Blaine Mini Mart
Blaine, Washington

Blaine Remedial Excavation Report

FINAL

Prepared for

DEPARTMENT OF ECOLOGY
State of Washington

Toxics Cleanup Program
Northwest Regional Office
Washington State Department of Ecology
Bellevue, Washington

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List of Acronyms

BEK	Bek Purnell Engineering
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, total xylenes
Clearcreek	Clearcreek Contractors
COC	contaminant of concern
CSBC	crushed surface base course
CUL	cleanup level
CAP	Cleanup Action Plan
Ecology	Washington State Department of Ecology
ESN NW	ESN Northwest Chemistry Laboratory
FM	field manager
ft	feet
GPS	global positioning system
mg/kg	milligrams per kilogram
MTBE	methyl tertiary-butyl ether
MTCA	Model Toxics Control Act
PID	photoionization detector
SAIC	Science Applications International Corporation
SCR	Site Characterization Report
SEPA	State Environmental Policy Act
TEE	Terrestrial Ecological Evaluation
TPH	total petroleum hydrocarbon
UST	underground storage tank

1.0 Introduction

The purpose of this Remedial Excavation Report is to document the results of remedial activities that were performed at the Blaine Mini Mart property, located at 2530 Peace Portal Drive in Blaine, Washington. The excavation work was performed between April 2011 and May 2011.

Washington State Department of Ecology's (Ecology) Toxic Cleanup Program is managing the remedial action for this project in accordance with the Cleanup Action Plan (SAIC 2010a). Ecology contracted Clearcreek Contractors (Clearcreek) of Everett, Washington, to perform remedial excavation and construction activities at the site and Science Applications International Corporation (SAIC) to collect confirmational soil and groundwater sampling during the remedial excavation.

2.0 Project Background

2.1 Site Description

The Blaine Mini Mart is currently a decommissioned service station located at 2530 Peace Portal Drive (see Figure 1). The site is located just within the city limits of Blaine, Washington. The property owners, Yon and Inson Kim, and McEvoy Oil Company, have begun construction to restore the service station to the pre-remedial action configuration.

The property is a one-half acre triangular lot bounded by Peace Portal Drive on the southwest and Bell Road to the west. To the north of the site is vacant property, and the former Rocky Mountain Trading Post building is located on the southeast side of the site. The property is located within a mixed commercial/residential area and was previously identified as 1828 Peace Portal Drive. The property is currently covered with crushed rock, asphalt, concrete, and structures (e.g., Mini Mart building, underground storage tank [UST] basin, and former garage), and the surface slopes gently to the southwest, toward Peace Portal Drive.

2.2 Site History

The site was originally developed for residential purposes, which included one house and two additional unknown buildings. In 1955, these structures were removed, followed by the construction of a 1,161-square foot convenience store, currently the Blaine Mini Mart, and a 1,120-square foot dual bay storage space (Environmental Associates, Inc., 2005), which initially housed the Blaine Mail and Package Center (BEK 1997). Both buildings were constructed of concrete and included a concrete slab floor and flat roof. According to aerial photos, between 1961 and 1969, Interstate 5 was constructed and freeway on/off ramps were provided south of the property, intersecting Peace Portal Drive. In 1980, four USTs were removed from a tank basin in front of the current Mini Mart, where the current fuel dispenser canopy is located (Environmental Associates, Inc. 2005). The owners, Yon and Inson Kim, purchased the property from Bell and Drake Enterprises in November 1997 (Whatcom Environmental Services 2010).

In 2005, a new fuel island canopy and four dispenser islands were constructed in the footprint of the previously existing fuel dispenser canopy and USTs during a transition from Texaco to Shell

branded gasoline (Environmental Associates, Inc. 2005). Ecology UST records indicate four USTs were permanently closed in June 2007, which ranged in size from 10,000 to 29,999 gallons and contained leaded and unleaded gasoline (Ecology 2010). This site was previously identified as 1828 Peace Portal Drive, until the City of Blaine reassigned street addresses sometime after 2008 (Whatcom Environmental Services 2008). Prior to decommissioning, three 10,000-gallon USTs, located in a tank pit on the east-central side of the property, stored gasoline (regular and premium) and diesel fuel (Northwest Tank 2010). Tank-tightness tests performed in January 2010 certified no leaks or concerns regarding three 10,000-gallon USTs (Northwest Tank 2010). According to the current property owner, Yon Kim, a former waste oil tank located on the east side of the mini mart was abandoned in-place and filled with sand and clay. Fresh asphalt indicates that the abandonment took place recently; however, additional records were not available for review. The former station configuration and features are shown on Figure 2.

2.3 Site Assessment History

A series of site investigations were completed between 1997 and 2010 at the Blaine Mini Mart property. These investigations have been documented in previous reports. Twenty-eight soil boring and five monitoring wells have been installed during these investigations. The findings from previous investigations were reported by Bek Purnell Engineering (BEK) in 1997, Environmental Associates, Inc. in 2005, and SAIC in 2010. See Figure 2 for previous investigation sampling locations.

In March 2010, SAIC installed 21 soil borings, three of which were completed as groundwater monitoring wells. This site characterization defined the horizontal and vertical extent of contaminated soil exceeding the site-specific cleanup levels (CULs) (SAIC 2010a,b) and identified two separate petroleum-contaminated areas on the property. A summary of these environmental investigations and findings is provided in the Site Characterization Report (SCR) and Cleanup Action Plan (CAP) (SAIC 2010a,b).

3.0 Remedial Action

The objective of this remedial action was to remove accessible petroleum-contaminated soil on the property. The remedial action focused on the excavation and disposal of soil contaminated with heavy oil-range hydrocarbons located south of the former garage area (Excavation 1), and soil contaminated with gasoline-range hydrocarbons associated with a former fuel dispenser and USTs located along the western side of the site (Excavation 2). The two excavation areas are depicted in Figure 3.

3.1 Scope of Work

Ecology and Clearcreek completed the following remediation activities:

- Obtained all required permits for the excavation including the State Environmental Policy Act (SEPA) Checklist, Fill and Grading Permit, Wastewater Discharge Permit, and Notice of Intent for Well Decommissioning.

- Notified the Utilities Location Center and performed subsurface utility locates on the property.
- Decommissioned five monitoring wells (MW-1 through MW-5).
- Decommissioned the station by removing the island dispensers, canopy, disconnected underground utilities, and flushed all product piping.
- Excavated readily available contaminated soil.
- Dewatered Excavation 2 to enable the excavation to proceed below the water table. Water was collected in poly holding tanks (holding tanks) before being discharged to the City of Blaine's sanitary sewer.
- Provided offsite transportation and disposal of petroleum-contaminated soil.
- Distributed a chemical oxidizer and enhanced aerobic bioremediation formulation (Adventus EHC-O®).
- Backfilled excavation pits and provided compaction.

The confirmation sampling activities completed by SAIC and approved by Ecology included:

- Collected confirmation soil samples from the bottom and sidewalls of both excavation pits (Excavation 1 and Excavation 2).
- Collected confirmation groundwater samples from the holding tanks.
- Field screened soil samples for the presence of petroleum by visual, sheen, and organic vapor measurements (photoionization detector [PID]).
- Collected groundwater samples from the UST basin.
- Submitted samples to an accredited laboratory for analysis.
- Distributed analytical results from the laboratory to Ecology and Ecology's contractor Clearcreek.

A detailed discussion of these remediation activities and analytical results is provided in Sections 3.2 through 3.10. Photo documentation of the excavation activities is included in Appendix A.

3.2 Subsurface Utility Locate

During station demolition, and prior to subsurface excavation, Clearcreek notified Utilities Underground Location Center. All known conductible and non-conductible underground utilities on the site and nearby public rights-of-way were marked. In addition, a private utility locator, contracted through Clearcreek, located and marked any underground utilities on the site. Additional utility representatives were present during the initial stages of the excavation in order to locate the sanitary sewer discharge locations. All utilities within the Excavation 2 footprint, including electric lines and product piping, were disconnected during the station decommissioning activities, and prior to excavation activities.

An active water line was encountered during soil removal activities within Excavation 2. The water line was disabled by Clearcreek. No other active utilities were encountered during excavation activities.

3.3 Monitoring Well Decommissioning

Prior to remedial excavation activities at the site, Clearcreek contracted Cascade Drilling, L.P. to decommission four groundwater monitoring wells (MW-1 through MW-4). Each groundwater monitoring well was decommissioned by a licensed driller in accordance with WAC 173-160 (see Appendix B for decommissioned well logs). Monitoring well MW-5, which was intended to remain in place, was later removed by Clearcreek during excavation activities. Contaminated soil was found to extend beyond the anticipated excavation boundary, beyond where MW-5 was located.

3.4 Station Decommissioning and Site Setup

All activities associated with the station decommissioning were performed by Clearcreek and overseen by Ecology. During the first day of station decommissioning, Clearcreek installed a temporary metal fencing around the Blaine Mini Mart property, in order to prevent bystanders from gaining access to the site. On April 26, 2011, Clearcreek began disassembling the pump station island dispensers. As stated in Section 3.2, all utilities associated with the canopy, island dispenser, and USTs were disconnected prior to construction activities. Product lines were flushed by Clearcreek's contractor, PresVac. The fuel dispenser pumps were preserved and temporarily stored in the former garage area to be reused after the station was restored.

Following removal of the dispenser islands, the four concrete footings along the steel canopy were demolished. Clearcreek removed the concrete block foundation to expose the base plates. A total of approximately 120 tons of concrete were transported off site to be recycled or disposed of.

On April 29, 2011, Bestworth-Rommel, Clearcreek's contractor, was on site to disassemble the canopy. The canopy was unbolted from the steel members; however, due to the condition of the steel members, they could not be re-used and were transported off site for disposal. Following the disassembly of the canopy, Sicklesteel Cranes, Inc. removed the canopy using a Demag AC1200 crane. The canopy was placed directly south of the former garage to be reused during station restoration. In addition, on April 29, 2011, Clearcreek installed a silt barrier along the right-of-way and Peace Portal Drive to prevent contamination and runoff from leaving the site.

3.5 Soil Cleanup Levels

The CAP established the site CULs for soil. Model Toxics Control Act (MTCA) Method A CULs were deemed appropriate for benzene, toluene, ethylbenzene, total xylenes (BTEX), methyl tertiary-butyl ether (MTBE), total naphthalenes, and total petroleum hydrocarbons (TPH) for gasoline. The CULs incorporated a simplified Terrestrial Ecological Evaluation (TEE) for diesel- and heavy oil- range petroleum hydrocarbons, per MTCA. Soil CULs selected for the site contaminants of concern (COCs) are tabulated below, with reference listed for their origin (SAIC 2010a).

Site-Specific Soil Cleanup Levels

Analyte	Site-Specific Soil CULs (mg/kg)	CUL Reference
Benzene	0.03	MTCA Method A
Toluene	7	MTCA Method A
Ethylbenzene	6	MTCA Method A
Total Xylenes	9	MTCA Method A
MTBE	0.1	MTCA Method A
Total Naphthalenes	5	MTCA Method A
TPH-gasoline	30	MTCA Method A
TPH-diesel	460	MTCA TEE
TPH-heavy oil	460	MTCA TEE

CUL = cleanup level
MTBE = methyl tertiary-butyl ether
MTCA = Model Toxics Control Act
mg/kg = milligrams per kilogram
TEE = terrestrial ecological evaluation
TPH = total petroleum hydrocarbon

3.6 Excavation and Confirmation Soil Sampling Methods

The methods used on both excavations (Excavation 1 and Excavation 2) were generally similar. Clearcreek performed excavation activities using three track-mounted excavators and a skid steer. Both excavations began along the northern side of the excavation and continued downward and outward to the south. Soil removal continued until petroleum-contaminated soil was no longer encountered, or as deemed unsafe due to the stability of soil near the USTs, the Mini Mart structure, active underground utilities, or Peace Portal Drive right-of-way. Contaminated soil was loaded into trucks and trailers or railroad carts for transport to the disposal facility.

Prior to excavation, SAIC marked a 10-foot by 10-foot grid spanning the entire site. The sample locations and grid coordinates were documented in the field notebook, hand-drawn on the field map, and recorded using a Trimble GeoXH Global Positioning System (GPS) unit. During excavation, an SAIC representative was present to observe and record soil condition, to field-screen soil with a PID, and to collect soil samples from the excavation sidewalls and base for laboratory analysis. Soil samples collected along the sidewalls and base of the excavation areas were collected at 10- to 15-foot intervals, and duplicate soil samples were collected at an interval of one per twenty samples or at the discretion of the Field Manager (FM). Confirmation samples collected were submitted to ESN Northwest (ESN NW) Chemistry Laboratory in Bellevue, Washington, or to ESN NW onsite mobile laboratory.

3.6.1 Excavation 1 – South of the Former Garage

Excavation 1, located directly south of the former garage in the northeast corner of the property, began on April 26, 2011 (Figure 3) and was performed simultaneously with the station decommissioning. The excavation proceeded laterally and vertically until field observations indicated that there were no petroleum impacts, or further excavation was not possible due to the close proximity of the USTs. The excavation proceeded vertically to approximately 5 feet below ground surface (bgs) along the northern section of the excavation and to approximately 14 feet

bgs along the southern area of Excavation 1 (next to the USTs). Eleven soil samples were collected from the sidewalls at the groundwater interface, and five samples were collected from the base of the excavation and were submitted to ESN NW Chemistry Laboratory in Bellevue, Washington. Groundwater infiltration was slow, and consequently no groundwater was pumped from this excavation. The excavation was limited laterally southward due to the concern of possibly undermining the UST basin. Excavation 1 was backfilled and compacted on April 29, 2011. A total of approximately 240 tons of contaminated soil were removed from Excavation 1 and transported to the CEMEX facility in Everett, Washington, or the Rabanco facility in Roosevelt, Washington.

The final dimensions of Excavation 1 were approximately 30 feet by 25 feet and extended to a depth from 5 feet bgs to 14 feet bgs. The final limits of Excavation 1 and soil sample locations are shown on Figure 3.

3.6.2 Excavation 2 – Canopy Area

Excavation along the southwestern side of the site (Excavation 2), within the canopy area, began on May 2, 2011, and was backfilled and compacted on May 27, 2011. The northern, eastern, and southern sidewalls of Excavation 2 were kept to an approximate 1:1 slope ratio. The northeastern sidewall and eastern sidewall were excavated using a slot-cutting technique to protect the Mini Mart structure, utilities, and roadway stability along Peace Portal Drive. All readily accessible contaminated soil was removed within Excavation 2; however, due to present structures, utilities, and property boundaries, not all contaminated soil was removed, as detailed below in Section 3.7.

As the excavation progressed, soil samples were collected and analyzed daily in the onsite mobile laboratory of ESN NW Chemistry Laboratory. Samples that exceeded site-specific CULs (Section 3.5) were over-excavated, where possible, and re-sampled until soil sample concentrations were below CULs.

A total of 41 sidewall samples were collected at various depths to represent where contamination had been present, and 24 base samples were collected along the bottom of the excavation. Once soil analytical results indicated that the lateral and/or vertical extent was delineated, or excavation could not proceed (due to Peace Portal Drive, the Mini Mart structure, utilities, or the UST basin), the excavation was deemed complete and was then backfilled.

In an effort to reduce the quantity of groundwater infiltrating into Excavation 2, a sump was dug at the bottom of the excavation, and a diaphragm pump was installed to remove groundwater. Accumulated groundwater was pumped into and stored on site in temporary holding tanks while waiting for groundwater analytical results prior to discharging into the City of Blaine's sanitary sewer.

A total of approximately 4,818 tons of soil from Excavation 2 were transported to the CEMEX facility or the Rabanco facility. The final dimensions of Excavation 2 were approximately 170 feet by 65 feet and extended to a depth of approximately 15 feet along the northern section of the excavation and to 10 feet along the southern edge of the excavation. The final limits of Excavation 2 and the confirmation soil sample locations are shown on Figure 3.

3.7 Excavation Soil Sampling Results

Soil sampling locations used to characterize the excavation sidewalls and bottoms are shown on Figure 3. Soil analytical results for Excavation 1 and Excavation 2 are provided on Table 1. Analytical laboratory results are included in Appendix C, and the data validation report is included in Appendix D.

All soil samples analyzed from the bottom of Excavation 1 had concentrations below the site-specific CULs. Analytical results for soil sample EX1-S3-2 (Excavation1) exceeded the site-specific CUL for total naphthalenes. Soil could not be removed beyond this sample location due to concern for undermining the UST basin. All soil samples analyzed from the bottom of Excavation 2 had concentrations below the site-specific CULs, with one exception. Soil sample EX2-B20-8 located along the southwestern excavation boundary next to Peace Portal Drive contained a concentration of benzene above the site-specific CUL.

There were three areas along the Excavation 2 boundary where confirmational samples exceeded the site-specific CULs and could not be over-excavated. The three areas are detailed below and sample locations are shown in Figure 3:

- Northeast corner of Excavation 2 (sample ID: EX2-S13-4, EX2-S16-14, and EX2-S17-4): Analytical results for these soil samples exceeded the site-specific CULs for benzene and gasoline-range hydrocarbons. The contaminated soil could not be over-excavated in this area due to the concern of undermining the Mini Mart building.
- Southeastern corner of Excavation 2 (sample ID: EX2-S38-11): Analytical results for this soil sample exceeded the site-specific CUL for benzene. Contaminated soil was not removed within 5 feet of the UST cathodic protection line, which runs from the current UST basin toward the building.
- Southwestern boundary of Excavation 2 (sample ID: EX2-S19-4, EX2-S20-14, EX2-S21-4, EX2-S22-8, EX2-S25-4, EX2-S28-6, EX2-S29-4, EX2-S39-5, and EX2-S40-4): Soil analytical results reported concentrations of benzene, ethylbenzene, total xylenes, and gasoline-range hydrocarbons above the site-specific CULs. The contaminated soil extended beyond the Blaine Mini Mart property, into the Peace Portal Drive right-of-way, and could not be over-excavated due to access restrictions and active underground utilities.

3.8 Oxygen Release Compound

To treat residual petroleum in the soil and groundwater, approximately 8,000 pounds of a controlled oxygen-releasing redox compound (Adventus EHC-O®), which contains a nitrogen nutrient mixture, was placed in areas of the excavations where petroleum-contaminated soil remained in place, and below the high water table. EHC-O was placed along the southern sidewall of Excavation 1, along the northeastern and southeastern extent of Excavation 2, and along the southwestern boundary (along Peace Portal Drive right-of-way) of Excavation 2. The EHC-O was distributed by excavator within the 1- to 2-foot backfill lifts. In addition, EHC-O was placed at the bottom of Excavation 2 to treat groundwater.

3.9 Soil and Groundwater Disposal

3.9.1 Disposal Methodology

Approximately 5,057 tons of petroleum-contaminated soil were removed from Excavations 1 and 2. Approximately 193 tons of contaminated soil were transported to the CEMEX facility in Everett, Washington, for thermal treatment. A total of approximately 4,863 tons of soil were transported via rail line to the Rabanco landfill in Roosevelt, Washington. CEMEX and Rabanco trucking tickets are provided in Appendix E.

Approximately 31,734 gallons of petroleum-contaminated groundwater were generated during Excavation 2 activities. Groundwater was temporarily stored on site in two 21,000-gallon holding tanks. Groundwater was treated by filtration through two activated carbon vessels. Prior to each discharge event, the City of Blaine required the collection and analysis of one groundwater sample, to be analyzed and compared to MTCA Method A CULs for petroleum constituents. Four groundwater samples were collected from the holding tanks and analyzed for gasoline-, diesel-, and heavy oil-range hydrocarbons, BTEX, MTBE, and total naphthalenes. Groundwater sample TW-1 contained concentrations of gasoline-range hydrocarbons, BTEX, and total naphthalenes exceeding their respective MTCA Method A CULs. In order to obtain groundwater concentrations below the MTCA CULs, the active carbon vessels were replaced with new activated carbon, and groundwater was then re-sampled. All other groundwater samples collected (TW-2 through TW-4) contained concentrations below the laboratory reporting limits. Groundwater analytical results are provided in Table 2. The dates and quantity of discharged groundwater are tabulated below.

Date of Discharge	Amount Discharged (gallons)
May 16, 2011	12,012
May 24, 2011	13,902
May 27, 2011	5,820

3.9.2 Observation Well Sample Methodology

Due to the unexpected petroleum-contaminated soil encountered during Excavation 1 (near the USTs), Ecology requested the collection of one groundwater sample from an onsite observation well (OW-1), located south of Excavation 1 and downgradient of the UST basin (shown in Figure 2). The purpose of collecting and analyzing this groundwater sample was to determine if a new release had occurred from current USTs. The groundwater sample was collected using a disposable bailer and was submitted to ESN NW Chemical Laboratory in Bellevue, Washington. The groundwater sample was analyzed for gasoline-, diesel-, and heavy oil-range hydrocarbons, BTEX, MTBE, and total naphthalenes. Groundwater analytical results from OW-1 indicated concentrations of gasoline-range hydrocarbons and BTEX above their respective MTCA Method A CULs.

3.10 Excavation Backfilling

After the excavation was completed and adequately documented with results from confirmational samples, the excavation was backfilled. A total of approximately 48 tons of

quarry spalls, 5,000 tons of 8-inch minus gravel (pit run), and 317 tons of 1¼-inch minus crushed surface base course (CSBC) were imported from Aggregates West. The excavations were backfilled by placing quarry spalls or 8-inch minus pit run at the base of the excavations, below the water table. This was followed by compactable backfill material consisting of 1¼-inch minus CSBC. Excavation 1 was compacted in approximately 1-foot lifts using a compaction plate attached to an excavator. Excavation 2 was compacted in approximately 1-foot lifts using a combination of an excavator-attached compaction plate and rolling vibrator.

3.11 Data Validation

All chemical analyses were conducted in accordance with the Sampling and Analysis Plan/Quality Assurance Project Plan (SAIC 2011). All chemical results of soil samples underwent independent data validation by EcoChem, Inc. of Seattle, WA. A minimum of a summary-level Stage 2B data validation was performed for all soil results; a full-level Stage 4 data validation was performed on one analytical batch for each test method performed by each laboratory (i.e., one batch of each test method from both the fixed and onsite laboratories). Data validation was performed following USEPA guidance (USEPA 2008, 2009). The data validation report, including a list of all qualified results, is presented in Appendix D. No results were rejected as a result of data validation; all results are acceptable for use, as qualified.

4.0 Summary

The remedial excavations at the Blaine Mini Mart property successfully removed and disposed of approximately 5,057 tons of petroleum-contaminated soil from the two excavation areas. This includes heavy oil-range hydrocarbons in soil located south of the former garage (Excavation 1), and gasoline-range hydrocarbons in soil located near the fuel dispenser and canopy area (Excavation 2). Although the excavations were successful in removing a significant portion of the petroleum source material in each of the excavation areas, some localized contaminated soil remains. As a result, approximately 8,000 pounds of EHC-O were applied to the sidewalls and base of the excavation, which will promote further attenuation of the petroleum source through enhanced bioremediation.

It is anticipated that the removal of petroleum-contaminated soil and the addition of EHC-O will result in a decrease of groundwater contaminant concentrations at the site. However, due to the decommissioning of all of the monitoring wells (MW-1 through MW-5) at the site, the impact of this remedial excavation and effectiveness of EHC-O cannot be further determined until groundwater monitoring wells are installed and sampled. Three groundwater monitoring wells are scheduled to be installed in late August or early September 2011, and proposed groundwater monitoring well locations are depicted on Figure 3. In addition, one groundwater sample collected from an existing observation well south of Excavation 1 and downgradient of the UST basin shows concentrations of gasoline-range constituents above MTCA Method A CULs.

5.0 References

BEK (Bek Purnell Engineering). 1997. Monitoring Well Installation and Ground Water Analysis Blaine Mini Mart. Bek Purnell Engineering. October 30, 1997.

Ecology (Washington State Department of Ecology). 2010. Regulated Underground Storage Tanks Site List. https://fortress.wa.gov/ecy/tcpwebreporting/reports.aspx

Environmental Associates, Inc. 2005. Subsurface Sampling and Testing Blaine Mini Mart (Gas Station and Convenience Store) Environmental Associates, Inc. December 08, 2005.

Northwest Tank. 2010. Field Report Testing Summary. Northwest Tank and Environmental Services, Inc. January 08, 2010.

SAIC (Science Applications International Corporation). 2010a. Blaine Mini Mart Site, Blaine, Washington, Cleanup Action Plan. Prepared for Washington State Department of Ecology. Prepared by Science Applications International Corporation. September 14, 2010. (Draft CAP document became final CAP without modification.)

SAIC. 2010b. Blaine Mini Mart Site, Blaine, Washington, Site Characterization Report. Prepared for Washington State Department of Ecology. Prepared by Science Applications International Corporation. July 21, 2010.

SAIC. 2011. Blaine Mini Mart Confirmational Sampling, 2530 Peace Portal Drive, Blaine, Washington, Sampling and Analysis Plan/Quality Assurance Project Plan. Prepared for Washington State Department of Ecology. Prepared by Science Applications International Corporation. April 22, 2011.

Whatcom Environmental Services. 2008. Groundwater Monitoring Well Sampling – Blaine Mini Mart (Ecology Facility Site ID # 42128291). Whatcom Environmental Services, Inc. May 02, 2008.

Whatcom Environmental Services. 2010. Whatcom Assessor and Treasurer – Property Details. http://property.whatcomcounty.us/propertyaccess/?cid=0

Figures

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State of Washington

Figure 1. Location Map for the Blaine Mini Mart Site

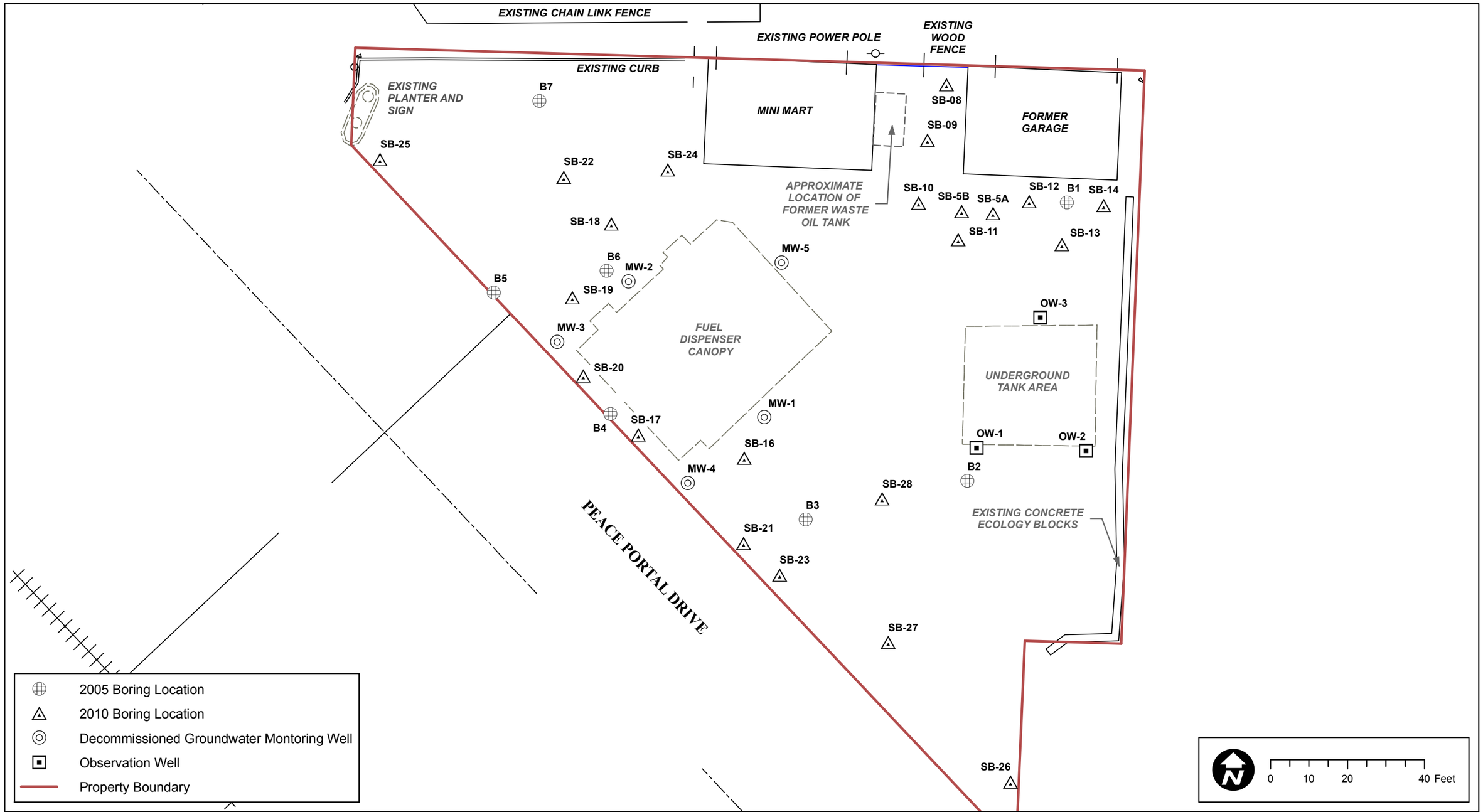

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Figure 2. Site Map

SAIC® From Science to Solutions

Coordinate System:
NAD 1983 StatePlane Washington North FIPS 4601 Feet
Prepared By: mlf
File: Fig-2_Site_Map
Illustrative purposes only.

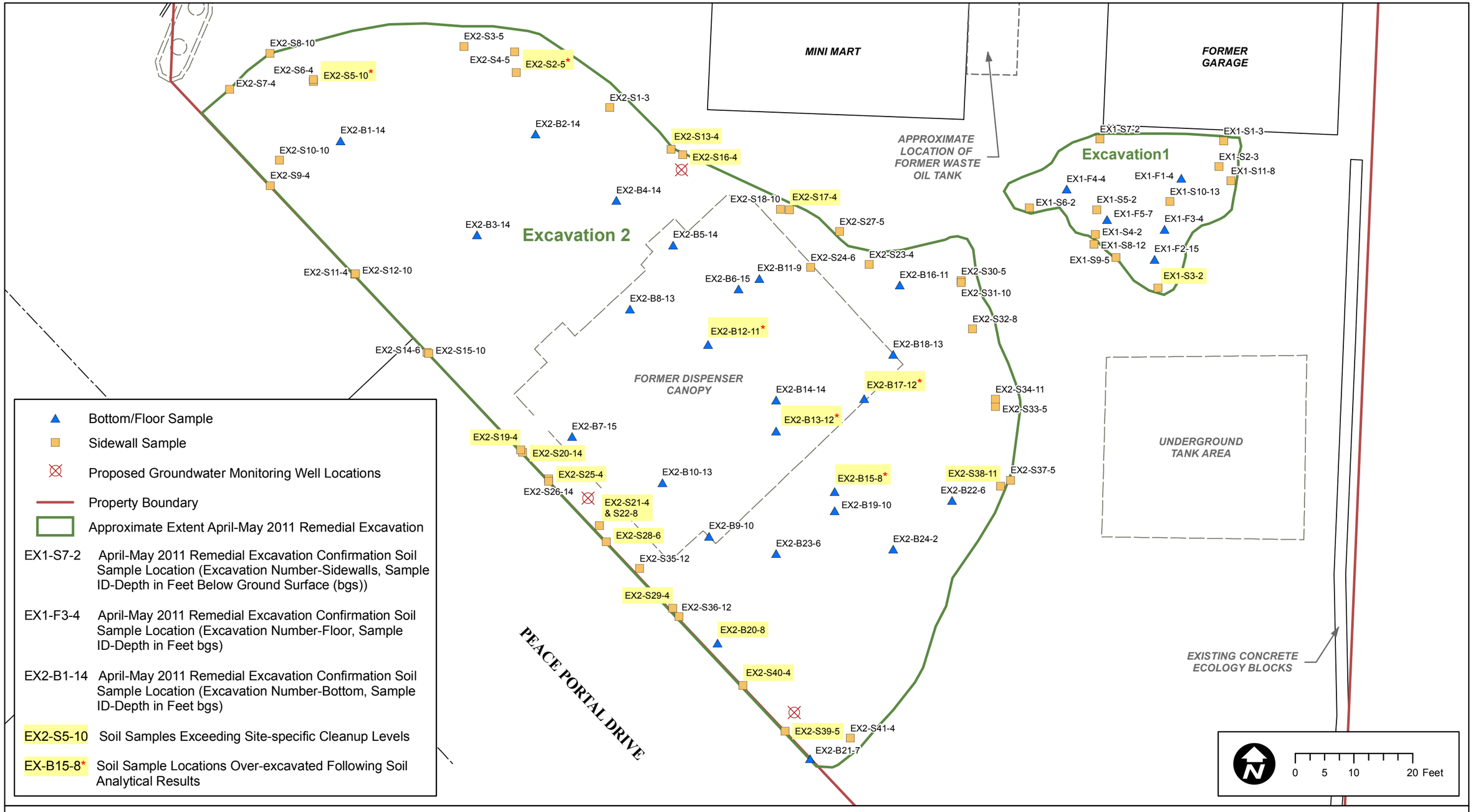

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Figure 3. 2011 Remedial Excavation Confirmation Soil Sample Locations

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Coordinate System:
NAD 1983 StatePlane Washington North FIPS 4601 Feet
Prepared By: mlf
File: Fig-3_Confirmation_Soil_Sample_Locations
Illustrative purposes only.

Tables

Table 1. Excavation Confirmation Soil Sample Analytical Results (mg/kg DW)

Sample ID	Sample Depth (feet bgs)	Date	Benzene [a]	Toluene [a]	Ethylbenzene [a]	Total Xylenes [a]	Methyl t-butyl ether [a]	Naphthalene [b]	1-Methyl Naphthalene [b]	2-Methyl Naphthalene [b]	TPH-Gasoline Range [c]	TPH-Diesel Range [d]	TPH-Heavy Oil Range [d]
EX1-F1-4	4	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-F1-4-2 *	4	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-F2-15	15	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-F3-4	4	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-F4-4	4	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-F5-7	7	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-S1-3	3	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-S2-3	3	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-S3-2	2	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	2 J	**5.2 J**	**7.9 J**	10 U	160	100 U
EX1-S4-2	2	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-S5-2	2	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-S6-2	2	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-S7-2	2	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-S8-12	12	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-S9-5	5	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-S10-13	13	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX1-S11-8	8	4/27/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX2-B1-14	14	5/3/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 UJ	1 UJ	1 UJ	1 UJ	10 U	100 U	100 U
EX2-B2-14	14	5/3/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 UJ	1 UJ	1 UJ	1 UJ	10 U	100 U	100 U
EX2-B3-14	14	5/4/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	1 U	1 UJ	1 U	10 U	100 U	100 U
EX2-B3-14-2 *	14	5/4/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	1 U	1 UJ	1 U	10 U	100 U	100 U
EX2-B4-14	14	5/4/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	1 U	1 UJ	1 U	10 U	100 U	100 U
EX2-B5-14	14	5/5/2011	0.05 U	0.05 U	0.05 U	0.15 U	0.05 U	1 UJ	1 UJ	1 UJ	10 U	100 U	100 U
EX2-B6-15	15	5/5/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	1 UJ	1.4 U	1 UJ	10 U	100 U	100 U
EX2-B7-15	15	5/6/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	1 U	1 U	1 U	10 U	100 U	100 U
EX2-B8-13	13	5/6/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	1 U	1 U	1 U	10 U	100 U	100 U
EX2-B9-10	10	5/6/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	1 U	1 U	1 U	10 U	100 U	100 U
EX2-B10-13	13	5/6/2011	0.05 U	0.05 U	0.05 U	0.15 U	0.05 U	1 U	1 U	1 U	10 U	100 U	100 U
EX2-B11-9	9	5/11/2011	0.02 U	0.05 UJ	0.05 UJ	0.15 UJ	0.05 U	1 UJ	1 U	1 U	10 U	100 U	100 U
EX2-B12-11	11	5/11/2011	**0.92**	0.05 UJ	0.05 UJ	0.15 UJ	0.05 U	1 UJ	1 U	1 U	10 U	100 U	100 U
EX2-B13-12	12	5/11/2011	**0.07**	0.05 UJ	0.05 UJ	0.15 UJ	0.05 U	1 UJ	1 U	1 U	10 U	100 U	100 U
EX2-B14-14	14	5/11/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	1 UJ	1 U	1 U	10 U	100 U	100 U
EX2-B15-8	8	5/12/2011	**0.07**	0.05 UJ	0.05 UJ	0.15 UJ	0.05 U	1 U	1 U	1 UJ	10 U	100 U	100 U
EX2-B16-11	11	5/12/2011	0.02 U	0.05 UJ	0.05 UJ	0.15 UJ	0.05 U	1 U	1 U	1 UJ	10 U	100 U	100 U
EX2-B17-12	12	5/16/2011	**0.04**	0.05 UJ	0.05 UJ	0.15 UJ	0.05 U	1 U	1 U	1 U	10 U	100 U	100 U
EX2-B17-12-2 *	12	5/16/2011	0.02	0.05 UJ	0.05 UJ	0.15 UJ	0.05 U	1 U	1 U	1 U	10 U	100 U	100 U
EX2-B18-13	13	5/17/2011	0.05 UJ	0.05 UJ	0.05 UJ	0.15 UJ	0.05 UJ	1 UJ	1 UJ	1 UJ	10 U	100 U	100 U
EX2-B19-10	10	5/18/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX2-B20-8	8	5/18/2011	**0.07**	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX2-B21-7	7	5/18/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX2-B22-6	6	5/18/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX2-B23-6	6	5/18/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX2-B24-2	2	5/18/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	0.02 UJ	0.02 UJ	0.02 UJ	10 U	50 U	100 U
EX2-S1-3	3	5/3/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 UJ	1 UJ	1 UJ	1 UJ	10 U	100 U	100 U
EX2-S2-5	5	5/3/2011	**0.21**	0.78	0.34	3.4	0.05 UJ	1 UJ	1 UJ	1 UJ	**62**	100 U	100 U
EX2-S3-5	5	5/3/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 UJ	1 UJ	2 J	1 UJ	10 U	110	100 U
EX2-S4-5	5	5/3/2011	0.05 U	0.05 U	0.05 U	0.15 U	0.05 UJ	1 UJ	1 UJ	1 UJ	10 U	100 U	100 U
EX2-S5-10	10	5/3/2011	**0.55**	0.05 U	0.31	1.6	0.05 UJ	1 UJ	1 UJ	1 UJ	22	100 U	100 U
EX2-S6-4	4	5/3/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 UJ	1 UJ	1 UJ	1 UJ	10 U	100 U	100 U
EX2-S7-4	4	5/4/2011	0.02 U	0.05 U	0.05 U	0.15 U	0.05 U	1 U	1 UJ	1 U	10 U	110	100 U

Table 1. Excavation Confirmation Soil Sample Analytical Results (mg/kg DW)

Sample ID	Sample Depth (feet bgs)	Date	Benzene [a]		Toluene [a]		Ethylbenzene [a]		Total Xylenes [a]		Methyl t-butyl ether [a]		Naphthalene [b]		1-Methyl Naphthalene [b]		2-Methyl Naphthalene [b]		TPH-Gasoline Range [c]		TPH-Diesel Range [d]		TPH-Heavy Oil Range [d]	
EX2-S8-10	10	5/4/2011	0.02	U	0.05	U	0.05	U	0.15	U	0.05	U	1	U	1	UJ	1	U	10	U	110		100	U
EX2-S9-4	4	5/4/2011	0.02	U	0.05	U	0.12		0.15	U	0.05	U	1	U	1	UJ	1	U	**85**		100	U	100	U
EX2-S10-10	10	5/4/2011	0.05	U	0.05	U	0.05	U	0.15	U	0.05	U	1	U	1	UJ	1	U	10	U	100	U	100	U
EX2-S11-4	4	5/4/2011	0.02	U	0.05	U	0.05	U	0.15	U	0.05	U	1	U	1	UJ	1	U	10	U	100	U	100	U
EX2-S12-10	10	5/4/2011	0.02	U	0.05	U	0.05	U	0.15	U	0.05	U	1	U	1	UJ	1	U	10	U	100	U	100	U
EX2-S13-4	4	5/5/2011	**0.05**	**J**	0.05	U	0.44		0.37	J	0.05	U	1	UJ	1	UJ	1	UJ	16		100	U	100	U
EX2-S14-6	6	5/5/2011	0.02	U	0.05	U	0.05	U	0.15	U	0.05	U	1	UJ	1	UJ	1	UJ	10	U	100	U	100	U
EX2-S15-10	10	5/5/2011	0.02	U	0.05	U	0.05	U	0.15	U	0.05	U	1	UJ	1	UJ	1	UJ	10	U	100	U	100	U
EX2-S16-4	4	5/5/2011	**0.27**	**J**	2	J	0.41		3.5	J	0.05	U	1	UJ	1.1	U	1	UJ	**430**		100	U	100	U
EX2-S17-4	4	5/5/2011	**0.08**	**J**	0.47	J	0.25		2.3	J	0.05	U	1	UJ	1	UJ	1	UJ	**47**		100	U	100	U
EX2-S18-10	10	5/5/2011	0.02	U	0.05	U	0.05	U	0.15	U	0.05	U	1	UJ	1	UJ	1	UJ	10	U	100	U	100	U
EX2-S19-4	4	5/6/2011	**0.9**		0.09		0.99		2.6	J	0.05	U	1	U	1	U	1	U	**41**		100	U	100	U
EX2-S20-14	14	5/6/2011	**1.4**		0.05	U	0.14		0.15	U	0.05	U	1	U	1	U	1	U	16		100	U	100	U
EX2-S21-4	4	5/6/2011	**0.41**		1.1		1.3		**9.3**	**J**	0.05	U	1	U	1	U	1	U	**720**		100	U	100	U
EX2-S22-8	8	5/6/2011	**0.61**		4.5		3.7		5.5	J	0.05	U	1.7		1	U	1	U	**390**		100	U	100	U
EX2-S23-4	4	5/11/2011	0.02	UJ	0.05	UJ	0.05	UJ	0.15	UJ	0.05	UJ	1	UJ	1	U	1	U	10	U	100	U	100	U
EX2-S24-6	6	5/11/2011	0.02	U	0.05	UJ	0.05	UJ	0.15	UJ	0.05	U	1	UJ	1	U	1	U	10	U	100	U	100	U
EX2-S25-4	4	5/11/2011	**0.23**		0.05	UJ	0.17	J	0.92	J	0.05	U	1	UJ	1	U	1	U	**40**		100	U	100	U
EX2-S26-14	14	5/11/2011	0.02	UJ	0.05	UJ	0.05	UJ	0.15	UJ	0.05	UJ	1	UJ	1	U	1	U	10	U	100	U	100	U
EX2-S27-5	5	5/12/2011	0.02	U	0.05	UJ	0.05	UJ	0.15	UJ	0.05	U	1	U	1	U	1	UJ	10	U	100	U	100	U
EX2-S28-6	6	5/12/2011	**0.13**		0.05	UJ	0.05	UJ	0.15	J	0.05	U	1	U	1	U	1	UJ	16		100	U	100	U
EX2-S29-4	4	5/16/2011	**2.6**		**15**	**J**	5.8	J	**48**	**J**	0.05	U	1.7		2.3		1	U	**550**		100	U	100	U
EX2-S30-5	5	5/16/2011	0.05	U	0.05	UJ	0.05	UJ	0.15	UJ	0.05	U	1	U	1	U	1	U	10	U	100	U	100	U
EX2-S31-10	10	5/16/2011	0.02	UJ	0.05	UJ	0.05	UJ	0.15	UJ	0.05	UJ	1	U	1	U	1	U	10	U	100	U	100	U
EX2-S33-5	5	5/17/2011	0.05	UJ	0.05	UJ	0.05	UJ	0.15	UJ	0.05	UJ	1	U	1	UJ	1	UJ	10	U	100	U	100	U
EX2-S32-8	8	5/17/2011	0.02	UJ	0.05	UJ	0.05	UJ	0.15	UJ	0.05	U	1	U	1	UJ	1	UJ	10	U	100	U	100	U
EX2-S34-11	11	5/17/2011	0.02	U	0.05	UJ	0.05	UJ	0.15	UJ	0.05	U	1	U	1	UJ	1	UJ	10	U	100	U	100	U
EX2-S35-12	12	5/17/2011	0.05	UJ	0.05	UJ	0.05	UJ	0.15	UJ	0.05	UJ	1	U	1	UJ	1	UJ	10	U	100	U	100	U
EX2-S36-12	12	5/17/2011	0.02	UJ	0.05	UJ	0.05	UJ	0.15	UJ	0.05	UJ	1	U	1	UJ	1	UJ	10	U	100	U	100	U
EX2-S37-5	5	5/18/2011	0.02	U	0.05	U	0.05	U	0.15	U	0.05	U	0.02	UJ	0.02	UJ	0.02	UJ	10	U	50	U	100	U
EX2-S38-11	11	5/18/2011	**0.08**		0.05	U	0.05	U	0.15	U	0.05	U	0.02	UJ	0.02	UJ	0.02	UJ	10	U	50	U	100	U
EX2-S39-5	5	5/18/2011	**4.4**		0.2		**8.5**		8.7		0.05	U	0.21	J	0.02	UJ	0.02	UJ	**3100**		50	U	100	U
EX2-S40-4	4	5/18/2011	**0.74**		0.05	U	1.7		2.1		0.05	U	0.02	UJ	0.02	UJ	0.02	UJ	**280**		50	U	100	U
EX2-S41-4	4	5/18/2011	0.02	U	0.05	U	0.05	U	0.15	U	0.05	U	0.02	UJ	0.02	UJ	0.02	UJ	10	U	50	U	100	U
Site-Specific Cleanup Levels			*0.03*		*7*		*6*		*9*		*0.1*		*5*						*30*		*460*		*460*	

Bold and gray shaded results indicate detected values that exceed site-specific cleanup levels.

* = Field Duplicate Sample

Ecology = Washington State Department of Ecology

EPA = United States Environmental Protection Agency

J = estimated concentration

mg/kg DW = milligrams per kilogram dry weight

TPH = Total petroleum hydrocarbon

U = Indicates that the target analyte was not detected at the reported concentration

UJ = Indicates that the target analyte was not detected at the reported estimated concentration

[a] = Analyzed by EPA Method 8260C

[b] = Analyzed by Ecology Method EPA 8260C or 8270

[c] = Analyzed by Ecology Method NWTPH-G

[d] = Analyzed by Ecology Method NWTPH-Dx with silica-gel cleanup

Table 2. Groundwater Sample Analytical Results (µg/L)

Sample ID	Date	Benzene [a]	Toluene [a]	Ethylbenzene [a]	Total Xylenes [a]	Methyl t-butyl ether [a]	Naphthalene [b]	1-Methyl Naphthalene [b]	2-Methyl Naphthalene [b]	TPH-Gasoline Range [c]	TPH-Diesel Range [d]	TPH-Heavy Oil Range [d]
TR-W1	5/5/2011	**390**	1000	360	**2700**	1.0 U	**200**	**65**	**160**	**38000**	250 U	500 U
TR-W2	5/11/2011	1.0 U	1.0 U	1.0 U	3.0 U	1.0 U	1.0 U	20 U	20 U	100 U	250 U	500 U
TR-W3	5/18/2011	1.0 U	1.0 U	1.0 U	3.0 U	1.0 U	0.1 U	0.1 U	0.1	100 U	250 U	500 U
TR-W4	5/25/2011	1.0 U	1.0 U	1.0 U	3.0 U	1.0 U	0.1 U	0.1 U	0.1	100 U	250 U	500 U
OW1-W1	5/12/2011	**56**	45	170	900	1.0 U	5.1	0.1 U	0.1 U	**3600**	250 U	500 U
MTCA Method A CUL		*5*	*1000*	*700*	*1000*	*20*		*160*		*800*	*500*	*500*

Bold and gray shaded results indicate detected values that exceed MTCA A cleanup levels

Ecology = Washington State Department of Ecology

EPA = United States Environmental Protection Agency

J = estimated concentration

µg/L = microgram per Liter

MTCA = Model Toxics Control Act

TPH = Total petroleum hydrocarbon

U = Indicates that the target analyte was not detected at the reported concentration

UJ = Indicates that the target analyte was not detected at the reported estimated concentration

[a] = Analyzed by EPA Method 8260C

[b] = Analyzed by Ecology Method EPA 8260C or 8270

[c] = Analyzed by Ecology Method NWTPH-G

[d] = Analyzed by Ecology Method NWTPH-Dx with silica-gel cleanup