U	0.00034 U	0.00023 U	0.00015 U	**0.023**	0.00021 U	0.00016 U
SB-11-0	4/3/2007	0.00013 U	0.00017 U	0.00017 U	**0.0035**	**0.00041**	0.0004 U	0.00032 U	0.00024 U	0.00017 U	0.00014 U	0.0011 U	0.00025 U	0.00017 U	0.00011 U	0.0002 U	0.00016 U	0.00012 U
SB-11-5	4/3/2007	0.00016 U	0.0002 U	0.0002 U	**0.0037**	**0.00031**	0.00048 U	0.00039 U	0.00029 U	0.0002 U	0.00017 U	0.0013 U	0.0003 U	0.0002 U	0.00014 U	0.00024 U	0.00019 U	0.00014 U
SB-11-9	4/3/2007	0.00029 U	0.00038 U	0.00038 U	**0.0041**	**0.0008**	0.00090 U	0.00071 U	0.00053 U	0.00038 U	0.00031 U	0.0023 U	0.00056 U	0.00038 U	0.00025 U	**0.00099**	0.00034 U	0.00026 U
SB-11-15	4/3/2007	0.00014 U	0.00019 U	0.00019 U	**0.0031**	0.00017 U	0.00044 U	0.00035 U	0.00026 U	0.00019 U	0.00016 U	0.0011 U	0.00028 U	0.00019 U	0.00012 U	0.00022 U	0.00017 U	0.00013 U
SB-12-4	4/3/2007	0.00015 U	0.00019 U	0.00019 U	**0.00068**	**0.00033**	0.00046 U	0.00037 U	0.00027 U	0.00019 U	0.00016 U	0.0012 U	0.00029 U	0.00019 U	0.00013 U	0.00023 U	0.00018 U	0.00013 U
SB-13-10	4/3/2007	0.00015 U	0.0002 U	0.0002 U	**0.0070**	**0.00099**	0.00047 U	0.00037 U	0.00027 U	0.0002 U	0.00016 U	0.0012 U	0.00029 U	0.0002 U	0.00013 U	**0.27**	**0.0005**	**0.00076**
SB-14-4	4/3/2007	0.00015 U	0.00019 U	0.00019 U	**0.0025**	**0.00054**	0.00046 U	0.00037 U	0.00027 U	0.00019 U	**0.0004**	0.0012 U	0.00029 U	0.00019 U	0.00013 U	**0.00044**	0.00018 U	0.00013 U
SB-15-0	4/3/2007	0.011 U	0.013 U	0.016 U	**19**	0.012 U	0.038 U	0.026 U	0.012 U	0.013 U	**0.82**	0.016 U	0.025 U	0.017 U	0.014 U	0.025 U	0.022 U	0.0091 U
SB-15-4	4/3/2007	0.00011 U	0.00014 U	0.00014 U	**3.7**	**0.00092**	0.00032 U	0.00026 U	0.00019 U	0.00014 U	**0.13**	0.0008 U	0.0002 U	0.00014 U	0.000087 U	**0.00033**	**0.00025**	0.00009 U
SB-16-3.5	4/3/2007	0.00011 U	0.00015 U	0.00015 U	**0.081**	**0.00023**	0.00034 U	0.00027 U	0.0002 U	0.00015 U	**0.015**	0.00086 U	0.00022 U	0.00015 U	0.000093 U	0.00017 U	0.00013 U	0.000096 U
SB-16-9	4/3/2007	0.00021 U	0.00027 U	0.00027 U	**0.016**	**0.00075**	0.00065 U	0.00052 U	0.00038 U	0.00027 U	**0.0008**	0.0017 U	0.0004 U	**0.003**	0.00018 U	**0.0018**	0.00025 U	0.00019 U
SB-17-4	4/3/2007	0.00015 U	0.00019 U	0.00019 U	**0.0045**	**0.00028**	0.00046 U	0.00036 U	0.00027 U	0.00019 U	0.00016 U	0.0012 U	0.00029 U	0.00019 U	0.00013 U	0.00022 U	0.00018 U	0.00013 U
SB-18-4	4/3/2007	0.00016 U	0.00021 U	0.00021 U	**0.0048**	**0.00051**	0.00049 U	0.00039 U	0.00029 U	0.00021 U	0.00017 U	0.0013 U	0.00031 U	0.00021 U	0.00014 U	**0.023**	**0.00044**	0.00014 U
SB-19-3	4/3/2007	0.00027 U	0.00035 U	0.00035 U	**0.0088**	**0.00094**	0.00083 U	0.00066 U	0.00049 U	0.00035 U	0.00029 U	0.0021 U	0.00052 U	**0.00048**	0.00023 U	**0.0033**	**0.00068**	0.00024 U
SB-20-4	4/3/2007	0.00017 U	0.00022 U	0.00022 U	**0.0012**	0.0002 U	0.00052 U	0.00042 U	0.00031 U	0.00022 U	0.00018 U	0.0014 U	0.00033 U	0.00022 U	0.00015 U	0.00025 U	0.0002 U	0.00015 U
SB-21-4	4/3/2007	0.00018 U	0.00024 U	0.00024 U	**0.0041**	**0.0005**	0.00057 U	0.00045 U	0.00033 U	0.00024 U	0.00020 U	0.0015 U	0.00035 U	0.00024 U	0.00016 U	**0.05**	0.00022 U	0.00016 U
SB-22-4	4/3/2007	0.00014 U	0.00018 U	0.00018 U	**0.011**	0.00016 U	0.00042 U	0.00034 U	0.00025 U	0.00018 U	**0.0037**	0.0011 U	0.00026 U	0.00018 U	0.00012 U	**0.00082**	0.00016 U	0.00012 U
SB-23-4	4/3/2007	0.00014 U	0.00019 U	0.00019 U	**0.016**	0.00017 U	0.00045 U	0.00035 U	0.00026 U	0.00019 U	0.00016 U	0.0012 U	0.00028 U	0.00019 U	0.00012 U	**0.0021**	0.00017 U	0.00013 U
SB-24-4	4/3/2007	0.00018 U	0.00024 U	0.00024 U	0.00017 U	0.00022 U	0.00057 U	0.00045 U	0.00033 U	0.00024 U	0.0002 U	0.0015 U	0.00035 U	0.00024 U	0.00016 U	**0.0043**	0.00022 U	0.00016 U
SB-25-4	4/3/2007	0.00015 U	0.0002 U	0.0002 U	**0.0017**	0.00018 U	0.00047 U	0.00037 U	0.00027 U	0.0002 U	**0.00063**	0.0012 U	0.00029 U	0.0002 U	0.00013 U	**0.015**	0.00018 U	0.00014 U
SB-26-0	4/4/2007	0.16 U	0.19 U	0.24 U	**410**	0.17 U	0.55 U	0.37 U	0.17 U	0.19 U	**8.4**	0.22 U	*0.36 U*	0.24 U	0.21 U	0.36 U	0.32 U	0.14 U
SB-26-2	4/4/2007	0.66 U	0.78 U	0.96 U	**2300**	0.68 U	2.3 U	1.6 U	0.69 U	0.78 U	**5.8**	0.91 U	*1.5 U*	**1.3**	0.84 U	*1.5 U*	1.3 U	0.55 U
SB-26-10	4/4/2007	4.1 U	4.9 U	*6.0 U*	**8300**	4.3 U	15 U	9.5 U	4.3 U	*4.9 U*	**110**	5.7 U	*9.3 U*	**21**	**6.9**	**35**	8.1 U	3.4 U
FD-1 (SB-26-10)	4/4/2007	0.52 U	0.61 U	0.76 U	**2000**	0.54 U	1.8 U	1.2 U	0.55 U	0.61 U	**45**	0.72 U	*1.2 U*	**4.6**	**1.5**	**28**	1.1 U	**0.55**
SB-26-17	4/4/2007	2.1 U	2.5 U	3.1 U	**8200**	2.2 U	7.3 U	4.9 U	2.3 U	*2.5 U*	**340**	3.0 U	*4.8 U*	**18**	**6.7**	**26**	4.2 U	1.8 U
SB-26-23	4/4/2007	0.065 U	0.077 U	0.095 U	**170**	0.067 U	0.23 U	0.15 U	0.069 U	0.077 U	**33**	0.091 U	*0.15 U*	**0.82**	**0.30**	**0.87**	0.13 U	**0.076**
SB-27-0	4/4/2007	0.086 U	0.11 U	0.13 U	**220**	0.089 U	0.30 U	0.20 U	0.090 U	0.11 U	**12**	0.12 U	*0.20 U*	0.13 U	0.11 U	0.20 U	0.17 U	0.072 U
SB-27-8	4/4/2007	0.052 U	0.061 U	0.075 U	**46**	**0.060**	0.18 U	0.12 U	0.054 U	0.061 U	**40**	0.072 U	0.12 U	**5.0**	**1.7**	**29**	**0.44**	**0.47**
SB-27-12	4/4/2007	0.038 U	0.045 U	0.056 U	**0.084**	0.040 U	0.14 U	0.088 U	0.040 U	0.045 U	*0.076 U*	0.053 U	0.086 U	**0.31**	**0.11**	**50**	**0.13**	**0.12**
SB-28-4	4/4/2007	0.014 U	0.017 U	0.021 U	**0.11**	0.015 U	0.048 U	0.032 U	0.015 U	0.017 U	0.028 U	0.020 U	0.032 U	0.021 U	0.018 U	0.031 U	0.028 U	0.012 U
SB-28-8	4/4/2007	0.00016 U	0.00021 U	0.00021 U	**0.0061**	**0.00035**	0.00049 U	0.00039 U	0.00029 U	0.00021 U	**0.00045**	0.0013 U	0.00031 U	0.00021 U	0.00014 U	**0.16**	0.00019 U	0.00014 U
SB-29-4	4/4/2007	0.00014 U	0.00018 U	0.00018 U	**0.017**	**0.00054**	0.00042 U	0.00034 U	0.00025 U	0.00018 U	**0.0015**	0.0011 U	0.00027 U	0.00018 U	0.00012 U	**0.048**	0.00016 U	0.00012 U
SB-30-0	4/4/2007	0.00012 U	0.00015 U	0.00015 U	**4.1**	**0.00062**	0.00036 U	0.00028 U	0.00021 U	0.00015 U	**0.036**	0.00089 U	0.00022 U	0.00015 U	0.000096 U	**0.0013**	0.00014 U	0.0001 U
SB-30-4	4/4/2007	0.00014 U	0.00018 U	0.00018 U	**10**	**0.00033**	0.00043 U	0.00034 U	0.00025 U	0.00018 U	**0.14**	0.0011 U	0.00027 U	0.00018 U	0.00012 U	**0.00068**	0.00017 U	0.00013 U
SB-31-3	4/4/2007	0.00015 U	0.00019 U	0.00019 U	**0.0046**	**0.0007**	0.00046 U	0.00036 U	0.00027 U	0.00019 U	**0.00081**	0.0012 U	0.00028 U	0.00019 U	0.00013 U	**0.08**	**0.00071**	**0.0024**
SB-32-4	4/4/2007	0.00014 U	0.00018 U	0.00018 U	**0.052**	**0.00018**	0.00043 U	0.00035 U	0.00026 U	0.00018 U	**0.0044**	0.0011 U	0.00027 U	0.00018 U	0.00012 U	**0.0021**	0.00017 U	0.00013 U
SB-33-3.5	4/4/2007	0.00012 U	0.00016 U	0.00016 U	**0.0040**	**0.00022**	0.00037 U	0.0003 U	0.00022 U	0.00016 U	**0.00079**	0.00093 U	0.00023 U	0.00016 U	0.00011 U	**0.0013**	0.00014 U	0.00011 U
SB-34-0	4/4/2007	0.014 U	0.017 U	0.021 U	**59**	0.015 U	0.049 U	0.033 U	0.015 U	0.017 U	**9.3**	0.020 U	0.032 U	0.021 U	0.018 U	0.032 U	0.028 U	0.012 U
SB-35-4	4/4/2007	0.00015 U	0.00019 U	0.00019 U	**0.0030**	**0.00024**	0.00046 U	0.00037 U	0.00027 U	0.00019 U	0.00016 U	0.0012 U	0.00029 U	0.00019 U	0.00013 U	**0.0028**	0.00018 U	0.00013 U

Table D-1
RI Soil Analytical Results for VOCs (mg/kg)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/Sample	Sampling Date	Styrene	1,1,1,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	Tetrachloroethene (PCE)	Toluene	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene	1,1,2-Trichloroethane (1,1,2-TCA)	1,1,1-Trichloroethane (TCA)	Trichloroethene (TCE)	Trichlorofluoromethane (CFC 11)	1,2,3-Trichloropropane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Vinyl Chloride	m,p-Xylenes	o-Xylene
SB-36-0	4/4/2007	0.00014 U	0.00018 U	0.00018 U	**0.13**	**0.00089**	0.00043 U	0.00034 U	0.00025 U	**0.0083**	**0.013**	0.0011 U	0.00027 U	0.00018 U	0.00012 U	**0.031**	0.00017 U	0.00013 U
SB-36-4	4/4/2007	0.014 U	0.017 U	0.021 U	**0.086**	0.015 U	0.049 U	0.033 U	0.015 U	0.017 U	0.028 U	0.020 U	0.032 U	0.021 U	0.018 U	0.032 U	0.028 U	0.012 U
SB-37-0	4/4/2007	0.00011 U	0.00014 U	0.00014 U	**0.17**	**0.0007**	0.00033 U	0.00026 U	0.00019 U	0.00014 U	**0.029**	0.00082 U	0.00021 U	0.00014 U	0.000089 U	**0.04**	0.00013 U	0.000092 U
SB-37-4	4/4/2007	0.00015 U	0.0002 U	0.0002 U	**0.0059**	**0.00035**	0.00047 U	0.00037 U	0.00028 U	0.0002 U	**0.00063**	0.0012 U	0.00029 U	0.0002 U	0.00013 U	**0.0013**	0.00018 U	0.00014 U
SB-37-8	4/4/2007	0.00019 U	0.00024 U	0.00024 U	**0.044**	**0.0018**	0.00058 U	0.00046 U	0.00034 U	0.00024 U	**0.006**	0.0015 U	0.00036 U	0.00024 U	0.00016 U	**0.0039**	0.00022 U	0.00017 U
SB-38-0	4/4/2007	0.00011 U	0.00014 U	0.00014 U	**0.0017**	**0.00015**	0.00034 U	0.00027 U	0.0002 U	0.00014 U	0.00012 U	0.00085 U	0.00021 U	0.00014 U	0.000092 U	0.00017 U	0.00013 U	0.000096 U
SB-38-4	4/4/2007	0.00015 U	0.0002 U	0.0002 U	**0.025**	**0.00096**	0.00048 U	0.00038 U	0.00028 U	0.0002 U	**0.0012**	0.0012 U	0.0003 U	0.0002 U	0.00013 U	**0.0024**	0.00018 U	0.00014 U
SB-39-0	4/4/2007	0.00012 U	0.00016 U	0.00016 U	**0.057**	**0.002**	0.00038 U	0.0003 U	0.00022 U	0.00016 U	**0.012**	0.00095 U	0.00024 U	0.00016 U	0.00011 U	0.00019 U	**0.00052**	0.00011 U
SB-39-2.5	4/4/2007	0.00012 U	0.00016 U	0.00016 U	**0.086**	**0.0028**	0.00037 U	0.0003 U	0.00022 U	0.00016 U	**0.018**	0.00093 U	0.00023 U	**0.00029**	0.0001 U	0.00018 U	**0.0006**	**0.00028**
SB-40-2	4/4/2007	0.16 U	0.18 U	0.23 U	**780**	0.16 U	0.53 U	0.36 U	0.17 U	0.18 U	**26**	0.22 U	*0.35 U*	0.23 U	0.20 U	0.35 U	0.31 U	0.13 U
SB-40-4	4/4/2007	0.040 U	0.047 U	0.058 U	**140**	0.041 U	0.14 U	0.091 U	0.042 U	0.047 U	**37**	0.055 U	0.089 U	**0.12**	0.051 U	**0.52**	0.078 U	0.033 U
SB-40-8	4/5/2007	0.0002 U	0.00026 U	0.00026 U	**2.1**	**0.005**	0.00061 U	0.00049 U	0.00036 U	0.00026 U	**0.36**	0.0016 U	0.00038 U	**0.0043**	**0.0025**	**0.43**	**0.00098**	**0.0011**
SB-41-4	4/5/2007	0.0002 U	0.00026 U	0.00026 U	**0.0037**	**0.00077**	0.00063 U	0.0005 U	0.00037 U	0.00026 U	0.00022 U	0.0016 U	0.00039 U	0.00026 U	0.00017 U	**0.0011**	**0.00041**	0.00018 U
SB-42-0	4/5/2007	**0.00017**	0.00016 U	0.00016 U	**0.027**	**0.028**	0.00037 U	0.00029 U	0.00022 U	0.00016 U	**0.00028**	0.00092 U	0.00023 U	**0.00025**	0.0001 U	0.00018 U	**0.0034**	**0.0015**
SB-42-4	4/5/2007	0.013 U	0.015 U	0.019 U	0.015 U	0.013 U	0.043 U	0.029 U	0.013 U	0.015 U	**0.11**	0.018 U	0.028 U	0.019 U	0.016 U	**0.77**	**0.067**	**0.054**
SB-43-4	4/5/2007	0.00021 U	0.00027 U	0.00027 U	**0.16**	**0.0013**	0.00065 U	0.00052 U	0.00039 U	0.00027 U	**0.028**	0.0017 U	0.00041 U	0.00027 U	0.00018 U	**0.004**	**0.00056**	0.00019 U
SB-44-4	4/5/2007	0.00015 U	0.00019 U	0.00019 U	**0.024**	**0.0005**	0.00046 U	0.00036 U	0.00027 U	0.00019 U	**0.0047**	0.0012 U	0.00029 U	0.00019 U	0.00013 U	**0.006**	0.00018 U	0.00013 U
SB-45-3	4/5/2007	0.014 U	0.016 U	0.020 U	**0.050**	0.014 U	0.046 U	0.031 U	0.014 U	0.016 U	0.027 U	0.019 U	0.030 U	0.020 U	0.017 U	0.030 U	0.026 U	0.011 U
SB-45-5	4/5/2007	0.00018 U	0.00024 U	0.00024 U	**0.0024**	**0.00045**	0.00057 U	0.00045 U	0.00034 U	0.00024 U	0.00020 U	0.0015 U	0.00035 U	0.00024 U	0.00016 U	**0.003**	0.00022 U	0.00016 U
SB-45-12	4/5/2007	0.018 U	0.021 U	0.026 U	**0.064**	0.018 U	0.060 U	0.040 U	0.019 U	0.021 U	*0.035 U*	0.024 U	0.039 U	0.026 U	0.023 U	**0.069**	0.034 U	0.015 U
SB-46-4	4/5/2007	0.017 U	0.020 U	0.024 U	**2.0**	**0.029**	0.056 U	0.038 U	0.018 U	0.020 U	**0.11**	0.023 U	0.037 U	**0.27**	**0.098**	**1.3**	**0.074**	**0.063**
FD-2 (SB-46-4)	4/5/2007	0.015 U	0.017 U	0.022 U	**0.37**	**0.072**	0.050 U	0.034 U	0.016 U	0.017 U	0.029 U	0.020 U	0.033 U	**0.050**	**0.049**	**3.7**	**0.16**	**0.053**
SB-46-8	4/5/2007	0.00018 U	0.00024 U	0.00024 U	**0.0040**	**0.00091**	0.00057 U	0.00045 U	0.00033 U	0.00024 U	0.00020 U	0.0015 U	0.00035 U	0.00024 U	0.00016 U	**0.013**	0.00022 U	0.00016 U
SB-47-0	4/5/2007	0.15 U	0.18 U	0.22 U	**620**	0.16 U	0.52 U	0.35 U	0.16 U	0.18 U	**27**	0.21 U	*0.34 U*	0.23 U	0.20 U	0.34 U	0.30 U	0.13 U
FD-3 (SB-47-0)	4/5/2007	0.12 U	0.14 U	0.17 U	**400**	0.12 U	0.40 U	0.27 U	0.13 U	0.14 U	**13**	0.17 U	*0.27 U*	0.18 U	0.15 U	0.26 U	0.23 U	0.097 U
SB-48-0	4/5/2007	0.00011 U	0.00014 U	0.00014 U	**0.061**	**0.00042**	0.00033 U	0.00027 U	0.0002 U	0.00014 U	**0.0096**	0.00084 U	0.00021 U	0.00014 U	0.00009 U	**0.00054**	**0.00021**	0.000094 U
SB-49-0	4/5/2007	0.00014 U	0.00018 U	0.00018 U	**0.030**	**0.00052**	0.00042 U	0.00033 U	0.00025 U	0.00018 U	**0.0042**	0.0011 U	0.00026 U	0.00018 U	0.00012 U	0.00021 U	**0.00021**	0.00012 U
SB-50-4	4/23/2007	0.00013 U	0.00016 U	0.00016 U	**0.0012**	**0.00031**	0.00039 U	0.00031 U	0.00023 U	0.00016 U	0.00014 U	0.00096 U	0.00024 U	0.00016 U	0.00011 U	**0.0005**	**0.00019**	0.00011 U
SB-51-2	4/23/2007	0.00013 U	0.00017 U	0.00017 U	**0.0052**	**0.00041**	0.00041 U	0.00032 U	0.00024 U	0.00017 U	**0.00060**	0.0011 U	0.00025 U	0.00017 U	0.00011 U	**0.0051**	**0.00025**	0.00012 U
SB-51-4.5	4/23/2007	0.0002 U	0.00026 U	0.00026 U	**0.026**	**0.00045**	0.00062 U	0.00049 U	0.00037 U	0.00026 U	**0.00068**	0.0016 U	0.00039 U	0.00026 U	0.00017 U	**0.0055**	0.00024 U	0.00018 U
SB-52-2	4/23/2007	0.017 U	0.020 U	0.024 U	**0.39**	**0.033**	0.056 U	0.038 U	0.018 U	0.020 U	**0.091**	0.023 U	0.037 U	**0.47**	**0.10**	0.037 U	**0.033**	**0.060**
SB-53-3	4/23/2007	0.00017 U	0.00022 U	0.00022 U	**0.00065**	**0.0013**	0.00053 U	0.00042 U	0.00032 U	0.00022 U	**0.00046**	0.0014 U	0.00033 U	**0.00038**	0.00015 U	**0.025**	**0.00081**	**0.00059**
SB-54-1.5	4/24/2007	0.00012 U	0.00016 U	0.00016 U	**0.099**	**0.0014**	0.00038 U	0.0003 U	0.00022 U	0.00016 U	**0.015**	0.00095 U	0.00024 U	0.00016 U	0.00011 U	**0.00062**	**0.0005**	0.00011 U
SB-55-1.5*	6/13/2007	0.00013 U	0.00014 U	0.00021 U	**0.0016**	**0.0023**	0.00034 U	0.00035 U	0.00021 U	0.00013 U	**0.00051**	0.00021 U	0.00054 U	0.00013 U	0.00013 U	**0.001**	**0.0015**	**0.00084**
SB-55-3	6/13/2007	0.017 U	0.020 U	0.025 U	0.020 U	**0.089**	0.059 U	0.039 U	0.018 U	0.020 U	*0.034 U*	0.024 U	0.038 U	0.026 U	0.022 U	0.038 U	**0.10**	**0.039**
SB-55-7.5	6/13/2007	0.027 U	0.032 U	0.040 U	0.031 U	**0.094**	0.093 U	0.062 U	0.029 U	0.032 U	*0.054 U*	0.038 U	0.061 U	**0.45**	**0.074**	**14**	**0.20**	**0.35**
SB-56-4	6/13/2007	0.39 U	**0.45**	0.56 U	**2.1**	**0.69**	1.4 U	0.89 U	0.41 U	0.45 U	*0.77 U*	0.53 U	*0.87 U*	**3.8**	**1.7**	**1.1**	**1.0**	**1.1**
SB-56-7.5	6/13/2007	0.00015 U	0.00017 U	0.00025 U	**0.00095**	**0.0031**	0.0004 U	0.00043 U	0.00025 U	0.00015 U	0.00016 U	0.00025 U	0.00065 U	0.00016 U	0.00016 U	**0.042**	0.00034 U	0.00013 U
SB-57-4	6/14/2007	0.00012 U	0.00014 U	0.0002 U	**0.012**	**0.00081**	0.00032 U	0.00034 U	0.0002 U	0.00012 U	**0.0025**	0.0002 U	0.00051 U	**0.00021**	0.00013 U	**0.0031**	**0.00046**	0.00011 U
SB-57-7	6/14/2007	0.00013 U	0.00015 U	0.00022 U	0.00015 U	0.00026 U	0.00035 U	0.00037 U	0.00022 U	0.00013 U	0.00014 U	0.00022 U	0.00056 U	0.00014 U	0.00014 U	**0.00042**	0.00029 U	0.00011 U
SB-58-4	6/14/2007	0.012 U	0.014 U	0.017 U	**3.2**	0.012 U	0.040 U	0.027 U	0.012 U	0.014 U	**0.089**	0.016 U	0.026 U	0.017 U	0.015 U	0.026 U	0.023 U	0.0095 U
SB-58-7	6/14/2007	0.00013 U	0.00014 U	0.00021 U	**0.0013**	**0.00063**	0.00034 U	0.00035 U	0.00021 U	0.00013 U	0.00013 U	0.00021 U	0.00054 U	**0.0013**	**0.00097**	**0.0056**	**0.00053**	**0.0005**
SB-58-13	6/14/2007	0.0001 U	0.00012 U	0.00017 U	**0.00084**	0.0002 U	0.00027 U	0.00029 U	0.00017 U	0.000098 U	0.00011 U	0.00017 U	0.00043 U	0.00011 U	0.00011 U	**0.0014**	0.00023 U	0.000085 U
SB-59-4	6/14/2007	0.036 U	0.042 U	0.052 U	**0.71**	**0.45**	0.13 U	0.082 U	0.038 U	0.042 U	*0.071 U*	0.050 U	0.080 U	0.053 U	0.046 U	**8.5**	0.070 U	0.030 U
SB-60-4	6/14/2007	0.12 U	0.14 U	0.18 U	**270**	0.13 U	0.42 U	0.28 U	0.13 U	0.14 U	**19**	0.17 U	*0.27 U*	**1.6**	**0.48**	**0.35**	0.24 U	**0.14**
SB-61-4	6/14/2007	0.00011 U	0.00013 U	0.00018 U	**0.0017**	0.00022 U	0.0003 U	0.00031 U	0.00018 U	0.00011 U	0.00012 U	0.00018 U	0.00047 U	0.00012 U	0.00012 U	**0.00055**	0.00025 U	0.000093 U
SB-61-7	6/14/2007	0.00015 U	0.00017 U	0.00025 U	**0.0021**	**0.00071**	0.0004 U	0.00042 U	0.00025 U	0.00015 U	0.00016 U	0.00025 U	0.00065 U	0.00016 U	0.00016 U	0.00021 U	0.00034 U	0.00013 U
SB-62-4	6/14/2007	0.031 U	0.036 U	0.045 U	**42**	**0.061**	0.11 U	0.070 U	0.032 U	0.036 U	**1.3**	0.042 U	0.068 U	**4.5**	**0.90**	**2.7**	**0.31**	**0.68**
SB-62-11.5	6/14/2007	0.019 U	0.022 U	0.027 U	0.022 U	0.020 U	0.064 U	0.043 U	0.020 U	0.022 U	*0.037 U*	0.026 U	0.042 U	**0.21**	**0.12**	**36**	**0.06200**	**0.086**
DUP-1-0614-7 (SB-62-11.5)	6/14/2007	0.022 U	0.026 U	0.032 U	**0.030**	**0.039**	0.075 U	0.051 U	0.023 U	0.026 U	*0.044 U*	0.031 U	0.049 U	**0.61**	**0.29**	**55**	**0.17**	**0.21**

Table D-1
RI Soil Analytical Results for VOCs (mg/kg)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/Sample	Sampling Date	Styrene	1,1,1,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	Tetrachloroethene (PCE)	Toluene	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene	1,1,2-Trichloroethane (1,1,2-TCA)	1,1,1-Trichloroethane (TCA)	Trichloroethene (TCE)	Trichlorofluoromethane (CFC 11)	1,2,3-Trichloropropane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Vinyl Chloride	m,p-Xylenes	o-Xylene
SB-62-17	6/14/2007	0.00011 U	0.00013 U	0.00018 U	**0.0011**	**0.00089**	0.00029 U	0.00031 U	0.00018 U	0.00011 U	0.00012 U	0.00018 U	0.00047 U	**0.13**	**0.059**	**8.1**	**0.012**	**0.013**
SB-62-20	6/14/2007	0.00011 U	0.00012 U	0.00017 U	**0.0010**	**0.00088**	0.00028 U	0.00029 U	0.00017 U	0.0001 U	**0.00033**	0.00017 U	0.00044 U	**0.0054**	**0.0023**	**0.99**	**0.0027**	**0.0035**
SB-63-3.5	6/14/2007	0.96 U	1.2 U	1.4 U	**2700**	0.99 U	3.3 U	2.3 U	1.1 U	1.2 U	**560**	1.4 U	*2.2 U*	**7.5**	**2.8**	*2.2 U*	1.9 U	0.80 U
SB-63-5	6/14/2007	0.62 U	0.73 U	0.91 U	**1700**	0.64 U	2.2 U	1.5 U	0.65 U	0.73 U	**470**	0.86 U	*1.4 U*	**47**	**13**	**2.4**	1.3 U	**2.0**
SB-64-7	6/14/2007	0.00015 U	0.00017 U	0.00025 U	**0.0012**	0.00029 U	0.0004 U	0.00042 U	0.00025 U	0.00015 U	0.00016 U	0.00025 U	0.00064 U	0.00016 U	0.00016 U	**0.062**	0.00033 U	0.00013 U
SB-65-4	6/15/2007	0.00013 U	0.00014 U	0.0002 U	**0.0033**	**0.00034**	0.00033 U	0.00035 U	0.0002 U	0.00012 U	**0.0013**	0.0002 U	0.00053 U	0.00013 U	0.00013 U	**0.0075**	0.00028 U	0.00011 U
SB-66-3.5	6/15/2007	0.00012 U	0.00013 U	0.00019 U	**0.0010**	0.00022 U	0.00031 U	0.00032 U	0.00019 U	0.00012 U	**0.00032**	0.00019 U	0.00049 U	0.00012 U	0.00012 U	**0.19**	0.00026 U	0.000096 U
SB-67-3	6/15/2007	0.00011 U	0.00013 U	0.00018 U	**0.0011**	**0.00029**	0.00029 U	0.00031 U	0.00018 U	0.00011 U	**0.0039**	0.00018 U	0.00047 U	0.00012 U	0.00012 U	**0.0054**	0.00024 U	0.000092 U
SB-68-4	6/27/2007	0.000085 U	0.000097 U	0.00014 U	**0.088**	**0.00093**	0.00023 U	0.00025 U	0.00014 U	0.000084 U	**0.061**	0.00014 U	0.00037 U	0.000089 U	0.000088 U	**0.010**	**0.00023**	**0.0002**
SB-69-3	10/20/2009	--	--	--	0.0016 U	0.0016 U	--	--	--	0.0016 U	0.0016 U	--	--	--	--	0.0016 U	0.0016 U	0.0016 U
SB-70-4	10/20/2009	--	--	--	**0.048**	0.0014 U	--	--	--	0.0014 U	**0.0039**	--	--	--	--	**0.023**	0.0014 U	0.0014 U
SB-70-4-R	10/20/2009	--	--	--	**0.0013**	0.0012 U	--	--	--	0.0012 U	0.0012 U	--	--	--	--	**0.0041**	0.0012 U	0.0012 U
SB-71-3.5	10/20/2009	--	--	--	0.0014 U	**0.0019**	--	--	--	0.0014 U	0.0014 U	--	--	--	--	0.0015 U	**0.0029**	**0.0018**
SB-72-3.5	10/20/2009	--	--	--	0.0014 U	0.0014 U	--	--	--	0.0014 U	0.0014 U	--	--	--	--	0.0014 U	0.0014 U	0.0014 U
SB-73-3.5	10/21/2009	--	--	--	0.0018 U	0.0018 U	--	--	--	0.0018 U	0.0018 U	--	--	--	--	**0.005**	0.0018 U	0.0018 U
SB-73-3.5-R	10/21/2009	--	--	--	**0.0085**	0.0019 U	--	--	--	0.0019 U	0.0019 U	--	--	--	--	**0.0039**	0.0019 U	0.0019 U
SB-74-3.5	10/21/2009	--	--	--	0.0017 U	0.0017 U	--	--	--	0.0017 U	0.0017 U	--	--	--	--	0.0017 U	0.0017 U	0.0017 U
SB-75-6.5	10/21/2009	--	--	--	0.0026 U	0.0026 U	--	--	--	0.0026 U	0.0026 U	--	--	--	--	0.0026 U	0.0026 U	0.0026 U
MW-1-4	4/23/2007	0.00019 U	0.00025 U	0.00025 U	**0.00096**	**0.0015**	0.0006 U	0.00048 U	0.00035 U	0.00025 U	0.00021 U	0.0015 U	0.00037 U	0.00025 U	0.00017 U	0.00029 U	**0.0007**	0.00017 U
MW-2-4	4/23/2007	0.0002 U	0.00026 U	0.00026 U	0.00019 U	**0.00064**	0.00063 U	0.0005 U	0.00037 U	0.00026 U	0.00022 U	0.0016 U	0.00039 U	0.00026 U	0.00017 U	0.00030 U	0.00024 U	0.00018 U
MW-3-4	4/23/2007	0.00018 U	0.00023 U	0.00023 U	0.00016 U	**0.00058**	0.00054 U	0.00043 U	0.00032 U	0.00023 U	0.00019 U	0.0014 U	0.00034 U	0.00023 U	0.00015 U	0.00027 U	**0.00035**	**0.00028**
MW-3-9	4/23/2007	0.00023 U	0.00030 U	0.0003 U	0.00022 U	**0.0055**	0.00072 U	0.00057 U	0.00043 U	0.0003 U	0.00025 U	0.0019 U	0.00045 U	0.0003 U	0.0002 U	0.00035 U	0.00028 U	0.00021 U
MW-4-4	4/23/2007	0.00019 U	0.00025 U	0.00025 U	**0.025**	**0.00079**	0.00059 U	0.00047 U	0.00035 U	0.00025 U	**0.0078**	0.0015 U	0.00037 U	0.00025 U	0.00016 U	**0.0091**	0.00023 U	0.00017 U
MW-5-5	4/24/2007	0.00017 U	0.00022 U	0.00022 U	0.00016 U	**0.0018**	0.00052 U	0.00041 U	0.00031 U	0.00022 U	0.00018 U	0.0013 U	0.00033 U	0.00022 U	0.00015 U	0.00025 U	**0.00043**	0.00015 U
MW-5-20	4/24/2007	0.00014 U	0.00018 U	0.00018 U	0.00013 U	**0.00052**	0.00044 U	0.00035 U	0.00026 U	0.00018 U	0.00015 U	0.0011 U	0.00027 U	0.00018 U	0.00012 U	0.00021 U	**0.00031**	0.00013 U
MW-6-3	6/13/2007	**0.00025**	0.00015 U	0.00021 U	**0.0017**	**0.0003**	0.00034 U	0.00036 U	0.00021 U	0.00013 U	**0.00053**	0.00021 U	0.00055 U	0.00014 U	0.00014 U	**0.010**	0.00029 U	0.00011 U
MW-7-4	6/13/2007	0.017 U	0.020 U	0.025 U	**16**	0.018 U	0.059 U	0.040 U	0.018 U	0.020 U	**12**	0.024 U	0.039 U	0.026 U	0.022 U	**0.51**	0.034 U	**0.067**
MW-7-9	6/13/2007	1.2 U	1.4 U	1.7 U	**4600**	1.2 U	4.0 U	2.7 U	1.3 U	1.4 U	**190**	1.6 U	*2.6 U*	**21**	**7.3**	**70**	**3.2**	**2.6**
MW-7-12	6/13/2007	0.19 U	0.22 U	0.27 U	*0.22 U*	0.19 U	0.64 U	0.43 U	0.20 U	0.22 U	*0.37 U*	0.26 U	*0.42 U*	**1.2**	**0.48**	**37**	0.36 U	**0.25**
MW-8-5	6/13/2007	0.00011 U	0.00013 U	0.00018 U	**0.014**	**0.00033**	0.00029 U	0.00031 U	0.00018 U	0.00011 U	**0.00041**	0.00018 U	0.00046 U	**0.00026**	0.00011 U	0.00015 U	**0.00033**	0.000091 U
MW-9-4	6/14/2007	**0.00019**	0.0001 U	0.00015 U	**0.0057**	**0.0013**	0.00024 U	0.00025 U	0.00015 U	0.000087 U	**0.00041**	0.00015 U	0.00038 U	**0.0017**	0.000091 U	**0.00047**	**0.00089**	**0.00045**
MW-10-4	10/21/2009	--	--	--	0.0018 U	0.0018 U	--	--	--	0.0018 U	0.0018 U	--	--	--	--	0.0018 U	0.0018 U	0.0018 U
MTCA Method A CUL (mg/kg)		--	--	--	**0.05**	**7**	--	--	--	**2**	**0.03**	--	--	--	--	--	**9 (total xylenes)**	
MTCA Method B CUL (mg/kg)		**33**	**38**	**5**	**1.9**	**6,400**	--	**800**	**18**	**72,000**	**11**	**24,000**	**0.14**	**4,000**	**4,000**	**0.67**	**16,000 (total xylenes)**	

Yellow highlighted detections are those values exceeding the appropriate MTCA cleanup levels (Method B CULs were accessed in October 2009).

Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.

Italicized non-detected values are detection or reporting limits that exceed the appropriate MTCA cleanup level.

U = Not detected at or above the reporting limit.

-- = Not Analyzed or Not Applicable

All units are in mg/kg (ppm)

* This sample (SB-55-1.5) was inadvertently labeled MW-7-1.5 when delivered to the laboratory for analysis.

Table D-2
RI Soil Analytical Results for TPH-Tin (mg/kg)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/ Sample	Date	TPH - Gasoline Range	TPH - Diesel Range	TPH - Heavy Oil Range	Tin (total)	Tri-n-butyltin (as cation)	Total Organic Carbon (%)
SB-5-8	4/2/2007	20 U	**320**	**980**	--	--	--
SB-7-0	4/2/2007	--	--	--	**1.48**	--	--
SB-11-9	4/3/2007	20 U	**1200**	**3400**	--	--	--
SB-12-0	4/3/2007	--	--	--	**0.96**	--	--
SB-25-0	4/3/2007	--	--	--	**2.47**	**0.00017**	--
SB-26-0	4/4/2007	--	--	--	**79.3**	**0.0010**	--
SB-26-2	4/4/2007	--	--	--	**2.09**	--	--
SB-26-4	4/4/2007	**4700**	**480**	**800**	--	--	--
SB-27-0	4/4/2007	--	--	--	**33.8**	**0.00039**	--
SB-27-1	4/4/2007	**1600**	**2400**	**3400**	--	--	--
SB-30-0	4/4/2007	--	--	--	**56.4**	**0.0019**	--
SB-34-0	4/4/2007	--	--	--	**35.1**	0.000082 U	--
SB-37-0	4/4/2007	--	--	--	**157**	**0.0011**	--
SB-38-0	4/4/2007	--	--	--	**4.38**	**0.00058**	--
SB-39-0	4/4/2007	--	--	--	**590**	**0.20**	--
SB-42-0	4/5/2007	--	--	--	**30.7**	0.000071 U	--
SB-46-4	4/5/2007	**100**	**2000**	**2800**	--	--	--
SB-47-0	4/5/2007	--	--	--	**83.1**	0.000089 U	--
SB-48-0	4/5/2007	--	--	--	**56.9**	**0.0022**	--
SB-55-4	6/13/2007	**790**	**1500**	**6100**	--	--	--
SB-55-7.5	6/13/2007	**16**	**3.6**	**12**	--	--	--
SB-57-4	6/14/2007	**13**	**4.9**	**21**	--	--	--
SB-57-7	6/14/2007	**81**	**35**	**31**	--	--	--
SB-58-4	6/14/2007	**5.8**	**140**	**300**	--	--	--
SB-58-7	6/14/2007	**8.2**	**16**	**42**	--	--	--
SB-60-4	6/14/2007	**3800**	**330**	**30**	--	--	--
SB-61-4	6/16/2007	**2.0**	**5.0**	**16**	--	--	--
SB-61-7	6/14/2007	**11**	**5.8**	**31**	--	--	--
SB-62-4	6/14/2007	**1200**	**330**	**510**	--	--	--
SB-62-11.5	6/14/2007	--	**2.8**	**11**	--	--	--
SB-62-17	6/14/2007	**29**	**10**	**21**	--	--	--
SB-63-3.5	6/14/2007	**2700**	**650**	**1700**	--	--	--
SB-69-3	10/20/2009	20 U	50 U	100 U	--	--	--
SB-70-4	10/20/2009	20 U	**35**	**200**	--	--	**2.15**
SB-71-3.5	10/20/2009	**220**	50 U	100 U	--	--	--
SB-72-3.5	10/20/2009	20 U	50 U	100 U	--	--	--
SB-73-3.5	10/21/2009	20 U	50 U	100 U	--	--	--

Table D-2
RI Soil Analytical Results for TPH-Tin (mg/kg)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/ Sample	Date	TPH - Gasoline Range	TPH - Diesel Range	TPH - Heavy Oil Range	Tin (total)	Tri-n-butyltin (as cation)	Total Organic Carbon (%)
SB-74-3.5	10/20/2009	**90**	**52**	**110**	--	--	--
SB-75-6.5	10/20/2009	20 U	**130**	**1600**	--	--	**1.20**
MW-7-4	6/13/2007	**480**	**38**	**25**	--	--	--
MW-7-9	6/13/2007	**2600**	**220**	**300**	--	--	--
MW-10-4	10/21/2009	20 U	50 U	100 U	--	--	--
MTCA Method A CUL (mg/kg)		**30**	**2,000**	**2,000**	--	--	--
MTCA Method B CUL (mg/kg)		--	--	--	**48,000**	**2.3***	--

Yellow highlighted detections are those values exceeding the appropriate MTCA cleanup levels

Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.

U = Not detected at or above the reporting limit.

-- = Not Analyzed or Not Applicable

All units are in mg/kg (ppm), except total organic carbon is in percent.

* MTCA Method B cleanup level for Tributyltin-oxide is 2.4 mg/kg; equivalent Tributyltin-cation CUL is 2.3 mg/kg

Table D-3
RI Soil Analytical Results for Groundwater (ug/L)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/Sample	Sampling Date	Acetone	Benzene	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	Bromomethane	2-Butanone (MEK)	n-Butylbenzene	sec-Butylbenzene	tert-Butylbenzene	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroethane (Ethyl Chloride)	Chloroform	Chloromethane (Methyl Chloride)	2-Chlorotoluene	4-Chlorotoluene	1,2-Dibromo-3-chloropropane (DBCP)	Dibromochloromethane	1,2-Dibromoethane (EDB)	Dibromomethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane (CFC 12)	1,1-Dichloroethane (1,1-DCA)	1,2-Dichloroethane (1,2,-DCA; EDC)	1,1-Dichloroethene (1,1-DCE)	cis-1,2-Dichloroethene (cis-1,2-DCE)	trans-1,2-Dichloroethene (trans-1,2-DCE)	Dichloromethane (Methylene Chloride)	1,2-Dichloropropane	1,3-Dichloropropane	2,2-Dichloropropane
SB-3-GW	4/5/2007	4.1 U	**0.32**	0.18 U	0.17 U	0.11 U	0.28 U	0.50 U	2.3 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	0.13 U	**56**	**0.31**	0.20 U	0.14 U	0.15 U	0.18 U
SB-5-GW	4/5/2007	**20**	**2.7**	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	**4.2**	0.23 U	0.13 U	0.13 U	**0.31**	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	0.13 U	**1.5**	0.15 U	0.20 U	0.14 U	0.15 U	0.18 U
SB-17-GW	4/3/2007	4.1 U	**0.72**	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.3 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	**0.17**	0.12 U	0.13 U	**0.25**	0.15 U	0.20 U	**0.15**	0.15 U	0.18 U
SB-19-GW	4/3/2007	4.1 U	**0.31**	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.3 U	0.23 U	0.13 U	0.13 U	**0.18**	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	0.13 U	**0.70**	0.15 U	0.20 U	**0.20**	0.15 U	0.18 U
SB-37-GW	4/4/2007	**11**	**0.29**	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.30 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.10 U*	0.12 U	**0.12**	0.11 U	0.12 U	0.17 U	**0.46**	0.12 U	0.13 U	**0.47**	0.15 U	0.20 U	0.14 U	0.15 U	0.18 U
SB-46-GW	4/5/2007	41 U	**2.1**	1.8 U	1.7 U	1.1 U	2.8 U	2.2 U	23 U	2.3 U	1.3 U	1.3 U	1.6 U	1.4 U	1.4 U	2.3 U	1.4 U	1.4 U	1.2 U	1.2 U	10 U	1.1 U	*0.99 U*	1.2 U	1.2 U	1.1 U	1.2 U	1.7 U	1.1 U	1.2 U	1.3 U	**3,300**	**2.6**	**2.5**	1.4 U	1.5 U	1.8 U
MW-1	5/2/2007	4.1 U	0.14 U	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.3 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	0.13 U	**5.1**	0.15 U	0.20 U	0.14 U	0.15 U	0.18 U
MW-1	6/27/2007	4.1 U	0.14 U	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.3 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	0.13 U	**1.1**	0.15 U	0.20 U	0.14 U	0.15 U	0.18 U
MW-1	10/21/2009	--	0.2 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2 U	--	0.2 U	--	0.2 U	**0.6**	0.2 U	0.5 U	0.2 U	--	--
MW-2	5/2/2007	4.1 U	**0.55**	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.3 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	**0.15**	0.12 U	0.13 U	**7.9**	0.15 U	0.20 U	**0.25**	0.15 U	0.18 U
MW-2	6/27/2007	4.1 U	**0.65**	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.3 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	**0.15**	0.12 U	0.13 U	**11**	0.15 U	0.20 U	**0.28**	0.15 U	0.18 U
MW-2	10/21/2009	--	**0.2**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2 U	--	0.2 U	--	0.2 U	**2.1**	0.2 U	0.5 U	**0.2**	--	--
MW-3	5/2/2007	4.1 U	**2.6**	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.3 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	**0.16**	**97**	**0.19**	0.20 U	0.14 U	0.15 U	0.18 U
Dup 1 (MW-3)	5/2/2007	4.1 U	**3.1**	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.3 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	**0.15**	**140**	**0.23**	0.20 U	0.14 U	0.15 U	0.18 U
MW-3	6/27/2007	21 U	**18**	0.86 U	0.82 U	0.55 U	1.4 U	1.1 U	12 U	1.2 U	0.64 U	0.61 U	0.80 U	0.70 U	0.67 U	1.2 U	0.68 U	0.68 U	0.56 U	0.59 U	5.0 U	0.52 U	*0.50 U*	0.60 U	0.56 U	0.51 U	0.57 U	0.83 U	0.51 U	0.57 U	**1.1**	**1,600**	**1.2**	**1.0**	0.70 U	0.74 U	0.87 U
MW-3	10/21/2009	--	**1.2**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2 U	--	0.2 U	--	0.2 U	**2.9**	0.2 U	0.5 U	0.2 U	--	--
Dup 1 (MW-3)	10/21/2009	--	**1.0**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2 U	--	0.2 U	--	0.2 U	**2.9**	0.2 U	0.5 U	0.2 U	--	--
MW-4	5/2/2007	8.2 U	0.28 U	0.35 U	0.33 U	0.22 U	0.56 U	0.44 U	4.6 U	0.45 U	0.26 U	0.25 U	0.32 U	0.28 U	0.27 U	0.46 U	0.28 U	0.28 U	0.23 U	0.24 U	2.0 U	0.21 U	*0.20 U*	0.24 U	0.23 U	0.21 U	0.23 U	0.34 U	0.21 U	0.23 U	**0.5**	**920**	**9.4**	**0.60**	0.28 U	0.30 U	0.35 U
MW-4	6/27/2007	8.2 U	**0.32**	0.35 U	0.33 U	0.22 U	0.56 U	0.44 U	4.6 U	0.45 U	**0.84**	0.25 U	0.32 U	0.28 U	0.27 U	0.46 U	0.28 U	0.28 U	0.23 U	0.24 U	2.0 U	0.21 U	*0.20 U*	0.24 U	0.23 U	0.21 U	0.23 U	0.34 U	0.21 U	0.23 U	**7.4**	**540**	**2.0**	**0.42**	0.28 U	0.30 U	0.35 U
MW-4	10/21/2009	--	0.2 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2 U	--	0.2 U	--	0.2 U	**73**	**0.7**	0.5 U	0.2 U	--	--
MW-5	5/2/2007	**4.8**	0.14 U	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	**5.7**	0.23 U	0.13 U	0.13 U	**0.18**	0.14 U	0.14 U	0.23 U	**0.75**	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	0.13 U	0.12 U	0.15 U	0.20 U	0.14 U	0.15 U	0.18 U
MW-5	6/27/2007	4.1 U	0.14 U	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.3 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	0.13 U	0.12 U	0.15 U	0.20 U	0.14 U	0.15 U	0.18 U
MW-5	10/21/2009	--	0.2 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2 U	--	0.2 U	--	0.2 U	0.2 U	0.2 U	0.5 U	0.2 U	--	--
MW-6	6/27/2007	**6.5**	**0.15**	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.3 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	**0.74**	**0.17**	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	0.13 U	**0.49**	0.15 U	0.20 U	0.14 U	0.15 U	0.18 U
MW-6	10/20/2009	--	0.2 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2 U	--	0.2 U	--	0.2 U	**9.7**	0.2 U	0.5 U	0.2 U	--	--
MW-7	6/27/2007	*2100 U*	*68 U*	86 U	82 U	55 U	*140 U*	110 U	1200 U	120 U	64 U	61 U	80 U	70 U	67 U	*120 U*	*68 U*	*68 U*	56 U	59 U	500 U	52 U	*50 U*	60 U	56 U	51 U	*57 U*	83 U	51 U	*57 U*	**70**	**63,000**	**200**	**100**	*70 U*	74 U	87 U
Dup-1 (MW-7)	6/27/2007	*820 U*	*28 U*	35 U	33 U	22 U	*56 U*	44 U	460 U	45 U	26 U	25 U	32 U	28 U	27 U	*46 U*	*28 U*	*28 U*	23 U	24 U	200 U	21 U	*20 U*	27 U	23 U	21 U	*23 U*	34 U	21 U	*23 U*	**64**	**73,000**	**220**	**44**	**44**	30 U	35 U
MW-7	10/22/2009	--	*20 U*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*20 U*	--	20 U	--	20 U	**20,000**	**170**	*50 U*	*20 U*	--	--
MW-8	6/27/2007	4.1 U	0.14 U	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	**4.3**	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	0.13 U	**2.1**	0.15 U	0.20 U	0.14 U	0.15 U	0.18 U
MW-8	10/21/2009	--	0.2 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2 U	--	0.2 U	--	0.2 U	0.2 U	0.2 U	0.5 U	0.2 U	--	--
MW-9	6/27/2007	4.1 U	0.14 U	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.3 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	**0.40**	**0.2**	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	0.13 U	**0.14**	0.15 U	0.20 U	0.14 U	0.15 U	0.18 U
MW-9	10/21/2009	--	0.2 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2 U	--	0.2 U	--	0.2 U	0.2 U	0.2 U	0.5 U	0.2 U	--	--
MW-10	10/22/2009	--	0.2 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2 U	--	0.2 U	--	0.2 U	0.2 U	0.2 U	0.5 U	0.2 U	--	--
Outfall 15th St*	6/15/2007	4.1 U	0.14 U	0.18 U	0.17 U	0.11 U	0.28 U	0.22 U	2.3 U	0.23 U	0.13 U	0.13 U	0.16 U	0.14 U	0.14 U	0.23 U	0.14 U	0.14 U	0.12 U	0.12 U	1.0 U	0.11 U	*0.099 U*	0.12 U	0.12 U	0.11 U	0.12 U	0.17 U	0.11 U	0.12 U	0.13 U	**4.7**	0.15 U	0.20 U	0.14 U	0.15 U	0.18 U
MTCA Method A CUL (ug/L)		**--**	**5**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0.01**	**--**	**--**	**--**	**--**	**--**	**--**	**5**	**--**	**--**	**--**	**5**	**--**	**--**	**--**
MTCA Method B CUL (ug/L)		**800**	**0.8**	**--**	**--**	**--**	**5.5**	**--**	**4,800**	**--**	**--**	**--**	**800**	**--**	**--**	**15**	**7.2**	**3.4**	**--**	**--**	**--**	**--**	**0.00051**	**--**	**720**	**--**	**1.8**	**1,600**	**1,600**	**0.48**	**400**	**80**	**160**	**5.8**	**0.64**	**--**	**--**

Yellow highlighted detections are those values exceeding the appropriate MTCA cleanup levels

Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.

U = Not detected at or above the reporting limit.

-- = Not Analyzed or Not Applicable

All units are in µg/L (ppb)

Italicized non-detected values are those detection or reporting limits that exceed the appropriate MTCA cleanup level.

* Surface water sample from the regional storm drain outfall on the Hoquiam River at 15th Street; the results do not exceed any surface water criteria for aquatic life or human health.

Table D-3
RI Soil Analytical Results for Groundwater (ug/L)
Most Western Laundry, Hoquiam, Washington
DRAFT Copy -- Data Not Validated

Location/Sample	Sampling Date	1,1-Dichloropropene	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene	Ethylbenzene	Hexachlorobutadiene	2-Hexanone	Isopropylbenzene (Cumene)	4-Isopropyltoluene	4-Methyl-2-pentanone (MIBK)	Naphthalene	n-Propylbenzene	Styrene	1,1,1,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	Tetrachloroethene (PCE)	Toluene	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene	1,1,1-Trichloroethane (TCA)	1,1,2-Trichloroethane	Trichloroethene (TCE)	Trichlorofluoromethane (CFC 11)	1,2,3-Trichloropropane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Vinyl Chloride	m,p-Xylenes	o-Xylene	TPH - Gasoline Range	TPH - Diesel Range	TPH - Heavy Oil Range
SB-3-GW	4/5/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	**2.5**	**0.39**	0.33 U	0.22 U	0.12 U	0.14 U	**2.0**	0.14 U	0.24 U	0.15 U	0.13 U	**11**	0.22 U	0.11 U	--	--	--
SB-5-GW	4/5/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	**3.7**	**0.31**	0.33 U	0.22 U	0.12 U	0.14 U	**0.49**	0.14 U	0.24 U	0.15 U	0.13 U	**1.8**	0.22 U	0.11 U	**66**	**20,000**	**54,000**
SB-17-GW	4/3/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	0.13 U	0.11 U	0.33 U	0.22 U	0.12 U	0.14 U	0.14 U	0.14 U	0.24 U	0.15 U	0.13 U	**1.3**	0.22 U	0.11 U	--	--	--
SB-19-GW	4/3/2007	0.15 U	0.11 U	0.11 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	0.13 U	**0.28**	0.33 U	0.22 U	0.12 U	0.14 U	0.14 U	0.14 U	0.24 U	0.15 U	0.13 U	**2.2**	0.22 U	0.11 U	--	--	--
SB-37-GW	4/4/2007	0.15 U	0.11 U	0.09 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	**0.42**	0.10 U	0.10 U	0.12 U	0.14 U	**3.0**	**0.28**	0.33 U	0.22 U	0.12 U	**0.15**	**0.3**	0.14 U	0.22 U	0.15 U	0.13 U	*0.4 U*	0.22 U	0.11 U	--	--	--
SB-46-GW	4/5/2007	1.5 U	*1.1 U*	*0.90 U*	1.3 U	2.8 U	40 U	1.1 U	1.3 U	27 U	2.9 U	0.98 U	0.95 U	1.2 U	1.4 U	**69**	**2.7**	3.3 U	2.2 U	1.2 U	*1.4 U*	**21**	1.4 U	2.4 U	1.5 U	1.3 U	**4,100**	2.2 U	1.1 U	**300**	**40,000**	**50,000**
MW-1	5/2/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	**0.31**	0.11 U	0.33 U	0.22 U	0.12 U	0.14 U	0.14 U	0.14 U	0.24 U	0.15 U	0.13 U	**2.9**	0.22 U	0.11 U	--	--	--
MW-1	6/27/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	0.13 U	0.11 U	0.33 U	0.22 U	0.12 U	0.14 U	**0.23**	0.14 U	0.24 U	0.15 U	0.13 U	**0.45**	0.22 U	0.11 U	--	--	--
MW-1	10/21/2009	--	--	--	0.2 U	--	--	--	--	--	0.5 U	--	--	--	--	**0.3**	0.2 U	--	--	0.2 U	--	0.2 U	--	--	--	--	0.2 U	0.4 U	0.2 U	--	--	--
MW-2	5/2/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	0.13 U	0.11 U	0.33 U	0.22 U	0.12 U	0.14 U	0.14 U	0.14 U	0.24 U	0.15 U	0.13 U	**17**	0.22 U	0.11 U	--	--	--
MW-2	6/27/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	0.13 U	**0.43**	0.33 U	0.22 U	0.12 U	0.14 U	0.14 U	0.14 U	0.24 U	0.15 U	0.13 U	**19**	**0.31**	**0.16**	--	--	--
MW-2	10/21/2009	--	--	--	0.2 U		--	--	--	--	0.5 U	--	--	--	--	**0.2**	0.2 U	--	--	0.2 U	--	0.2 U	--	--	--	--	**3.1**	0.4 U	0.2 U	--	--	--
MW-3	5/2/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	**5.9**	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	**4.6**	**0.23**	0.33 U	0.22 U	0.12 U	0.14 U	**0.62**	0.14 U	0.24 U	0.15 U	0.13 U	**110**	0.22 U	**0.22**	**71**	**38**	21 U
Dup 1 (MW-3)	5/2/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	**7.5**	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	**4.3**	**0.24**	0..33 U	0.22 U	0.12 U	0.14 U	**0.75**	0.14 U	0.24 U	0.15 U	0.13 U	**130**	0.22 U	0.11 U	--	--	--
MW-3	6/27/2007	0.75 U	*0.55 U*	*0.45 U*	0.65 U	1.4 U	20 U	0.53 U	**140**	14 U	1.5 U	0.49 U	0.48 U	0.56 U	0.69 U	**0.75**	**0.65**	1.7 U	1.1 U	0.58 U	0.69 U	**2.1**	0.66 U	1.2 U	0.71 U	0.61 U	**820**	1.1 U	0.51 U	**590**	**42**	**61**
MW-3	10/21/2009	--	--	--	0.2 U	--	--	--	--	--	0.5 U	--	--	--	--	**14**	0.2 U	--	--	0.2 U	--	**1.1**	--	--	--	--	**4.4**	0.4 U	0.2 U	250 U	**3,800**	**1,400**
Dup 1 (MW-3)	10/21/2009	--	--	--	0.2 U	--	--	--	--	--	0.5 U	--	--	--	--	**15**	0.2 U	--	--	0.2 U	--	**1.1**	--	--	--	--	**4.5**	0.4 U	0.2 U	250 U	**3,900**	**1,300**
MW-4	5/2/2007	0.30 U	0.22 U	0.18 U	0.26 U	0.56 U	8.0 U	0.21 U	0.26 U	5.4 U	0.57 U	0.20 U	0.19 U	0.23 U	0.28 U	**460**	**0.34**	0.66 U	0.44 U	0.24 U	0.28 U	**540**	0.27 U	0.48 U	0.29 U	0.25 U	**11**	0.44 U	0.21 U	--	--	--
MW-4	6/27/2007	0.30 U	0.22 U	0.18 U	0.26 U	0.56 U	8.0 U	**0.56**	0.26 U	5.4 U	0.57 U	0.20 U	0.19 U	0.23 U	0.28 U	**20**	**0.56**	0.66 U	0.44 U	0.24 U	0.28 U	**100**	0.27 U	0.48 U	0.29 U	0.25 U	**160**	0.44 U	**0.76**	--	--	--
MW-4	10/21/2009	--	--	--	0.2 U	--	--	--	--	--	0.5 U	--	--	--	--	**96**	0.2 U	--	--	0.2 U	--	**93**	--	--	--	--	**0.2**	0.4 U	0.2 U	--	--	--
MW-5	5/2/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	0.13 U	**0.12**	0.33 U	0.22 U	0.12 U	0.14 U	0.14 U	0.14 U	0.24 U	0.15 U	0.13 U	0.042 U	0.22 U	0.11 U	250 U	*630 U*	*630 U*
MW-5	6/27/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	0.13 U	0.11 U	0.33 U	0.22 U	0.12 U	0.14 U	0.14 U	0.14 U	0.24 U	0.15 U	0.13 U	**0.060**	0.22 U	0.11 U	**18**	**20**	**60**
MW-5	10/21/2009	--	--	--	0.2 U		--	--	--	--	0.5 U	--	--	--	--	0.2 U	0.2 U	--	--	0.2 U	--	0.2 U	--	--	--	--	0.2 U	0.4 U	0.2 U	--	--	--
MW-6	6/27/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	**0.78**	**0.20**	0.33 U	0.22 U	0.12 U	0.14 U	**0.15**	0.14 U	0.24 U	0.15 U	0.13 U	**0.22**	0.22 U	0.11 U	--	--	--
MW-6	10/20/2009	--	--	--	0.2 U	--	--	--	--	--	0.5 U	--	--	--	--	**4.2**	0.2 U	--	--	0.2 U	--	**8.7**	--	--	--	--	**0.6**	0.4 U	0.2 U	--	--	--
MW-7	6/27/2007	75 U	*55 U*	*54 U*	65 U	*140 U*	2000 U	53 U	64 U	*1400 U*	150 U	49 U	*48 U*	56 U	69 U	**39,000**	45 U	170 U	*110 U*	58 U	*69 U*	**11,000**	66 U	*120 U*	71 U	61 U	**8,300**	110 U	51 U	**22,000**	**57**	**61**
Dup-1 (MW-7)	6/27/2007	30 U	*22 U*	*22 U*	26 U	*56 U*	800 U	21 U	26 U	540 U	57 U	20 U	*19 U*	23 U	28 U	**41,000**	18 U	66 U	44 U	24 U	*28 U*	**12,000**	27 U	*48 U*	**30**	25 U	**10,000**	44 U	21 U	**27,000**	**51**	**63**
MW-7	10/22/2009	--	--	--	20 U	--	--	--	--	--	50 U	--	--	--	--	**97,000**	20 U	--	--	20 U	--	**23,000**	--	--	--	--	**2,000**	40 U	20 U	**55,000**	**1,300**	**510**
MW-8	6/27/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	**54**	0.11 U	0.33 U	0.22 U	0.12 U	0.14 U	**1.6**	0.14 U	0.24 U	0.15 U	0.13 U	**0.22**	0.22 U	0.11 U	--	--	--
MW-8	10/21/2009	--	--	--	0.2 U	--	--	--	--	--	0.5 U	--	--	--	--	**0.4**	0.2 U	--	--	0.2 U	--	0.2 U	--	--	--	--	0.2 U	0.4 U	0.2 U	--	--	--
MW-9	6/27/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	**6.5**	**0.11**	0.33 U	0.22 U	0.12 U	0.14 U	0.14 U	0.14 U	0.24 U	0.15 U	0.13 U	0.042 U	0.22 U	0.11 U	--	--	--
MW-9	10/21/2009	--	--	--	0.2 U	--	--	--	--	--	0.5 U	--	--	--	--	0.2 U	0.2 U	--	--	0.2 U	--	0.2 U	--	--	--	--	0.2 U	0.4 U	0.2 U	--	--	--
MW-10	10/22/2009	--	--	--	0.2 U	--	--	--	--	--	0.5 U	--	--	--	--	**0.8**	0.2 U	--	--	0.2 U	--	**0.2**	--	--	--	--	0.2 U	0.4 U	0.2 U	250 U	**370**	500 U
Outfall 15th St*	6/15/2007	0.15 U	0.11 U	0.090 U	0.13 U	0.28 U	4.0 U	0.11 U	0.13 U	2.7 U	0.29 U	0.098 U	0.095 U	0.12 U	0.14 U	0.13 U	0.11 U	0.33 U	0.22 U	0.12 U	0.14 U	0.14 U	0.14 U	0.24 U	0.15 U	0.13 U	**0.31**	0.22 U	0.11 U	--	--	--
MTCA Method A CUL (ug/L)		**--**	**--**	**--**	**700**	**--**	**--**	**--**	**--**	**--**	**160**	**--**	**--**	**--**	**--**	**5**	**1,000**	**--**	**--**	**200**	**--**	**5**	**--**	**--**	**--**	**--**	**0.2**	**1,000 (total)**		**800**	**500**	**500**
MTCA Method B CUL (ug/L)		**--**	**0.24 (both c/t)**		**800**	**0.56**	**--**	**800**	**--**	**640**	**160**	**--**	**1.5**	**--**	**--**	**0.081**	**640**	**--**	**80**	**7,200**	**0.77**	**0.49**	**2,400**	**40**	**400**	**400**	**0.029**	**1,600 (total)**		**--**	**--**	**--**

Yellow highlighted detections are those values exceeding the appropriate MTCA cleanup levels

Bold values are detected concentrations; non-bold values are non-detected at the reporting or detection limit.

U = Not detected at or above the reporting limit.

-- = Not Analyzed or Not Applicable

All units are in µg/L (ppb)

Italicized non-detected values are those detection or reporting limits that exceed the appropriate MTCA cleanup level.

* Surface water sample from the regional storm drain outfall on the Hoquiam River at 15th Street; the results do not exceed any surface water criteria for aquatic life or human health.

Appendix E
Vapor Intrusion Modeling Runs
(Provided only electronically)

Appendix F
Remedial Alternative Cost Estimates

Remedial Alternatives for Former Most Western Laundry, Hoquiam, Washington
Summary of Remedial Alternatives

Remedial Alternatives	Non-Discounted Cost			
	Capital Cost	O&M Cost	Total Cost	Duration
Alternative 1 - Complete Soil Removal, Biostimulation and MNA	**$1,284,289**	**$196,125**	**$1,480,414**	**3 years**
Alternative 2 - Soil Removal, Biostimulation and MNA	**$1,211,614**	**$196,125**	**$1,407,739**	**3 years**
Alternative 3 - ERH, Biostimulation and MNA	**$1,294,412**	**$196,125**	**$1,490,537**	**3 years**

Remedial Alternatives	Discounted Cost (Nominal Rate = 5%)			
	Capital Cost	O&M Cost	Total Cost	Duration
Alternative 1 - Complete Soil Removal, Biostimulation and MNA	**$1,284,289**	**$182,024**	**$1,466,313**	**3 years**
Alternative 2 - Soil Removal, Biostimulation and MNA	**$1,211,614**	**$182,024**	**$1,393,638**	**3 years**
Alternative 3 - ERH, Biostimulation and MNA	**$1,294,412**	**$182,024**	**$1,476,436**	**3 years**

General Notes:

1. The following markups have been applied to all costs: 8% Design, 5% Office Overhead, 15% Field Overhead, and 25% Contingency. Design markup cost has not been applied to O&M cost totals.

Remedial Alternatives for Former Most Western Laundry, Hoquiam, Washington
Alternative 1 - Complete Soil Removal, Biostimulation and MNA
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
CAPITAL			
Excavation Subcontractor Mobilization	ls	$2,500	Mobilization, project management and demobilization
Subcontractor pre-construction plans	ls	$3,500	Preparation and submittal of pre-construction plans and deliverables
Traffic Control			
Estimated duration for traffic control needs	days	14	
Traffic control daily rate	$/day	$900	Historic costs from Traffic Control Co.
Concrete Slab Removal and Concrete Recycling			
Hydraulic breaker mobilization	ls	$3,000	Quote from Clean Harbors
Concrete slab volume	cy	185	Concrete slabs and brick removal
Cost for concrete slab removal and recycling	$/cy	$50	Quote from Clean Harbors
On-site Analytical Lab			
On-site lab used during all excavation work	days	20	15 days for LDAB work, 5 days for remaining excavation
On-site lab daily rate	$/day	$1,600	ESN mobile laboratory quote
SOIL EXCAVATION BY LARGE DIAMETER AUGER BORINGS			
Contaminated Soil Volume	cy	450	All contaminated soils inside the 10-foot "hot spot" contour
Excavation unit cost by large diameter augers	$/cy	$200	DBM Contractors (excludes cost of backfill)
Soil Disposal (Contaminated Material)			
Percent of soil above RCRA 10x LDR limits	%	67%	Estimated based on Table 7-2 and LDAB outline, approximate
Disposal at Subtitle C Landfill (Oregon)	cy	180	Incl 20% soil vol increase upon excavation and stockpiling
Cost for disposal at Subtitle C Landfill	$cy	$255	Quote from Clean Harbors, assumes 1.4 tons/cy for excav soil
Disposal at Subtitle C Landfill, incl thermal desorption treatment (Oregon)	cy	360	Incl 20% soil vol increase upon excavation and stockpiling
Cost for disposal at Hazardous Waste Landfill	$/cy	$555	Quote from Arlington HW Landfill, assumes 1.4 tons/cy for excav soil
SOIL EXCAVATION BY STANDARD EXCAVATOR			
Contaminated Soil Volume	cy	550	Contaminated soils outside the 10-foot contour, including soils in alley and asphalt easement areas
Excavation, stockpile, and loading costs	$/cy	$12	Quote from Clean Harbors
Soil Disposal (Contaminated Material)			
Percent of soil above RCRA 10x LDR limits	%	0%	All or almost all of soil to be treated is in "hot spot" area
Disposal at Subtitle C Landfill (Oregon)	cy	660	Incl 20% soil vol increase upon excavation and stockpiling
Cost for disposal at Subtitle C Landfill	$cy	$255	Quote from Clean Harbors, assumes 1.4 tons/cy for excav soil
Disposal at Subtitle C Landfill, incl thermal desorption treatment (Oregon)	cy	0	Incl 20% soil vol increase upon excavation and stockpiling
Cost for disposal at Hazardous Waste Landfill	$/cy	$555	Quote from Arlington HW Landfill, assumes 1.4 tons/cy for excav soil
EXCAVATION DEWATERING AND TREATMENT SYSTEM			
Frac Tank monthly rental rate	$/mo	$4,000	Historic costs
GAC dual bed unit monthly rental rate	$/mo	$5,000	Historic costs
1 HP centrifugal pump	ls	$900	
Distribution piping	ls	$400	
Connectors, valves, gauges	ls	$500	
EXCAVATION BACKFILL AND SITE RESTORATION			
Fill Material (backfill for shallow excavation areas)	$/cy	$15	Quote from Clean Harbors
Fill Material Volume	cy	550	
Controlled Density Backfill (backfill for LDAB area)	$/cy	$75	Quote from DBM Contractors
CDF Volume	cy	450	
Sodding	sq yds	636	Entire excavation area to be sodded. Area increased by 30% to account for overexcavation for sloping and areas heavily disturbed by machinery.
Sodding	$/sq yd	$25	Quote from Clean Harbors
16th Street Replacement Sidewalk	feet	50	Length of sidewalk along 16th street demolished by excavation
Sidewalk replacement cost	$/lin ft	$14	Quote from Clean Harbors

Remedial Alternatives for Former Most Western Laundry, Hoquiam, Washington
Alternative 1 - Complete Soil Removal, Biostimulation and MNA
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Install Monitoring Wells			
Install Monitoring Wells Replacement for MW-7 & MW-3	ea	2	Assume 2 monitoring wells @ 15' bgs with 5' screen
Install Monitoring Wells	$/ea	$736	Assume 1" casing, 5' prepack screen, 5" well mount, cost developed from Cascade Drilling
BIOSTIMULATION OF GROUNDWATER			
Injection Wells--Multiple Use	ea	33	1-inch well with 5-foot screen and 15-foot total depth.
Injection Well Cost	$/ea	$736	Based upon historic costs from Cascade Drilling
Injection Boreholes--One Time Use	ea	33	1-inch borehole, with only 10 feet of casing, pulled after single use
Injection Borehole Cost	$/ea	$256	Based upon historic costs from Cascade Drilling
Geologist for Well Installation Oversight	hrs	80	Installation rate 5 wells per day or 10 boreholes per day
Geologist Labor Cost	$/hr	$80	
EVO (emulsified vegetable oil)	lbs	24,600	
EVO (emulsified vegetable oil) cost	$/lb	$2.20	Quote from EOS Remediation
Source Water for Injection	ls	2,500	Transport-pump and treatment area.
Pumps, piping, tanks, mixers, misc.	ls	7,500	
Field Technicians for EVO Injection	hrs	100	Assume 1,000 gals per well, pumping @ 2 gpm/well and injecting to 16 wells simultaneously. Total duration is 6 days, 2 technicians
Field Technician Labor Cost	$/hr	$55	
Construction Completion Report			
Report	hrs	400	Assume 400 hours to generate construction completion report.
Report	$/hr	$80	
O&M			
Quarterly Groundwater Sampling and Analysis (year 1)	year	1	
Sampling Labor	days/year	12.5	Includes 2.5 days for sampling 9 site wells per event. Sample all wells for VOCs, field parameters and natural attenuation parameters. One baseline event and four quarterly events after remediation.
Sampling Labor	hrs/year	250	Assume 2 sampling technicians at 10 hours/day.
Sampling Labor	$/hr	$55	
Analytical Cost	$/year	$11,925	Analyze groundwater samples from 9 wells for VOCs (12 @ $90) and natural attenuation parameters (9 @ $145). Includes QA/QC.
Bacteriological Analyses	$/yr	$3,350	Sample 5 of the wells once per year for the bacteriological parameters qPCR and PLFA, at cost of $670 per sample.
Quarterly Groundwater Sampling and Analysis (yrs 2 - 3)	years	2	
Sampling Labor	days/year	10	Includes 2.5 days for sampling 9 site wells per event. Sample all wells for VOCs, field parameters and natural attenuation parameters. One baseline event and four quarterly events after remediation.
Sampling Labor	hrs/year	200	Assume 2 sampling technicians at 10 hours/day.
Sampling Labor	$/hr	$55	
Analytical Cost	$/year	$9,540	Analyze groundwater samples from 9 wells for VOCs (12 @ $90) and natural attenuation parameters (9 @ $145). Includes QA/QC.
Bacteriological Analyses	$/yr	$3,350	Sample 5 of the wells once per year for the bacteriological parameters qPCR and PLFA, at cost of $670 per sample.
Sampling and Analysis Report			
Annual Report	years	3	
Annual Report	hrs	160	Assume 160 hours to generate annual report.
Annual Report	$/hr	$80	

Remedial Alternatives for Former Most Western Laundry, Hoquiam, Washington
Alternative 1 - Complete Soil Removal, Biostimulation and MNA
Cost Estimate

CAPITAL COST	**$1,284,289**

Activity (unit)	Quantity	Unit Cost	Total
Excavation Subcontractor Mobilization	1	$2,500	$2,500
Subcontractor pre-construction plans	1	$3,500	$3,500
Traffic Control			
Traffic control costs (days)	14	$900	$12,600
Concrete Slab Removal and Concrete Recycling			
Hydraulic breaker mobilization	1	$3,000	$3,000
Concrete removal and recycling (cy)	185	$50	$9,250
On-Site Analytical Lab			
On-site analytical lab cost	20	$1,600	$32,000
SOIL REMOVAL BY LARGE DIAMETER AUGERS			
Soil Excavation (cy)	450	$200	$90,000
Soil Disposal			
Transport and Disposal			
Subtitle C Waste Landfill (cy)	180	$255	$45,901
Hazardous Waste Landfill, w/ thermal desorption (cy)	360	$555	$199,798
SOIL REMOVAL BY STANDARD EXCAVATOR			
Soil Excavation (cy)	550	$12	$6,600
Soil Disposal			
Transport and Disposal			
Subtitle C Waste Landfill (cy)	660	$255	$168,300
Hazardous Waste Landfill, w/ thermal desorption (cy)	0	$555	$0
EXCAVATION DEWATERING			
Frac tank rental	1	$4,000	$4,000
Activated carbon rental	1	$5,000	$5,000
Pump	1	$900	$900
Distribution piping	1	$400	$400
Connections, valves, gauges	1	$500	$500
EXCAVATION BACKFILL & SITE RESTORATION			
Fill Material for shallow excavation area (cy)	550	$15	$8,250
CDF Material for LDAB excavation area (cy)	450	$75	$33,750
Sodding (sy)	636	$25	$15,889
Sidewalk Replacment (ft)	50	$14	$700
Install Monitoring Wells			
Install Monitoring Wells	2	$736	$1,472
BIOSTIMULATION			
Injection Well Installation	33	$736	$24,288
Injection Borehole Installation	33	$256	$8,448
Geologist Well Installation (hrs)	80	$80	$6,400
EVO (lbs)	24,600	$2.20	$54,120
Water Supply (ls)	1	$2,500	$2,500
Injection Equipment (ls)	1	$7,500	$7,500
Field Technicians Injection (hrs)	100	$55	$5,500
Construction Completion Report			
Report	1	$32,000	$32,000

Remedial Alternatives for Former Most Western Laundry, Hoquiam, Washington
Alternative 1 - Complete Soil Removal, Biostimulation and MNA
Cost Estimate

Subtotal			$785,066
Design		8%	$62,805
Office Overhead		5%	$39,253
Field Overhead		10%	$78,507
Subtotal			$965,631
Profit		8%	$77,250
Contingency		25%	$241,408
Total			$1,284,289

Operation and Maintenance Cost **$196,125**

Activity (unit)	Quantity (yrs)	Annual Cost	Total Cost	Present Value
Quarterly Groundwater Sampling & Analysis (year 1)				
Sampling Labor All Events (hr)	1	$13,750	$13,750	$13,095
Analytical Cost All Events	1	$11,925	$11,925	$11,357
Bacteriological Analyses	1	$3,350	$3,350	$3,190
Semi-Annual Groundwater Sampling & Analysis (yr 2-3)				
Sampling Labor All Events (hr)	2	$11,000	$22,000	$20,454
Analytical Cost All Events	2	$9,540	$19,080	$17,739
Bacteriological Analyses	2	$3,350	$6,700	$6,229
Sampling and Analysis Report	3	$12,800	$38,400	$34,858
Subtotal O&M			$115,205	$106,922
Design		8%	$9,216	$8,554
Office Overhead		5%	$5,760	$5,346
Field Overhead		15%	$17,281	$16,038
Subtotal			$147,462	$136,860
Profit		8%	$11,797	$10,949
Contingency		25%	$36,866	$34,215
Total			**$196,125**	$182,024

Total Alternative Capital and O&M Cost (Non Discounted Cost) **$1,480,414**

Remedial Alternatives for Former Most Western Laundry, Hoquiam, Washington
Alternative 2 - Soil Removal, Biostimulation and MNA
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
CAPITAL			
Excavation Subcontractor Mobilization	ls	$2,500	Mobilization, project management and demobilization
Subcontractor pre-construction plans	ls	$3,500	Preparation and submittal of pre-construction plans and deliverables
Traffic Control			
Estimated duration for traffic control needs	days	10	
Traffic control daily rate	$/day	$900	Historic costs from Traffic Control Co.
Concrete Slab Removal and Concrete Recycling			
Hydraulic breaker mobilization	ls	$3,000	Quote from Clean Harbors
Concrete slab volume	cy	185	Concrete slabs and brick removal
Cost for concrete slab removal and recycling	$/cy	$50	Quote from Clean Harbors
On-site Analytical Lab			
On-site lab used during all excavation work	days	20	15 days for LDAB work, 5 days for remaining excavation
On-site lab daily rate	$/day	$1,600	ESN mobile laboratory quote
SOIL EXCAVATION BY LARGE DIAMETER AUGER BORINGS			
Contaminated Soil Volume	cy	400	Most contaminated soils inside the 10-foot "hot spot" contour
Excavation unit cost by large diameter augers	$/cy	$200	DBM Contractors (excludes cost of backfill)
Soil Disposal (Contaminated Material)			
Percent of soil above RCRA 10x LDR limits	%	70%	Estimated based on Table 7-2 and LDAB outline, approximate
Disposal at Subtitle C Landfill (Oregon)	cy	144	Incl 20% soil vol increase upon excavation and stockpiling
Cost for disposal at Subtitle C Landfill	$cy	$255	Quote from Clean Harbors, assumes 1.4 tons/cy for excav soil
Disposal at Subtitle C Landfill, incl thermal desorption treatment (Oregon)	cy	336	Incl 20% soil vol increase upon excavation and stockpiling
Cost for disposal at Hazardous Waste Landfill	$/cy	$555	Quote from Arlington HW Landfill, assumes 1.4 tons/cy for excav soil
SOIL EXCAVATION BY STANDARD EXCAVATOR			
Contaminated Soil Volume	cy	450	Contaminated soils outside the 10-foot contour, including soils in alley and asphalt easement areas only above the water table.
Excavation, stockpile, and loading costs	$/cy	$12	Quote from Clean Harbors
Soil Disposal (Contaminated Material)			
Percent of soil above RCRA 10x LDR limits	%	0%	All or almost all of soil to be treated is in "hot spot" area
Disposal at Subtitle C Landfill (Oregon)	cy	540	Incl 20% soil vol increase upon excavation and stockpiling
Cost for disposal at Subtitle C Landfill	$cy	$255	Quote from Clean Harbors, assumes 1.4 tons/cy for excav soil
Disposal at Subtitle C Landfill, incl thermal desorption treatment (Oregon)	cy	0	Incl 20% soil vol increase upon excavation and stockpiling
Cost for disposal at Hazardous Waste Landfill	$/cy	$555	Quote from Arlington HW Landfill, assumes 1.4 tons/cy for excav soil
EXCAVATION DEWATERING AND TREATMENT SYSTEM			
Frac Tank monthly rental rate	$/mo	$4,000	Historic costs
GAC dual bed unit monthly rental rate	$/mo	$5,000	Historic costs
1 HP centrifugal pump	ls	$900	
Distribution piping	ls	$400	
Connectors, valves, gauges	ls	$500	
EXCAVATION BACKFILL AND SITE RESTORATION			
Fill Material (backfill for shallow excavation areas)	$/cy	$15	Quote from Clean Harbors
Fill Material Volume	cy	450	
Controlled Density Backfill (backfill for LDAB area)	$/cy	$75	Quote from DBM Contractors
CDF Volume	cy	400	
Sodding	sq yds	636	Entire excavation area to be sodded. Area increased by 30% to account for overexcavation for sloping and areas heavily disturbed by machinery.
Sodding	$/sq yd	$25	Quote from Clean Harbors
16th Street Replacement Sidewalk	feet	50	Length of sidewalk along 16th street demolished by excavation
Sidewalk replacement cost	$/lin ft	$14	Quote from Clean Harbors

Remedial Alternatives for Former Most Western Laundry, Hoquiam, Washington
Alternative 2 - Soil Removal, Biostimulation and MNA
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Install Monitoring Wells			
Install Monitoring Wells Replacement for MW-7 & MW-3	ea	2	Assume 2 monitoring wells @ 15' bgs with 5' screen
Install Monitoring Wells	$/ea	$736	Assume 1" casing, 5' prepack screen, 5" well mount, cost developed from Cascade Drilling
BIOSTIMULATION OF SAT'D SOILS AND GROUNDWATER			
Injection Wells--Multiple Use	ea	43	1-inch well with 5-foot screen and 15-foot total depth.
Injection Well Cost	$/ea	$736	Based upon historic costs from Cascade Drilling
Injection Boreholes--One Time Use	ea	43	1-inch borehole, with only 10 feet of casing, pulled after single use
Injection Borehole Cost	$/ea	$256	Based upon historic costs from Cascade Drilling
Geologist for Well Installation Oversight	hrs	100	Installation rate 5 wells per day or 10 boreholes per day
Geologist Labor Cost	$/hr	$80	
EVO (emulsified vegetable oil)	lbs	31,920	
EVO (emulsified vegetable oil) cost	$/lb	$2.20	Quote from EOS Remediation
Source Water for Injection	ls	2,500	Transport-pump and treatment area.
Pumps, piping, tanks, mixers, misc.	ls	7,500	
Field Technicians for EVO Injection	hrs	120	Assume 1,000 gals per well, pumping @ 2 gpm/well and injecting to 16 wells simultaneously. Total duration is 6 days, 2 technicians
Field Technician Labor Cost	$/hr	$55	
Construction Completion Report			
Report	hrs	400	Assume 400 hours to generate construction completion report.
Report	$/hr	$80	
<u>O&M</u>			
Quarterly Groundwater Sampling and Analysis (year 1)	year	1	
Sampling Labor	days/year	12.5	Includes 2.5 days for sampling 9 site wells per event. Sample all wells for VOCs, field parameters and natural attenuation parameters. One baseline event and four quarterly events after remediation.
Sampling Labor	hrs/year	250	Assume 2 sampling technicians at 10 hours/day.
Sampling Labor	$/hr	$55	
Analytical Cost	$/year	$11,925	Analyze groundwater samples from 9 wells for VOCs (12 @ $90) and natural attenuation parameters (9 @ $145). Includes QA/QC.
Bacteriological Analyses	$/yr	$3,350	Sample 5 of the wells once per year for the bacteriological parameters qPCR and PLFA, at cost of $670 per sample.
Quarterly Groundwater Sampling and Analysis (yrs 2 - 3)	years	2	
Sampling Labor	days/year	10	Includes 2.5 days for sampling 9 site wells per event. Sample all wells for VOCs, field parameters and natural attenuation parameters. One baseline event and four quarterly events after remediation.
Sampling Labor	hrs/year	200	Assume 2 sampling technicians at 10 hours/day.
Sampling Labor	$/hr	$55	
Analytical Cost	$/year	$9,540	Analyze groundwater samples from 9 wells for VOCs (12 @ $90) and natural attenuation parameters (9 @ $145). Includes QA/QC.
Bacteriological Analyses	$/yr	$3,350	Sample 5 of the wells once per year for the bacteriological parameters qPCR and PLFA, at cost of $670 per sample.
Sampling and Analysis Report			
Annual Report	years	3	
Annual Report	hrs	160	Assume 160 hours to generate annual report.
Annual Report	$/hr	$80	

Remedial Alternatives for Former Most Western Laundry, Hoquiam, Washington
Alternative 2 - Soil Removal, Biostimulation and MNA
Cost Estimate

CAPITAL COST	$1,211,614

Activity (unit)	Quantity	Unit Cost	Total
Excavation Subcontractor Mobilization	1	$2,500	$2,500
Subcontractor pre-construction plans	1	$3,500	$3,500
Traffic Control			
Traffic control costs (days)	10	$900	$9,000
Concrete Slab Removal and Concrete Recycling			
Hydraulic breaker mobilization	1	$3,000	$3,000
Concrete removal and recycling (cy)	185	$50	$9,250
On-Site Analytical Lab			
On-site analytical lab cost	20	$1,600	$32,000
SOIL REMOVAL BY LARGE DIAMETER AUGERS			
Soil Excavation (cy)	400	$200.00	$80,000
Soil Disposal			
Transport and Disposal			
Subtitle C Waste Landfill (cy)	144	$255	$36,720
Hazardous Waste Landfill, w/ thermal desorption (cy)	336	$555	$186,480
SOIL REMOVAL BY STANDARD EXCAVATOR			
Soil Excavation (cy)	450	$12	$5,400
Soil Disposal			
Transport and Disposal			
Subtitle C Waste Landfill (cy)	540	$255	$137,700
Hazardous Waste Landfill, w/ thermal desorption (cy)	0	$555	$0
EXCAVATION DEWATERING			
Frac tank rental	1	$4,000	$4,000
Activated carbon rental	1	$5,000	$5,000
Pump	1	$900	$900
Distribution piping	1	$400	$400
Connections, valves, gauges	1	$500	$500
EXCAVATION BACKFILL & SITE RESTORATION			
Fill Material for shallow excavation area (cy)	450	$15	$6,750
CDF Material for LDAB excavation area (cy)	400	$75	$30,000
Sodding (sy)	636	$25	$15,889
Sidewalk Replacment (ft)	50	$14	$700
Install Monitoring Wells			
Install Monitoring Wells	2	$736	$1,472
BIOSTIMULATION			
Injection Well Installation	43	$736	$31,648
Injection Borehole Installation	43	$256	$11,008
Geologist Well Installation (hrs)	100	$80	$8,000
EVO (lbs)	31,920	$2.20	$70,224
Water Supply (ls)	1	$2,500	$2,500
Injection Equipment (ls)	1	$7,500	$7,500
Field Technicians Injection (hrs)	120	$55	$6,600

Remedial Alternatives for Former Most Western Laundry, Hoquiam, Washington
Alternative 2 - Soil Removal, Biostimulation and MNA
Cost Estimate

Construction Completion Report Report	1	$32,000	$32,000
Subtotal			$740,641
Design		8%	$59,251
Office Overhead		5%	$37,032
Field Overhead		10%	$74,064
Subtotal			$910,988
Profit		8%	$72,879
Contingency		25%	$227,747
Total			$1,211,614

Operation and Maintenance Cost **$196,125**

Activity (unit)	Quantity (yrs)	Annual Cost	Total Cost	Present Value
Quarterly Groundwater Sampling & Analysis (year 1)				
Sampling Labor All Events (hr)	1	$13,750	$13,750	$13,095
Analytical Cost All Events	1	$11,925	$11,925	$11,357
Bacteriological Analyses	1	$3,350	$3,350	$3,190
Quarterly Groundwater Sampling & Analysis (yr 2-3)				
Sampling Labor All Events (hr)	2	$11,000	$22,000	$20,454
Analytical Cost All Events	2	$9,540	$19,080	$17,739
Bacteriological Analyses	2	$3,350	$6,700	$6,229
Sampling and Analysis Report	3	$12,800	$38,400	$34,858
Subtotal O&M			$115,205	$106,922
Design		8%	$9,216	$8,554
Office Overhead		5%	$5,760	$5,346
Field Overhead		15%	$17,281	$16,038
Subtotal			$147,462	$136,860
Profit		8%	$11,797	$10,949
Contingency		25%	$36,866	$34,215
Total			**$196,125**	$182,024

Total Alternative Capital and O&M Cost (Non Discounted Cost) **$1,407,739**

Remedial Alternatives for Former Most Western Laundry, Hoquiam, Washington
Alternative 3 - ERH, Biostimulation and MNA
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
CAPITAL			
Traffic Control			
Estimated duration for traffic control needs	days	3	
Traffic control daily rate	$/day	$900	Historic costs from Traffic Control Co.
SOIL TREATMENT BY ELECTRICAL RESISTANCE HEATING			
Contaminated Soil Volume	cy	1,000	Contaminated soils inside the 10-foot "hot spot" contour
Unit Cost for ERH	$/cy	$630	Assume temporary above ground systems for power distribution and voltage control, soil vapor extraction blowers, condensation collection, and vapor treatment (preferably by GAC). Assume inclusive cost per cy for ERH, based on budgetary quote from CES.
ERH Monitoring & Confirmation			
ERH Vapor System Sampling & Analysis	$/lot	$5,352	Assume 4 events in 6 months = (6 samples x 4 events) = 24 samples. Assume $20/well for labor. Analyze for VOCs (12 @ $203). Cost = $5,352
Verification Boreholes	ea	12	1-inch borehole, verification sampling for ERH process
Verification Borehole Cost	$/ea	$256	Based upon historic costs from Cascade Drilling
ERH Verification Soil Samples	$/lot	$5,352	Assume 1 event = (2 samples x 12 boreholes) = 24 samples. Assume $20/well for labor. Analyze for VOCs (24 @ $203). Cost = $5,352
Electrode Install Soil Cuttings Disposal			
Disposal at Subtitle C Landfill (Oregon)	cy	10	Estimate for soils generated by ERH installation drilling
Cost for disposal at Subtitle C Landfill	$/cy	$255	Quote from Clean Harbors, assumes 1.4 tons/cy for excav soil
Install Monitoring Wells			
Install Monitoring Wells Replacement for MW-7 & MW-3	ea	2	Assume 2 monitoring wells @ 15' bgs with 5' screen
Install Monitoring Wells	$/ea	$736	Assume 1" casing, 5' prepack screen, 5" well mount, cost developed from Cascade Drilling
BIOSTIMULATION OF GROUNDWATER			
Injection Wells--Multiple Use	ea	33	1-inch well with 5-foot screen and 15-foot total depth.
Injection Well Cost	$/ea	$736	Based upon historic costs from Cascade Drilling
Injection Boreholes--One Time Use	ea	33	1-inch borehole, with only 10 feet of casing, pulled after single use
Injection Borehole Cost	$/ea	$256	Based upon historic costs from Cascade Drilling
Geologist for Well Installation Oversight	hrs	80	Installation rate 5 wells per day or 10 boreholes per day
Geologist Labor Cost	$/hr	$80	
EVO (emulsified vegetable oil)	lbs	24,600	
EVO (emulsified vegetable oil) cost	$/lb	$2.20	Quote from EOS Remediation
Source Water for Injection	ls	2,500	Transport-pump and treatment area.
Pumps, piping, tanks, mixers, misc.	ls	7,500	
Field Technicians for EVO Injection	hrs	100	Assume 1,000 gals per well, pumping @ 2 gpm/well and injecting to 16 wells simultaneously. Total duration is 6 days, 2 technicians.
Field Technician Labor Cost	$/hr	$55	
Construction Completion Report			
Report	hrs	400	Assume 400 hours to generate construction completion report.
Report	$/hr	$80	

Remedial Alternatives for Former Most Western Laundry, Hoquiam, Washington
Alternative 3 - ERH, Biostimulation and MNA
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
O&M			
Quarterly Groundwater Sampling and Analysis (year 1)	year	1	
Sampling Labor	days/year	12.5	Includes 2.5 days for sampling 9 site wells per event. Sample all wells for VOCs, field parameters and natural attenuation parameters. One baseline event and four quarterly events after remediation.
Sampling Labor	hrs/year	250	Assume 2 sampling technicians at 10 hours/day.
Sampling Labor	$/hr	$55	
Analytical Cost	$/year	$11,925	Analyze groundwater samples from 9 wells for VOCs (12 @ $90) and natural attenuation parameters (9 @ $145). Includes QA/QC.
Bacteriological Analyses	$/yr	$3,350	Sample 5 of the wells once per year for the bacteriological parameters qPCR and PLFA, at cost of $670 per sample.
Quarterly Groundwater Sampling and Analysis (yrs 2 - 3)	years	2	
Sampling Labor	days/year	10	Includes 2.5 days for sampling 9 site wells per event. Sample all wells for VOCs, field parameters and natural attenuation parameters. One baseline event and four quarterly events after remediation.
Sampling Labor	hrs/year	200	Assume 2 sampling technicians at 10 hours/day.
Sampling Labor	$/hr	$55	
Analytical Cost	$/year	$9,540	Analyze groundwater samples from 9 wells for VOCs (12 @ $90) and natural attenuation parameters (9 @ $145). Includes QA/QC.
Bacteriological Analyses	$/yr	$3,350	Sample 5 of the wells once per year for the bacteriological parameters qPCR and PLFA, at cost of $670 per sample.
Sampling and Analysis Report			
Annual Report	years	3	
Annual Report	hrs	160	Assume 160 hours to generate annual report.
Annual Report	$/hr	$80	

Remedial Alternatives for Former Most Western Laundry, Hoquiam, Washington
Alternative 3 - ERH, Biostimulation and MNA
Cost Estimate

CAPITAL COST **$1,294,412**

Activity (unit)	Quantity	Unit Cost	Total
Traffic Control			
Traffic control costs (days)	3	$900	$2,700
SOIL TREATMENT BY ELEC RESISTANCE HEATING			
Target Contaminated Soil Volume (cy)	1,000	$630	$630,000
Vapor Sampling (ls)	1	$5,352	$5,352
Verification Boreholes	12	$256	$3,072
Soil Verfication Sampling (ls)	1	$5,352	$5,352
Electrode Install Soil Cuttings Disposal			
Subtitle C Waste Landfill (cy)	10	$255	$2,550
Install Monitoring Wells			
Install Monitoring Wells	2	$736	$1,472
BIOSTIMULATION			
Injection Well Installation	33	$736	$24,288
Injection Borehole Installation	33	$256	$8,448
Geologist Well Installation (hrs)	80	$80	$6,400
EVO (lbs)	24,600	$2.20	$54,120
Water Supply (ls)	1	$2,500	$2,500
Injection Equipment (ls)	1	$7,500	$7,500
Field Technicians Injection (hrs)	100	$55	$5,500
Construction Completion Report			
Report	1	$32,000	$32,000
Subtotal			$791,254
Design		8%	$63,300
Office Overhead		5%	$39,563
Field Overhead		10%	$79,125
Subtotal			$973,242
Profit		8%	$77,859
Contingency		25%	$243,311
Total			$1,294,412

Operation and Maintenance Cost **$196,125**

Activity (unit)	Quantity (yrs)	Annual Cost	Total Cost	Present Value
Quarterly Groundwater Sampling & Analysis (year 1)				
Sampling Labor All Events (hr)	1	$13,750	$13,750	$13,095
Analytical Cost All Events	1	$11,925	$11,925	$11,357
Bacteriological Analyses	1	$3,350	$3,350	$3,190
Quarterly Groundwater Sampling & Analysis (yr 2-3)				
Sampling Labor All Events (hr)	2	$11,000	$22,000	$20,454
Analytical Cost All Events	2	$9,540	$19,080	$17,739
Bacteriological Analyses	2	$3,350	$6,700	$6,229
Sampling and Analysis Report	3	$12,800	$38,400	$34,858
Subtotal O&M			$115,205	$106,922
Design		8%	$9,216	$8,554
Office Overhead		5%	$5,760	$5,346
Field Overhead		15%	$17,281	$16,038
Subtotal			$147,462	$136,860
Profit		8%	$11,797	$10,949
Contingency		25%	$36,866	$34,215
Total			**$196,125**	$182,024

Total Alternative Capital and O&M Cost (Non Discounted Cost) **$1,490,537**