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FEASIBILITY STUDY/DISPROPORTIONATE COST ANALYSIS

Site:
North Colfax Petroleum Contamination Site
North Main Street and East Tyler Street
Colfax, Washington

Prepared for:
The North Colfax Group

Report Date:
March 16, 2012

Feasibility Study/Disproportionate Cost Analysis

Prepared for:

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North Colfax Petroleum Contamination Site
North Main Street and East Tyler Street
Colfax, Washington

Project No.: 0592-001

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March 16, 2012

SoundEarth Strategies

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ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter, equivalent to parts per billion
ARAR	applicable or relevant and appropriate requirement
AST	aboveground storage tank
bcy	bank cubic yards
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CAP	Cleanup Action Plan
Cenex property	those portions of Whitman County tax parcel numbers 1-0135-00-01-01-0000 and 8-0195-00-00-00-0323 located to the north of the railroad tracks
CFR	Code of Federal Regulations
COC	chemical of concern
Colfax Grange	Colfax Grange Supply Company, Inc.
Colfax Grange property	those portions of Whitman County tax parcel numbers 1-0135-00-01-15-0000 and 8-0195-00-00-00-0323 located to the south of the railroad tracks
DCA	disproportionate cost analysis
DRPH	diesel-range petroleum hydrocarbons
Eastern Colfax Grange	the property bordering the above-described Colfax Grange property to the east
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FS	feasibility study
FS/DCA	Feasibility Study/Disproportionate Cost Analysis
GEI	GeoEngineers, Inc.
GRPH	gasoline-range petroleum hydrocarbons

ACRONYMS AND ABBREVIATIONS (CONTINUED)

mg/kg	milligrams per kilogram, equivalent to parts per million
MTCA	Washington State Model Toxics Control Act
MTBE	methyl tertiary-butyl ether
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NJDEP	New Jersey Department of Environmental Protection
North Colfax Group	PetroSun Fuel, Inc.; TOC Holdings Co.; CHS, Inc.; and Colfax Grange Supply Company, Inc., collectively
O&M	operation and maintenance
ORPH	oil-range petroleum hydrocarbons
OSWER	Office of Solid Waste and Emergency Response
PCS	petroleum-contaminated soil
PLP	potentially liable party
Quantum	Quantum Engineering, Inc.
RAO	Remedial Action Objective
RCW	Revised Code of Washington
RI	remedial investigation
RI Report	Remedial Investigation Report prepared by SoundEarth and dated January 4, 2010
ROW	right-of-way
SES	Sound Environmental Strategies Corporation
SESOIL	Seasonal Soil
Shell property	the land located to the east of North Morton Street and north of the railroad tracks, formerly occupied by a Shell-brand retail gasoline station

ACRONYMS AND ABBREVIATIONS (CONTINUED)

the Site	the full lateral and vertical extent of contamination that has resulted from the former and current operation of retail gasoline service stations on the properties located along the east side of North Main Street, at the northeast corner of its intersection with East Harrison Street and on the northeast and southeast corners of its intersection with East Tyler Street in Colfax, Washington
SoundEarth	SoundEarth Strategies, Inc., formerly Sound Environmental Strategies Corporation
South Fork	the South Fork of the Palouse River
Sterling property	the property occupied by a Sterling Savings Bank and located to the west of the Time Oil property
SVE	soil vapor extraction
Time Oil property	property at 804 North Main Street in Colfax, Washington
TPH	total petroleum hydrocarbon
USC	United States Code
UST	underground storage tank
WAC	Washington Administrative Code

EXECUTIVE SUMMARY

SoundEarth Strategies, Inc. (formerly Sound Environmental Strategies Corporation) has prepared this Feasibility Study/Disproportionate Cost Analysis for the North Colfax Petroleum Contamination Site, located at the intersection of North Main Street and East Tyler Street in Colfax, Washington (the Site), on behalf of PetroSun Fuel, Inc. (currently Pacific Convenience & Fuel, LLC); TOC Holdings Co. (formerly Time Oil Co.); CHS, Inc.; and Colfax Grange Supply Company, Inc.; collectively, the North Colfax Group. The Feasibility Study/Disproportionate Cost Analysis was prepared in general accordance with the Washington State Model Toxics Control Act promulgated in the Washington Administrative Code Chapters 173-340-350 through 173-340-390.

The Site, as it is currently defined, is comprised of an area that includes several tax parcels that are currently occupied or have historically been occupied by gasoline stations. These properties are located along the east side of North Main Street where it intersects with East Tyler Street and East Harrison Street, and they are referred to in this report as the Time Oil, Cenex, and Colfax Grange properties. The Time Oil property, located at the northeast corner of the intersection of North Main Street and East Tyler Street, was developed as a retail gasoline station sometime prior to 1939 and was reportedly redeveloped in 1956 with a Phillips 66 retail gasoline station and service station that was equipped with five underground storage tanks (two 3,000-gallon fuel tanks, one 4,000-gallon fuel tank, one 500-gallon heating oil tank, and one 500-gallon waste oil tank). The tanks were replaced in 1976 with three underground storage tanks (one 6,000-gallon tank, one 8,000-gallon tank, and one 12,000-gallon tank) containing gasoline. In 1999, the Time Oil property was redeveloped into its current configuration, including the installation of an 8,000-gallon diesel underground storage tank. The Cenex property, which is situated between the railroad tracks and East Tyler Street, was first occupied by a gasoline station in 1985 when three 8,000-gallon underground storage tanks (two gasoline tanks and one diesel tank) and two fuel-dispensing pump islands were installed at the property. The 1985-vintage station was upgraded in 2006, and the currently existing station is equipped with two fuel-dispensing pump islands, two 12,000-gallon underground storage tanks containing unleaded gasoline and on-road diesel, and one 12,000-gallon underground storage tank with two 6,000-gallon compartments of off-road diesel and super unleaded gasoline. The Colfax Grange property, which is situated between East Harrison Street and the railroad tracks, was occupied by a gasoline station in 1939; the station was removed from the Colfax Grange property sometime prior to the construction of the existing Colfax Grange Building in 1953. No information regarding the underground storage tanks or other product delivery systems associated with the gasoline station formerly located on the Colfax Grange property was observed in the available public record.

Petroleum-contaminated soil and groundwater were encountered beneath the Time Oil property in 1999 during the course of the gasoline station upgrade activities. The contamination was primarily encountered in the vicinity of a grease pit that had been associated with the automotive repair facility formerly located on the property. More than 900 cubic yards of petroleum-contaminated soil were excavated from the property, but areas of impacted soil were left in place to maintain the structural stability of the canopy that covers the existing fuel-dispensing pump islands. A total of 12 monitoring wells (MW01 through MW12) were installed on and in the vicinity of the Time Oil property between 2001 and 2002 in order to assess the extent of impacts that resulted from the release at the Time Oil property. Analytical testing of soil and groundwater samples collected from the borings and wells confirmed that the impacts extended across much of the Time Oil property; the results also suggested

that petroleum-contaminated groundwater was migrating toward the Time Oil property from the upgradient Cenex property.

On behalf of the Colfax Grange Supply Company, Inc., three monitoring wells (CMW01 through CMW03) were installed to the south of the gasoline station on the Cenex property in early October 2004 in order to assess whether the impacts encountered in the monitoring wells installed for Time Oil Co. had resulted from a release at the Cenex property. On October 15, 2004, a surficial release of an unspecified volume of gasoline occurred during the refueling of one of the underground storage tanks at the Cenex property. Washington State Department of Ecology was notified of the release on November 8, 2004, and on November 15, 2004, the small volume of near-surface petroleum-contaminated soil was removed using a vacuum truck. In December 2004, two additional monitoring wells (CMW04 and CMW05) were installed to the north of the Cenex station. During the gasoline station upgrade activities conducted in 2006, petroleum-contaminated soil was encountered in the vicinity of the underground storage tanks and fuel-dispensing pump islands on the Cenex property. More than 2,600 cubic yards of petroleum-contaminated soil were reportedly excavated and removed from the Cenex property; however, petroleum contamination was encountered in the soil samples collected from the final limits of the excavation.

In 2007, the members of the North Colfax Group entered into Agreed Order No. DE 4599, which required them to conduct a remedial investigation and feasibility study for the petroleum releases at the Site. The remedial investigation was conducted in an effort to identify the sources and the full lateral and vertical extents of the releases that have occurred at the Site. In order to accomplish this task, a total of 41 soil borings were advanced at locations throughout the Site and 3 test pits were excavated on the Colfax Grange property. Twenty of the soil borings were subsequently completed as monitoring wells (MW13 through MW32) that were incorporated into a quarterly groundwater monitoring program.

The results of the remedial investigation activities confirmed that elevated concentrations of petroleum contamination remain in soil collected from the vicinities of the gasoline stations that have historically operated on the Time Oil, Cenex, and Colfax Grange properties. Chemicals of concern that were encountered at elevated concentrations in soil beneath the Time Oil property included gasoline- and diesel-range petroleum hydrocarbons, naphthalenes, and volatile organic compounds including benzene, toluene, ethylbenzene, total xylenes, and methyl tertiary-butyl ether. The impacted soil appeared to be limited to depths of approximately 11 feet or less beneath the southwestern portion of the Time Oil property (borings SP02, SP04, and SP05). Elevated concentrations of oil-range petroleum hydrocarbons like those encountered during the 1999 excavation activities on the Time Oil property were not detected during the remedial investigation activities.

Soil samples collected from several locations on and proximal to the Cenex property contained concentrations of gasoline-range petroleum hydrocarbons and/or benzene (borings SP11, SP12, SP14, and SP15) that exceeded their respective Washington State Model Toxics Control Act Method A cleanup levels. The contamination was encountered in the uppermost 6 to 8 feet of soil in borings advanced to the north and south of the 2006 excavation area (borings SP11, SP14, and SP15) and in soil collected from depths of 10 to 14 feet in the boring advanced by the eastern diesel pump island (boring SP12).

Elevated petroleum concentrations were encountered in soil collected from two of the three test pits that were excavated in the vicinity of the former gasoline station on the Colfax Grange property and in soil samples collected from borings advanced proximal to the north (B16) and east (B29) of the former gasoline station. None of the soil samples collected from above the saturated zone exhibited indications of contamination, which suggests either that (1) the source area was not explored during the investigation activities and that the contamination migrated to the exploration locations via groundwater or that (2) the source was removed (i.e., the underground storage tanks were removed and the excavation was backfilled with uncontaminated soil).

Groundwater monitoring has been conducted on a periodic basis at the Site since 2001 and was performed on a quarterly basis throughout the course of the remedial investigation activities. Prior to the 2006 excavation of petroleum-contaminated soil from the Cenex property, groundwater beneath much of the Site contained elevated concentrations of gasoline- and diesel-range petroleum hydrocarbons and benzene. Elevated concentrations of oil-range petroleum hydrocarbons; naphthalenes; and the volatile organic compounds toluene, ethylbenzene, total xylenes, and methyl tertiary-butyl ether were also detected in one or more of the wells. Following completion of the excavation activities in 2006, the contaminant concentrations in groundwater decreased dramatically throughout the Site. During the eight quarterly monitoring events conducted at the Site between September 2009 and May 2011, groundwater samples collected from four of the monitoring wells have been found to contain concentrations of one or more chemicals of concern that exceeded the applicable Washington State Model Toxics Control Act Method A cleanup levels. However, the chemicals of concern detected in wells MW14 (abandoned in December 2009), MW20, and MW30 are not attributable to a release that occurred at the Site; rather, they are associated with releases that have occurred on the nearby Sterling and Shell properties. This assertion was confirmed by the results soil and groundwater sampling, which demonstrated that areas of unimpacted soil and groundwater were situated between the Site and the Sterling and Shell properties. With the exception of oil-range petroleum hydrocarbons in the groundwater samples collected from monitoring well MW26 in March and June 2010 and February 2011, none of the chemicals of concern were detected at concentrations exceeding their respective Washington State Model Toxics Cleanup Act Method A cleanup levels during any of these eight most recent quarterly monitoring events. Additional quarterly monitoring will be required in order to demonstrate continued compliance with Washington State Department of Ecology requirements.

Based on the findings from the investigations conducted by SoundEarth Strategies, Inc., and others between May 1999 and May 2011 and as discussed in the *Remedial Investigation Report*, *North Colfax Petroleum Contamination Site, North Main Street and East Tyler Street, Colfax, Washington*, by SoundEarth Strategies, Inc., dated January 4, 2010, the Site has been defined to include the following:

- The extent of petroleum-contaminated soil and groundwater that originated from releases at the retail gasoline stations and automotive repair facilities that have historically operated on the Time Oil property. The current extent of these impacts appears to be limited to soil beneath the southwestern portion of the Time Oil property and the easternmost portion of the North Main Street right-of-way, as well as oil-range petroleum hydrocarbon-contaminated groundwater in the vicinity of monitoring well MW26.
- The extent of petroleum-contaminated soil and groundwater that originated from releases at the retail gasoline station that formerly operated on the Cenex property. The current extent of

these impacts appears to be limited to a "rind" of soil that was left in place following the excavation of the 1985-vintage underground storage tanks. The petroleum-contaminated soil associated with the Cenex property extends beneath the East Tyler Street right-of-way. Groundwater samples collected from wells associated with the Cenex property have not contained concentrations of chemicals of concern that exceeded their respective Washington State Model Toxics Cleanup Act Method A cleanup levels for four or more consecutive quarterly monitoring events.

- The extent of petroleum-contaminated soil and groundwater that originated from releases at the retail gasoline station that formerly operated on the southwest portion of the Colfax Grange property. The impacts to soil from this source extend between monitoring wells MW29 and MW16, as well as beneath a portion of the adjacent East Harrison Street right-of-way. Groundwater samples collected from wells associated with the Colfax Grange property have not contained concentrations of chemicals of concern that exceeded their respective Washington State Model Toxics Cleanup Act Method A cleanup levels for four or more consecutive quarterly monitoring events.

Using the Site definition described above, a feasibility study was conducted to develop and evaluate cleanup alternatives that would facilitate selection of a final cleanup action at each property within the Site in accordance with Chapter 173-340-350(8) of the Washington Administrative Code.

As demonstrated in the course of the remedial investigation, the potential risk for exposure to the chemicals of concern at the Site exists via the direct-contact and soil-to-groundwater pathways. Based on the evaluation, the vapor intrusion and surface water pathways were concluded to be incomplete for the Site. To further assess the risk to human health via the soil-to-groundwater and direct-contact pathways, soil samples collected from the Site were evaluated using the MTCATPH11.1 Method B Worksheet. Considering the distinct nature of the three releases, the total petroleum hydrocarbon concentrations in soil that are protective of human health and the environment were calculated for each of the three properties that comprise the Site. The results for the Site indicate that only soil in the vicinity of borings SP02 and SP05 on the Time Oil property is not considered protective of human health via the direct-contact pathway; however, soil beneath much of the Site contains total petroleum hydrocarbon concentrations that exceed the levels considered protective of drinking water via the soil-to-groundwater pathway. Based upon the results of a groundwater potability evaluation, drinking water is the highest beneficial use for groundwater beneath the Site. Therefore, the Method A levels for unrestricted land use were identified as the appropriate cleanup levels for soil and groundwater beneath the Site.

For the Time Oil property, three cleanup alternatives were developed and evaluated in the course of the feasibility study and disproportionate cost analysis:

- **Cleanup Alternative 1.** Maintenance of a containment cap (currently asphalt and concrete) with monitored natural attenuation and implementation of an institutional control such as a management plan or contaminant contingency plan for residual petroleum-contaminated subsurface soil.
- **Cleanup Alternative 2.** In situ bioremediation of soil via soil vapor extraction with maintenance of the containment cap.

- **Cleanup Alternative 3.** Excavation with shoring and off-property disposal of petroleum-contaminated soil.

A comparative analysis and ranking of the cleanup alternatives that was performed in accordance with the appropriate evaluation criteria indicates that Cleanup Alternative 1 is the preferred alternative. Cleanup Alternative 1 meets the threshold requirements for cleanup actions set forth in Chapters 173-340-360(3) and 173-340-370 of the Washington Administrative Code. Cleanup Alternative 1 is protective of human health and the environment, is more easily implemented than the competing alternatives, will not impact the nearby commercial or residential tenants, and provides a permanent solution for reducing concentrations of chemicals of concern at the property. Cleanup Alternative 1 is also the least costly alternative and exhibits a lower cost-to-benefit ratio relative to the competing alternatives. A Cleanup Action Plan will be prepared based on the results of the feasibility study to present more detail on the implementation of this remedial alternative.

For the Cenex property, three cleanup alternatives were developed and evaluated in the course of the feasibility study and disproportionate cost analysis:

- **Cleanup Alternative 1.** Maintenance of a containment cap (currently asphalt and concrete) with monitored natural attenuation and implementation of an institutional control such as a management plan or contaminant contingency plan for residual petroleum-contaminated subsurface soil.
- **Cleanup Alternative 2.** In situ bioremediation of soil via soil vapor extraction with maintenance of the containment cap.
- **Cleanup Alternative 3.** Excavation with shoring and off-property disposal of petroleum-contaminated soil.

A comparative analysis and ranking of the cleanup alternatives that was performed in accordance with the appropriate evaluation criteria indicates that Cleanup Alternative 1 is the preferred alternative. Cleanup Alternative 1 meets the threshold requirements for cleanup actions set forth in Chapters 173-340-360(3) and 173-340-370 Washington Administrative Code. Cleanup Alternative 1 is protective of human health and the environment, is more easily implemented than the competing alternatives, will not impact the nearby commercial or residential tenants, and provides a permanent solution for reducing concentrations of chemicals of concern at the property. Additionally, because groundwater beneath the Cenex property currently complies with the Washington State Model Toxics Control Act Method A cleanup levels, the necessity to actively address residual impacts to soil beneath the property is low. Cleanup Alternative 1 is also the least costly alternative and exhibits a lower cost-to-benefit ratio relative to the competing alternatives. A Cleanup Action Plan will be prepared based on the results of the feasibility study to present more detail on the implementation of this remedial alternative.

For the Colfax Grange property, three cleanup alternatives were developed and evaluated in the course of the feasibility study and disproportionate cost analysis:

- **Cleanup Alternative 1.** Installation and maintenance of a containment cap (asphalt and concrete) with monitored natural attenuation and implementation of an institutional control such as a management plan or contaminant contingency plan for residual petroleum-contaminated subsurface soil.

- **Cleanup Alternative 2.** In situ remediation of soil and groundwater via chemical oxidation with maintenance of the containment cap.
- **Cleanup Alternative 3.** Excavation with shoring and off-property disposal of petroleum-contaminated soil.

A comparative analysis and ranking of cleanup alternatives that was performed in accordance with the appropriate evaluation criteria indicates that Cleanup Alternative 1 is the preferred alternative. Cleanup Alternative 1 meets the threshold requirements for cleanup actions set forth in Chapters 173-340-360(3) and 173-340-370 Washington Administrative Code. Cleanup Alternative 1 is protective of human health and the environment, is more easily implemented than the competing alternatives, will not impact the nearby commercial or residential tenants, and provides a permanent solution for reducing concentrations of chemicals of concern at the property. Additionally, because groundwater beneath the Colfax Grange property currently complies with the Washington State Model Toxics Control Act Method A cleanup levels, the necessity to actively address residual impacts to soil beneath the property is low. Cleanup Alternative 1 also exhibits the lowest cost-to-benefit ratio compared to the competing alternatives. A Cleanup Action Plan will be prepared based on the results of the feasibility study to present more detail on the implementation of this remedial alternative.

This executive summary is presented solely for introductory purposes, and the information contained in this section should be used only in conjunction with the full text of this report. A complete description of the project, Site conditions, investigative methods, and investigation results is contained within this report.

1.0 INTRODUCTION

SoundEarth Strategies, Inc. (SoundEarth; formerly Sound Environmental Strategies Corporation [SES]) has prepared this Feasibility Study/Disproportionate Cost Analysis (FS/DCA) for the North Colfax Petroleum Contamination Site (Figure 1), located at the intersection of North Main Street and East Tyler Street in Colfax, Washington (the Site), on behalf of PetroSun Fuel, Inc. (currently Pacific Convenience & Fuel, LLC); TOC Holdings Co. (formerly Time Oil Co.); CHS, Inc.; and Colfax Grange Supply Company, Inc. (Colfax Grange); collectively, the North Colfax Group. This FS/DCA was prepared for submittal to the Washington State Department of Ecology (Ecology), and it was developed to select a cleanup action based on the remedy selection criteria and requirements as defined by the Washington State Model Toxics Control Act (MTCA) Regulation in Chapters 173-340-350 through 173-340-390 of the Washington Administrative Code (WAC 173-340-350 through 173-340-390).

As established in WAC 173-340-200, the "Site" is defined by the full lateral and vertical extent of contamination that has resulted from the former and current operation of retail gasoline service stations on the properties located along the east side of North Main Street, at the northeast corner of its intersection with East Harrison Street and on the northeast and southeast corners of its intersection with East Tyler Street (Figure 2).

1.1 DOCUMENT PURPOSE AND ORGANIZATION

The purpose of this FS/DCA is to develop and evaluate remedial alternatives for the Site and to select the most appropriate alternative based on the evaluation criteria listed below.

According to MTCA, a cleanup alternative must satisfy all of the following threshold criteria as specified in WAC 173-340-360(2):

- Protect human health and the environment.
- Comply with cleanup standards outlined in WAC 173-340-700 through 173-340-760.
- Comply with applicable state and federal laws.
- Provide for compliance monitoring outlined in WAC 173-340-410.

While these criteria represent the minimum standards for an acceptable cleanup action, WAC 173-340-360(2b) also requires that the cleanup action alternative:

- Use permanent solutions to the maximum extent practicable.
- Provide for a reasonable restoration time frame.
- Consider public concerns on the proposed cleanup action alternative.

This FS/DCA is organized into the following sections:

- **Section 2.0, Background.** This section discusses the Site location, description, and the geologic and hydrogeologic setting of the Site, summarizes the historical land use and previous investigations on the Site, and provides the chemicals of concern (COCs), the media of concern, and the Site definition.

- **Section 3.0, Remedial Alternatives Assessment.** This section develops and evaluates cleanup action alternatives and discusses cleanup regulations and levels, the screening of remedial technologies, the development and evaluation of cleanup alternatives, and the recommended cleanup alternative.
- **Section 4.0, References.** This section lists references used in the production of this document.
- **Section 5.0, Limitations.** This section discusses document limitations.

2.0 BACKGROUND

The following section discusses the Site location, description, and the geologic and hydrogeologic setting of the Site; summarizes the historical land use and previous investigations on the Site; and provides the COCs, the media of concern, and the Site definition.

2.1 SITE LOCATION AND DESCRIPTION

The following subsections present the current land use practices on the Site and surrounding parcels.

2.1.1 Site

The Site includes the Time Oil property, a retail gasoline station and convenience store (currently operated as a Cougar Mart) that is located on the northeast corner of the intersection of North Main Street and East Tyler Street, inclusive of monitoring wells MW11 and MW13; the property occupied by a Cenex-brand retail gasoline station located to the north of the railroad tracks on the southeast corner of the intersection of North Main Street and East Tyler Street; and portions of the Colfax Grange property located to the south of the railroad tracks, where another retail gasoline station formerly operated.

2.1.1.1 Time Oil Property

The Time Oil property, located at 804 North Main Street, resides on one tax parcel (Whitman County tax parcel number 1-0135-00-01-04-000) and occupies Lots 2, 3, 4, and 5 of Block 1 of the Perkins Prescott Addition, which encompasses roughly 19,000 square feet (0.44 acres) of land. The property is improved with a 1999-vintage convenience store and Conoco-brand retail gasoline station equipped with two fuel-dispensing pump islands and associated canopy (Figure 2). The single-story brick building covers a reported 2,750 square feet and is operated as the Cougar Mart convenience store. The property also supports a 1999-vintage, self-service fueling facility with two fuel-dispensing pump islands and four underground storage tanks (USTs), including one 6,000-gallon gasoline tank, one 8,000-gallon gasoline tank, one 12,000 gallon gasoline tank, and one 8,000 diesel tank. Three of the USTs were installed in 1976, and one of the USTs was installed in 1999. The exterior areas are mostly paved with asphalt or concrete. The building is serviced by overhead power, underground natural gas, and municipal sanitary sewer and potable water. Surface water drainage from the property is collected in the catch basins at the property and reportedly directed to an oil/water separator near the southwest corner of the property prior to discharging to the stormwater line under East Tyler Street, as depicted on a draft 1999 drainage plan for the property.

2.1.1.2 Cenex Property

The Cenex property supports a 2006-vintage Cenex-brand retail gasoline station and Cardtrol facility, and is owned by the Colfax Grange. The Cenex property occupies Lot 1 Block 1 of the Perkins Prescott Riverside Addition to Colfax subdivision, inclusive of all of Whitman County tax parcel number 1-0135-00-01-01-0000 and the northern portion of Whitman County tax No. 8-0195-00-00-00-0323. The Cenex property is bordered to the north by East Tyler Street, to the west by North Main Street, to the south by the railroad tracks, and to the east by an unopened City of Colfax right-of-way (ROW). The Cenex property, as defined above, covers approximately 12,000 square feet (0.28 acres) of land. The gasoline station on the Cenex property is equipped with two fuel-dispensing pump islands, three fuel USTs, and concrete drive slabs with peripheral asphaltic pavements (Figure 2). The UST system, which was upgraded in 2006, includes three 12,000-gallon, dual-walled (fiberglass and steel construction) USTs, one of which contains unleaded gasoline, one on-road diesel, and one double-compartment UST that stores 6,000 gallons of dyed diesel and 6,000 gallons of super unleaded gasoline.

2.1.1.3 Colfax Grange Property

The Colfax Grange property, located at 105 East Harrison Street, is situated on Whitman County tax parcel number 1-0135-00-01-15-0000 and the southern portion of Whitman County tax No. 8-0195-00-00-00-0323. The Colfax Grange property is bordered to the north by the railroad tracks, to the west by North Main Street, to the south by East Harrison Street, and to the east by an unopened City of Colfax ROW, beyond which is Colfax Grange Supply Building No. 2. The Colfax Grange property, as defined for the purposes of this investigation, extends roughly 230 feet east from the northeast corner of North Main Street and East Harrison Street, and extends 85 feet to the north of the same intersection to the railroad tracks, encompassing roughly 27,000 square feet (0.62 acres) of land. The property is occupied by a hardware store and warehouse facility that has operated on the property since the building was constructed in 1953, with an addition constructed in 1974. The building is a single-story, masonry and metal-sided, slab-on-grade commercial structure that covers a reported 7,680 square feet, with landscaped, paved, and gravel-surfaced non-building areas (Figure 2). The building is serviced by underground natural gas, overhead power, and municipal sanitary sewer and potable water supply utilities.

2.1.2 Adjoining Properties

Development in the vicinity of the Site is primarily commercial and residential. Uses of nearby parcels at the time this report was prepared are summarized below.

- **North.** The Time Oil property is bordered to the north by a vacant gravel lot and residential properties.
- **South.** The Colfax Grange property is bordered to the south by East Harrison Street, beyond which is a Taco Time restaurant and the asphalt-paved parking lot for the Rosauer's Supermarket that is farther to the south.
- **East.** Those portions of the Site located to the north of East Tyler Street are bordered to the east by single-family residences, beyond which is North Morton Street, a single-family residence, an apartment building, and a recreational vehicle lot. The land located to the east of North Morton Street was formerly occupied by a Shell-brand retail gasoline station and is referred to as the Shell property. The land

located to the south of East Tyler Street and east of the Colfax Grange property is referred to as the Eastern Colfax Grange property and is currently occupied by an unopened City of Colfax ROW and Colfax Grange Supply Building No. 2.

- **West.** The Site is bordered to the west by North Main Street (U.S. Highway 195), beyond which are several residential and commercial structures. A Sterling Savings Bank occupies the property (the Sterling property) located to the west of the Time Oil property. The Sterling property was formerly occupied by a retail gasoline station.

2.1.3 Utilities

Private and municipal underground utilities located on or adjacent to the Site include municipal storm sewer, sanitary sewer, drinking water, natural gas, telephone, and electrical utilities (Figure 2).

2.2 SITE AND VICINITY LAND USE HISTORY

The Site and vicinity history summarized below was obtained by reviewing Sanborn Fire Insurance Maps, tax assessor's records, reverse directories, available building plans and permitting records, historical maps, an aerial photograph taken in 1969, personal communications, and recollections from long-time local residents (SES 2010a). A more detailed discussion of the Site and vicinity land use history is provided in the Remedial Investigation Report (RI Report), prepared by SoundEarth and dated January 4, 2010 (SES 2010a).

2.2.1 Time Oil Property

The Time Oil property is currently occupied by a retail gasoline station facility. Several vintages of retail petroleum facilities have occupied the property since some time prior to 1939. The USTs associated with the original station were located beneath the southwestern portion of the property, and the station building was located on the northern portion of the property. In 1956, the property was reportedly redeveloped with a sales/service building located along the east-central side of the property and a pump island canopy to the west of the sales/service building. Three of the currently existing USTs were installed in 1976; in 1999, the Time Oil property was redeveloped with the current convenience store and a fourth UST was installed to the west of the three 1976-vintage USTs. The convenience store is now located on the northern portion of the property, the pump island canopy is located on the south-central portion of the property, and the USTs are located beneath the southern portions of the property (Figure 2).

2.2.2 Cenex Property

Prior to the construction of a fueling facility on the Cenex property in 1985, the property was occupied by, in succession, a railroad depot, a city park, and a storage and sales lot for heavy equipment. The original 1985-vintage gasoline station on the Cenex property included three single-walled, steel, 8,000-gallon fuel USTs (two gasoline tanks and one diesel tank) and two fuel-dispensing islands. In 2006, the original UST system and fuel-dispensing pump island were upgraded to three 12,000-gallon, dual-walled (steel and fiberglass) USTs, one of which contains unleaded gasoline, one on-road diesel, and one double-compartment UST that stores 6,000 gallons of dyed diesel and 6,000 gallons of super unleaded gasoline.

2.2.3 Colfax Grange Property

The southwestern portion of the Colfax Grange property was occupied by a gasoline station in 1939; the station was removed from the Colfax Grange property sometime prior to the construction of the existing Colfax Grange Building in 1953. The existing building was used by Sweeney Tractor until it was purchased by Colfax Grange in 1984. No information regarding the USTs or other product delivery systems associated with the gasoline station formerly located on the Colfax Grange property was observed in the available public record.

2.2.4 Adjacent and Nearby Properties

The following is a description of the properties located adjacent and nearby to the Site. A complete and detailed discussion of the adjacent and nearby properties is provided in the RI Report (SES 2010a).

2.2.4.1 Sterling Property

Prior to being redeveloped into a Lewis and Clark Savings Bank in 1980, the property located across North Main Street to the west of the Time Oil property was historically occupied by several vintages of retail gasoline stations between at least 1959 and 1972. Based upon a review of reverse directories, the Sterling property has been operated as Sterling Savings Bank since at least 1984. USTs associated with the former gasoline station on the Sterling property were decommissioned on behalf of Sterling Savings Bank in November 2009.

2.2.4.2 Shell Property

The Shell property, which is located to the east of North Morton Street and north of the railroad tracks, is currently occupied by an RV park and apartment buildings. Historically, the Shell property was operated by Shell Company of California with facilities consisting of an office, an oil warehouse, a filling station, a pump house, and an oil aboveground storage tank (AST) situated on a concrete base. The Shell property operated as an oil distribution facility from approximately 1939 through 1968. No information regarding the fate of the ASTs or USTs or the environmental quality of soil and/or groundwater beneath the Shell property was observed in the available public record.

2.2.4.3 Eastern Colfax Grange Property

The Eastern Colfax Grange property, which is situated adjacent to the east of the Colfax Grange property, remained primarily vacant with the exception of a railroad turntable until 1934. The property formerly included five buildings, the oldest of which dates back to 1934. Several ASTs were removed from the eastern portion of this property in the 1980s; the contents of the ASTs are unknown. In 1985, the Colfax Grange Building No. 2 was permitted to be converted into an auto maintenance facility. In 1992, four fuel USTs located in the former vicinity of the previously mentioned ASTs were decommissioned and removed from the Eastern Colfax Grange property.

2.3 FUTURE PROPERTY LAND USE

Mr. Scott Zuger, the former general manager of the Colfax Grange, and Mr. Walter Sprague, owner of the Time Oil property, have indicated that there are no changes in land use planned for the Colfax Grange, Cenex, or Time Oil properties (SES 2010b and SES 2010c). Mr. Andy Rogers of the City of Colfax Public Works Department stated that he was not aware of any significant public works projects in the Site vicinity (SES 2009b). No other significant planned changes in land use for the Site or vicinity were reported.

2.4 GEOLOGIC AND HYDROGEOLOGIC SETTING

The following sections provide a summary of the physiography, geology, and hydrogeology beneath and in the vicinity of the Site.

2.4.1 Regional Physiography and Geology

The Site is located within the Palouse Hills Subprovince of the Columbia Basin Geomorphic province. The Palouse Hills are characterized by rolling topography of glacially-derived loess deposits of both aeolian and fluvial origin. The Site and vicinity are located within the bottom land of the Palouse River and South Fork of the Palouse River (South Fork). This valley bottom area is generally flat, with a sharp transition along the ascending valley margins.

According to the *Bedrock Geologic Map of the Colfax North 7.5 Minute Quadrangle, Washington* (Bush et al. 2005), the upland areas adjacent to the valley are typically blanketed with loess deposits of the Palouse Formation, which in turn are underlain by the Wanapum Formation and the Grande Ronde Formation of the Columbia River Basalt Group. The loess deposits range in thicknesses of up to 150 feet on local hills to nonexistent within stream and river valleys. The basalt bedrock is as much as 5,000 feet thick in the vicinity, overlying granitoid basement rock, which occasionally emerges through the basalt as steptoes (i.e., Steptoe Butte, located about 10 miles north of the Site). Stream valleys, such as the Site vicinity, are characterized by alluvial and reworked colluvial deposits overlying weathered grading to unweathered basalt bedrock.

2.4.2 Regional Hydrogeology

The general groundwater aquifers identified in the Colfax area include the following:

- A near-surface, unconfined aquifer located within the surficial loess or alluvium/colluvium.
- Deeper confined and semiconfined aquifers within the Wanapum and Grande Ronde Basalt Formations.

Past groundwater monitoring completed at the Site by SoundEarth and others indicates that groundwater within the near-surface aquifer is present approximately 6 to 12 feet below ground surface (bgs), with a preferred migration direction that has been consistently toward the northwest to north-northwest. The near-surface groundwater aquifer is primarily contained within the gravel-rich deposits and upper portion of the basalt rubble. Based upon discussions with City of Colfax Public Works Department and Whitman County Department of Environmental Health representatives, drinking water wells that are seated in the near-surface aquifer are typically hand-dug wells or cisterns associated with older rural or farm properties; however, the representatives were unaware of any such existing wells or cisterns within the City limits (SES 2008b).

The underlying basalt aquifers are generally characterized by horizontal groundwater flow through permeable interflow zones separated by less porous and permeable, unweathered basalt entablature and colonnade, which makes up 90 to 95 percent of the formation (Whiteman et al. 1994). A review of the boring logs for the City of Colfax municipal water wells and private domestic wells in the general vicinity of the Site revealed that the wells are all seated in the deeper basalt aquifers, several hundred feet below ground surface.

2.4.3 Site Geology

According to the *Bedrock Geologic Map of the Colfax North 7.5 Minute Quadrangle, Washington* (Bush et al. 2005), the Site is mantled by a thin veneer of alluvial and colluvial deposits, which is underlain by several thousand feet of basalt bedrock of the Grande Ronde Formation of the Columbia River Basalt Group. Numerous soil borings completed by GeoEngineers, Inc. (GEI), Quantum Engineering, Inc. (Quantum), and SoundEarth show the Site to be underlain by native, soft to medium stiff silt-rich soils (Unified Soil Classification System Classification ML), locally with interbedded sand that extends to depths of about 7 to 15 feet bgs. These soils are interpreted to be low-energy over-bank deposits that resulted from ancestral flooding of the Palouse River and South Fork. These upper soils were locally underlain by medium dense to dense sandy gravel to gravelly with variable silt (GM/GP) that extended to depths ranging from about 10 to 16 feet bgs, at which depth basalt rubble and or bedrock was encountered and extended to the maximum depth explored at the Site of up to 20.5 feet bgs.

2.4.4 Site Hydrology

Near-surface groundwater at the Site occurs within the silt and underlying sand, silty sand, and gravels that mantle the basalt bedrock to depths of up to about 16 feet beneath the Site and immediate vicinity. The upper water-bearing zone appears to be unconfined, with the basalt bedrock forming an underlying confining unit. The saturated thickness of this water-bearing zone varies seasonally from about 6 to 10 feet.

Periodic monitoring of near-surface groundwater conditions completed by GEI, Quantum, and SoundEarth has indicated groundwater depths generally range from about 6 to 10 feet bgs. Groundwater depths in individual wells have seasonally varied between about 2 and 3.5 feet. Periodic monitoring completed by SoundEarth and others since 2001 has consistently indicated a groundwater migration toward the northwest to north-northwest, with a gradient ranging from about 0.008 feet per foot to 0.019 feet per foot.

As was previously discussed in Section 2.4.3 of this report, the Site is underlain by several thousand feet of basalt bedrock with multiple deep groundwater aquifers that serve as water supply and production irrigation wells. However, previous studies completed by GEI and SoundEarth (GEI 2003, SES 2008d) suggest that vertical permeability within the basalt is negligible, and it is highly unlikely that the near-surface water-bearing zone observed in the shallow wells is hydraulically connected to the underlying basalt aquifers.

No reports documenting the physical characteristics and parameters of the upper water-bearing zone of the Site vicinity were observed in the available public record; however, a groundwater potability evaluation completed by SoundEarth did not reveal significant concentrations of nitrates, nitrates, fecal coliform, biological oxygen demand, or chemical oxygen demand, suggesting that the near-surface groundwater has not been significantly impacted by agricultural chemical or residential or industrial effluent (SoundEarth 2012).

2.5 PREVIOUS INVESTIGATIONS

Several subsurface investigations and remedial actions have been conducted at the Site since 1997. The locations of Site features, monitoring wells, and soil samples collected in the vicinity of the Site are shown on Figure 2. Tables 1 and 2 provide the petroleum hydrocarbon soil and groundwater analytical results, respectively; the analytical results for additional COCs for the Site can be referenced in tables published in the RI Report (SES 2010a). Samples that were subsequently overexcavated are shown in

shaded cells on Table 1. The remainder of this report includes references to cleanup levels; unless otherwise specified, these refer to the MTCA Method A Cleanup Levels for Unrestricted Land Use for soil and groundwater. For chemicals that do not have a specific MTCA Method A cleanup level, the detected concentrations are compared to the MTCA Method B and/or C levels, State of Washington Drinking Water, or the U.S. Environmental Protection Agency (EPA) Region 10 Maximum Cleanup Levels. The following subsections provide a summary of previous subsurface investigations and interim cleanup actions conducted at the Site which led to the discovery of the releases at the Site.

2.5.1 Time Oil Property

This subsection provides a summary of subsurface assessments and remedial actions completed on or associated with the Time Oil property. A complete and detailed discussion of the previous investigations for the Time Oil property is provided in the RI Report (SES 2010a).

2.5.1.1 1997 Limited Remedial Excavation

A letter from Time Oil Co. to Ecology dated March 28, 2002 (Time Oil Co. 2002) references a January 1997 release of two drums containing gasoline and water to near-surface soil in a dirt alley east of the Time Oil property. A limited remedial excavation was conducted by Agra Earth & Environmental to remove impacted soil, and confirmation soil samples collected from the final limits of the excavation were reportedly found to be compliant with the applicable cleanup levels. A regulatory listing under the State Hazardous Waste Sites database documents a release of gasoline at the Time Oil property. This release report appears to be associated with the 1997 release described above, although no additional records documenting the excavation, soil sampling efforts, or soil disposal were found in the available records of Ecology or Time Oil.

2.5.1.2 1999 Preliminary Subsurface Investigation and Limited Remediation

In September 1999, an additional 8,000-gallon UST was installed beneath the southwestern portion of the Time Oil property to the west of the three existing USTs (GEI 2000). During the installation of the UST, a petroleum sheen was observed on groundwater that had collected within the tank excavation at a depth of approximately 10 feet bgs. An abandoned grease pit system associated with historical automotive repair activities was also removed from the property at that time. The grease pit was located beneath the northern portion of the former gasoline station building, as shown on Figure 2. Soil samples collected in the immediate vicinity of the grease pit were found to contain elevated concentrations of oil-range petroleum hydrocarbons (ORPH), and the excavation was expanded westward in an effort to remove the petroleum-contaminated soil (PCS); however, additional soil excavation to the west was reportedly suspended to prevent risking the structural integrity of canopy footings that had been placed as part of the then ongoing facility renovation. During soil excavation activities, a second grease pit was also encountered approximately 15 feet west of the initial grease pit; however, no evidence of PCS was observed in the immediate vicinity of the second grease pit.

Eight soil samples were collected from the limits of the remedial excavation to identify areas of residual soil contamination. As shown on Table 1, most of the confirmation soil samples collected from the final limits of the excavation contained no detectable concentrations of gasoline-range petroleum hydrocarbons (GRPH), diesel-range petroleum hydrocarbons (DRPH), or ORPH (where analyzed). However, two of the soil samples (T-7/9 and T-8/9) collected from the bottom and sidewalls of the western portion of the excavation contained concentrations of ORPH (2,770 milligrams per kilogram [mg/kg] and 3,260 mg/kg, respectively) that exceeded the

current cleanup level (Table 1). Contaminated soil in the vicinity of samples T-7/9 and T-8/9 was not excavated due to the close proximity of the canopy footings.

2.5.1.3 2001 Supplemental Subsurface Assessment

In February 2001, GEI advanced seven borings at the Time Oil property and completed each as a monitoring well (MW01 through MW07) in an effort to further characterize soil at the property (Figure 2). Concentrations of GRPH exceeded the cleanup level in soil samples collected from borings MW05 and MW06 (Table 1). The highest concentrations of petroleum hydrocarbons were collected from boring MW06 at a depth of approximately 5 feet bgs. MW06 is located to the west of the southwestern pump island, in the vicinity of the gasoline station that formerly operated on the Time Oil property (GEI 2001).

2.5.1.4 2002 Groundwater Monitoring Well Installation

In October 2002, an additional five monitoring wells (MW08 through MW12) were advanced by GEI on behalf of Time Oil in order to further evaluate the extent of contamination and to identify the source of the contamination detected beneath the upgradient (southern) portions of the Time Oil property (Figure 2). One monitoring well (MW08) was installed on the Time Oil property, another well was installed across North Main Street to the north-northwest of the property (MW11), and three monitoring wells were installed within the East Tyler Street ROW to the south of the Time Oil property (MW09, MW10, and MW12). Soil samples were collected from borings MW09 and MW10 but no soil samples were collected from the remaining borings due to a mechanical failure. Soil samples collected from borings MW09 and MW10 were reportedly not submitted to the laboratory for analysis (GEI 2002).

2.5.2 Cenex Property

This subsection summarizes subsurface investigations and remedial action completed on or associated with the Cenex property. A more detailed discussion of the previous investigations for the Cenex property is provided in the RI Report (SES 2010a).

2.5.2.1 2004 Monitoring Well Installation and Limited Remedial Excavation

A surficial release of an unspecified volume of unleaded gasoline occurred at the Cenex property on October 15, 2004, and an initial remedial response to the release was conducted on November 15, 2004. Approximately four to five cubic yards of soil were removed from the property during the initial remedial response using an industrial vacuum, and two additional monitoring wells (CMW04 and CMW05) were installed at hydrologically downgradient locations to the north of the USTs on December 3, 2004. Monitoring wells CMW01 through CMW03 had previously been installed at the property just prior to the overfill release that occurred on October 15, 2004.

None of the soil samples that were submitted for analysis from the installation of monitoring wells CMW01 through CMW05 contained detectable concentrations of GRPH or benzene, toluene, ethylbenzene and total xylenes (BTEX), as shown on Table 1.

2.5.2.2 2006 UST Closure and Remediation

In October 2006, three 1985-vintage USTs were excavated and removed from the Cenex property, along with the gasoline and diesel pump islands and associated product delivery systems. The excavation activities were conducted by Quantum on behalf of Colfax Grange. PCS was encountered in the course of the excavation activities, and analytical testing of soil samples

collected from the southeastern, eastern, western, and northern sidewalls and floor of the final excavation limits confirmed that elevated concentrations of GRPH and/or benzene remained at these locations (Figure 2, Table 1).

Following completion of the excavation activities, three 12,000-gallon USTs and the associated pump islands were installed at the Cenex property in November 2006. Prior to backfilling the excavation, a trench was excavated to a depth of approximately 13 feet bgs along the northern portion of the Cenex property.

2.5.3 Groundwater Monitoring Program

Prior to the initiation of the current remedial investigation (RI) activities, groundwater sampling and testing had been conducted at the Site on a quarterly to semiannual basis. Groundwater samples collected from monitoring wells MW01 through MW12 had been tested for the presence of GRPH, DRPH, ORPH, and BTEX constituents since February 2001. Samples collected from these wells were initially tested for the presence of methyl tertiary-butyl ether (MTBE) in February 2004, and additional oxygenates, including ethylene dibromide and ethylene dichloride, were added to the sampling program in September 2005. Groundwater samples collected from monitoring wells CMW01 through CMW05 had been tested for the presence of GRPH and BTEX since the wells were installed in October and December 2004. Well CMW01 was decommissioned in 2006 due to the encroachment of the excavation for the new USTs at the Cenex property. Groundwater samples collected from CMW01 through CMW05 since December 2005 have been tested for the presence of MTBE, DRPH, ORPH; oxygenates were added to the sampling program in March 2007 (Table 2).

Groundwater samples collected from monitoring wells MW03, MW05, MW06, MW07, MW10, and MW12 between 2001 and 2005 revealed consistently elevated concentrations of GRPH and/or benzene, and to a lesser extent DRPH. Samples collected from wells MW01, MW02, MW04, and MW11 seasonally exhibited concentrations of GRPH and/or benzene and to a lesser extent DRPH in excess of their respective cleanup levels, with elevated concentrations generally occurring during monitoring events performed in the Third Quarter (August to November). Samples collected from monitoring well MW08 did not exhibit elevated concentrations of petroleum hydrocarbons, and samples collected from MW09 seasonally exhibited concentrations of DRPH and ORPH that exceeded their respective cleanup levels. Groundwater samples collected from wells CMW01, CMW02, CMW04, and CMW05, located on the Cenex property, consistently exhibited elevated concentrations of GRPH and/or benzene from 2004 through 2006.

Groundwater concentrations dropped substantially across the Site following the October 2006 UST replacement and remedial excavation and dewatering activities completed on the Cenex property. Groundwater samples collected between Fourth Quarter 2006 and Second Quarter 2007 from monitoring wells MW01, MW03, MW04, MW05, MW07, MW08, and MW11 did not contain concentrations of petroleum hydrocarbons in excess of the applicable cleanup levels. Groundwater samples collected from wells MW02, MW06, MW09, MW10, MW12, and CMW02 through CMW05 during the same time period frequently contained concentrations of petroleum hydrocarbons and associated BTEX constituents in excess of the cleanup levels; however, the concentrations have decreased significantly relative to the preexcavation samples. A more detailed summary of the Site groundwater contaminant concentrations is provided in the *Site*

Conceptual Model and Remedial Investigation Work Plan (SES 2008a), the RI Report (SES 2010a), and the *Second Quarter 2011 Groundwater Monitoring Report* (SES 2011).

2.6 CHEMICALS OF CONCERN

Based upon the results of the investigations conducted to date, the COCs for the Site are listed below:

- GRPH, DRPH, and ORPH
- BTEX
- MTBE
- Naphthalene

Although lead was detected at a concentration exceeding the cleanup level in a single shallow soil sample and a single groundwater sample collected from beneath the East Tyler Street ROW, the elevated concentrations appear to be the result of the overlying road fill material and are not associated with a release at the Site. Therefore, lead is not considered to be a COC for the Site. The specific analyses employed are described in the Sampling and Analysis Plan (SES 2008a). Supplemental testing also included extractable petroleum hydrocarbon-volatile petroleum hydrocarbon analyses and forensic analyses, which included gas chromatography with a flame ionization detector. In addition, selected samples were analyzed for volatile organic compounds using a gas chromatograph fitted with a mass spectrometer, organometallic compounds using a gas chromatograph fitted with an electron capture detector as well as an inductively coupled plasma mass spectrometer, and hydrocarbon fingerprinting interpretation.

2.7 MEDIA OF CONCERN

Based on the findings of the RI Report (SES 2010a), soil and groundwater are the media of concern at the Site. Considering the separation distance of over 300 feet between the Site and the nearest non-concrete-banked portions of the Palouse River and the South Fork and the current absence of significant contaminant concentrations in groundwater collected from downgradient wells at the Site, there does not appear to be a significant risk of impacts to surface water or sediment associated with these water bodies. In the event that impacts attributable to a release from the Site are encountered in downgradient wells during future groundwater monitoring events, or in the above-mentioned water bodies or sediment, additional investigation of this potential pathway will be required.

2.8 EXPOSURE PATHWAYS

This section presents the evaluation and conclusions pertaining to the exposure pathways at the Site. The goal of this subsection is to identify potential exposure scenarios that will assist in the evaluation of potential feasible cleanup alternatives that are protective of human health.

2.8.1 Direct-Contact Pathway

Direct contact with soil and groundwater exhibiting concentrations of petroleum hydrocarbons in excess of the cleanup levels is limited to human receptors that come into close contact with the media via direct exposure, including dermal contact or ingestion of excavated soil or groundwater. The standard point of compliance for soil contamination beneath a site is approximately 15 feet bgs, which represents a reasonable estimate of the depth that could be accessed during normal site redevelopment activities (WAC 173-340-740[6][d]). Although PCS is

present within 15 feet of the ground surface, due to the existing pavement, contaminated soil beneath the Site is not easily accessible, thereby minimizing the direct-contact pathway. However, until such point as the contaminated soil and groundwater are removed from the Site or an institutional control limiting direct contact is implemented, the direct-contact pathway is complete.

To further assess the risk to human health via the direct-contact pathway, soil samples collected from the Site were evaluated using the MTCATPH11.1 Method B Worksheet (SES 2010a). Considering the distinct nature of the three releases, the total petroleum hydrocarbon (TPH) concentrations in soil that are considered protective via direct contact were calculated for each of the three properties that comprise the Site:

- The results for the Time Oil property indicate that a TPH concentration of 2,892 mg/kg is considered protective for human health via the direct-contact pathway (SES 2010a). Based on these calculations, only soil in the vicinity of borings SP02 and SP05 is not considered protective of human health via the direct-contact pathway (Figure 2, Table 1).
- The results for the Cenex property indicate that a TPH concentration of 2,354 mg/kg is considered protective for human health via the direct-contact pathway (SES 2010a). Based on these calculations, TPH concentrations in residual soil beneath the Cenex property are considered protective of human health via the direct-contact pathway.
- The results for the Colfax Grange property indicate that a TPH concentration of 2,221 mg/kg is considered protective for human health via the direct-contact pathway (SES 2010a). Based on these calculations, the TPH concentrations in all of the soil samples collected from the vicinity of the former gasoline station on the Colfax Grange property are considered protective of human health via the direct-contact pathway.

2.8.2 Soil-to-Groundwater Pathway

Results from the RI and previous investigations suggest that soil contamination exists locally in the subsurface at depths greater than the seasonally high groundwater level (SES 2010a). The PCS can therefore potentially act as an ongoing source to groundwater contamination as the hydrocarbons desorb from the soil particles into water. The results of the MTCATPH11.1 Method B Worksheet calculations suggest that the TPH concentrations in soil that are considered protective of human health via the leaching-to-groundwater pathway for the Time Oil, Cenex, and Colfax Grange properties are 81 mg/kg, 17 mg/kg, and 61 mg/kg, respectively. As such, the soil-to-groundwater pathway beneath the Site is considered to be complete. Based upon the results of a groundwater potability evaluation (SoundEarth 2012), drinking water remains the highest beneficial use for near-surface groundwater; additional monitoring of the groundwater conditions beneath the Site will be required to demonstrate continued compliance with Ecology's cleanup criteria.

Soil contamination also exists at depths less than the seasonally high groundwater level in areas of the Time Oil and Cenex properties. To evaluate whether natural attenuation is a viable remedial strategy for the unsaturated (vadose) zone and to estimate the rate at which natural attenuation would reduce COC concentrations, the fate of benzene was simulated using the

Seasonal Soil (SESOIL) model, which is the industry-standard model for this. The fate of benzene was modeled because it is the COC that poses the greatest risk to human health at the Site.

Under MTCA, monitored natural attenuation can be considered an active remedial measure if site conditions conform to the expectations listed in WAC 173-340-370(7), as follows:

- Source control (including removal and/or treatment of hazardous substances) has been conducted to the maximum extent practicable.
- Leaving contaminants on-site during the restoration time frame does not pose an unacceptable threat to human health or the environment.
- There is evidence that natural biodegradation or chemical degradation is occurring and will continue to occur at a reasonable rate at the site.
- Appropriate monitoring requirements are conducted to ensure that the monitored natural attenuation process is taking place and that human health and the environment is protected.

The purpose of the modeling effort was to estimate the duration of benzene persistence in the vadose zone for each of the two subareas of concern at the Site where elevated concentrations of benzene have been identified, which include the Time Oil property and Cenex property. SESOIL is a one-dimensional, vertical transport computer code typically used to estimate the pollutant rate of movement through the vadose zone (Oak Ridge National Laboratory 1996). The SESOIL code is written to calculate a mass balance and equilibrium partitioning of one pollutant at a time between the dissolved, sorbed, and vapor phases. Up to four soil layers in the vadose zone can be represented in SESOIL.

The New Jersey Department of Environmental Protection (NJDEP) guidance for the use of SESOIL (NJDEP 2008) was the principle reference for conducting the fate and transport modeling of benzene in the vadose zone. The following step-wise approach was used for the simulations:

- The vadose zone subsurface conditions were conceptualized based on Site-specific investigation reports, soil boring lithologic descriptions, and water level monitoring data. Site-specific data was used wherever possible; and where not available, default protective values recommended in NJDEP 2008 were used.
- The hydrologic portion of the SESOIL model simulation was matched with the documented groundwater recharge rate from the U.S. Geological Survey (Bauer and Vaccaro 1990) at the Site (i.e., the model was calibrated).
- The vertical permeability in the uppermost layer profile was adjusted to simulate the presence of pavement, and SESOIL code was rerun to predict partitioning of benzene. The highest benzene concentrations documented from soil sampling were used in each subarea for sublayer loading.

For each subarea, a SESOIL simulation was run to create a 10-year projection of benzene concentration degradation. For the Time Oil property and Cenex property subareas, the SESOIL simulations indicated that benzene concentrations encountered in soil samples collected from the vadose zone in 2008 will attenuate to below the MTCA Method A cleanup level of 0.03 mg/kg within 5 years. The modeling runs indicate that natural attenuation is a viable remedial strategy for benzene in the vadose zone and that the rate of attenuation for benzene is

reasonable, thereby addressing the expectation of reasonable rate for natural attenuation listed in WAC 173-340-370(7).

Background details on the SESOIL code development history, limitations and applicability, model conceptualization for Time Oil property and Cenex property subareas, input parameters and sources, layer structure, and model output/results are provided in Appendix A.

2.8.3 Vapor Intrusion Pathway

Using the guidance provided in Ecology 2009 draft guidance document *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action* (Ecology 2009), the potential risks to human health and the environmental from the vapor intrusion pathway at the Site are not significant and do not warrant additional investigation. The observations that form the basis for this conclusion are the following:

- Evidence of impacts, such as petroleum staining and odors, significant photoionization detector readings, or elevated concentrations of petroleum hydrocarbons, was not encountered in soil samples collected from either of the borings (SP18 and SP19) advanced to the north and east of monitoring well MW09, where impacts had previously been encountered (Table 1). As such, the petroleum contamination encountered beneath other portions of the Site does not extend to the vicinity of the off-Site residences.
- The residences located to the northeast of monitoring well MW09 and east of boring SP02 (those within 100 feet of petroleum-contaminated soil associated with the Site) are constructed with crawlspaces that would further mitigate the risk of vapor intrusion.
- The fact that the Time Oil and Cenex properties are operational gas stations negates the need for further evaluation of these properties since the Ecology draft guidance document indicates that Occupational Safety and Health Administration regulations apply to these properties. As stated in Section 1.2 of the Ecology draft guidance document, worker exposure to use of chemicals of concern is greater than the risk associated with vapor intrusion.
- The risk of vapor intrusion into the Colfax Grange building is mitigated by the absence of volatile organic compounds (benzene) in soil and groundwater, as stated in Section 1.4.1 of the Ecology draft guidance document.

2.8.4 Surface Water

Migration of contaminants via surface water infiltration and leaching to the subsurface is mitigated by the asphalt and concrete that cover most of the Site and adjacent ROWs. While both the Time Oil property and the Colfax Grange support fueling operations, both systems are equipped with electronic inventory and spill catchments and alarms. A small, open storm drainage impoundment associated with a stormwater conveyance system was formerly located to the east of the Site. The City of Colfax recently installed a culvert line connecting influent and effluent lines, installed a vertical access pipe with a manhole cover, and filled the area to roughly match adjacent grades. Stormwater runoff from the trailer court to the northeast and North Mill Street to the south flows through the culvert to an effluent point in a ditch along the east side of Bellinger Street, which then directs flow to the north into the Palouse River. Groundwater from

the Site is not discharged to this stormwater conveyance system, and there are no surface water bodies currently on or adjacent to the Site. Groundwater samples collected from downgradient monitoring wells situated between the Site and the Palouse River (wells MW11 and MW13) have not contained concentrations of COCs in excess of their respective cleanup levels since September of 2006 (MW11) nor exhibited elevated contaminant concentrations in any of the ten consecutive quarterly sampling events since June of 2008 (MW13). Therefore, because there is a low risk/potential for human contact with contaminated surface water or for contaminant migration through this medium, this contaminant migration pathway is incomplete. In the event that impacts attributable to a release from the Site are encountered in downgradient wells during future groundwater monitoring events, or in the above-mentioned water bodies or sediment, additional investigation of this potential pathway will be required.

2.9 SITE DEFINITION

Based on the findings from the investigations conducted by SoundEarth and others between May 1999 and May 2011 and the historical research presented in this report, the Site has been defined to include the following:

- The extent of petroleum-contaminated soil and groundwater that originated from releases at the retail gasoline stations and automotive repair facilities that have historically operated on the Time Oil property. The current extent of these impacts appears to be limited to soil beneath the southwestern portion of the Time Oil property and the easternmost portion of the North Main Street ROW, as well as ORPH-contaminated groundwater in the vicinity of monitoring well MW26.
- The extent of petroleum-contaminated soil and groundwater that originated from releases at the retail gasoline station that formerly operated on the Cenex property. The current extent of these impacts appears to be limited to a "rind" of soil that was left in place following the excavation of the 1985-vintage USTs. The PCS associated with the Cenex property extends beneath the East Tyler Street ROW. Groundwater samples collected from wells associated with the Cenex property have not contained concentrations of COCs that exceeded their respective MTCA Method A cleanup levels for four or more consecutive quarterly monitoring events.
- The extent of petroleum-contamination soil and groundwater that originated from releases at the retail gasoline station that formerly operated on the southwest portion of the Colfax Grange property. The impacts to soil from this source extend between monitoring wells MW29 and MW16, as well as beneath a portion of the adjacent East Harrison Street ROW. Groundwater samples collected from wells associated with the Colfax Grange property have not contained concentrations of COCs that exceeded their respective MTCA Method A cleanup levels for four or more consecutive quarterly monitoring events.

The Site boundary limits are depicted on Figure 2.

3.0 REMEDIAL ALTERNATIVES ASSESSMENT

The purpose of this feasibility study (FS) is to develop and evaluate cleanup action alternatives to facilitate selection of a final cleanup action at the Site in accordance with WAC 173-340-350(8). An FS typically includes an extensive development, screening, and evaluation process for numerous remedial alternatives. However, because property-specific conditions preclude many remedial components from

application at the Site, the evaluation focused on a limited number of likely feasible components and alternatives that are both implementable and capable of achieving the remediation objectives.

In addition, the FS process screens cleanup alternatives to eliminate those that are not technically possible, those with costs that are disproportionate under WAC 173-340-360(3)(e), or those that will substantially affect the future planned business operations at the Site. Based on the screening, the FS presented below evaluates the most advantageous remedial components to recommend a final cleanup action for the Site in conformance with WAC 173-340-360 through WAC 173-340-390. Selection of the final cleanup action and details of its implementation will be documented in the Cleanup Action Plan (CAP), which will be prepared by Ecology in accordance with WAC 173-340-380.

3.1 CLEANUP STANDARDS

The selected cleanup alternative must comply with MTCA cleanup regulations specified in WAC 173-340 and with applicable state and federal laws. The cleanup standards selected for the Site are discussed in detail below.

3.1.1 Applicable or Relevant and Appropriate Requirements

Under WAC 173-340-350 and 173-340-710, applicable requirements include regulatory cleanup standards, standards of control, and other environmental requirements, criteria, or limitations established under state or federal law that specifically address a contaminant, remedial action, location, or other circumstances at a site.

MTCA (WAC 173-340-710[3]) defines relevant and appropriate requirements as:

> those cleanup action standards, standards of control, and other environmental requirements, criteria or limitations established under state and federal law that, while not legally applicable to the hazardous substance, cleanup action, location, or other circumstances at a site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site.

The criteria used to make this determination are presented in WAC 173-340-710(4)(a)-(i).

Remedial actions conducted under MTCA must comply with the substantive requirements of the applicable or relevant and appropriate requirements (ARARs) but are exempt from their procedural requirements (WAC 173-340-710[9]). Specifically, this exemption applies to state and local permitting requirements under the Washington State Water Pollution Control Act, Solid Waste Management Act, Hazardous Waste Management Act, Clean Air Act, State Fisheries Code, and Shoreline Management Act.

3.1.1.1 Screening of ARARs

ARARs were screened in order to assess their applicability to the Site. Only those that were deemed appropriate and applicable were retained as Remedial Action Objectives (RAOs). The following list identifies the ARARs that may be applicable to the Site:

- State Environmental Policy Act (Chapter 43.21C of the Revised Code of Washington [RCW 43.21C])

- Washington State Shoreline Management Act (RCW 90.58; WAC 173-18, 173-22, and 173-27)
- The Clean Water Act (33 United States Code [USC] 1251 et seq.)
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 USC 9601 et seq. and Part 300 of Title 40 of the Code of Federal Regulations [40 CFR 300])
- The Fish and Wildlife Coordination Act
- Endangered Species Act (16 USC 1531 et seq.; 50 CFR 17, 225, and 402)
- Native American Graves Protection and Repatriation Act (25 USC 3001 through 3013; 43 CFR 10) and Washington's Indian Graves and Records Law (RCW 27.44)
- Archaeological Resources Protection Act (16 USC 470aa et seq.; 43 CFR 7)
- Washington Dangerous Waste Regulations (WAC 173-303)
- Solid Waste Management Act (RCW 70.95; WAC 173-304 and 173-351)
- Water Quality Standards for Surface Waters of the State of Washington (RCW 90.48 and 90.54; WAC 173-201A)
- Department of Transportation Hazardous Materials Regulations (40 CFR Parts 100 through 185)
- Washington State Water Well Construction Act (RCW 18.104; WAC 173-160)
- City of Colfax and Whitman County regulations, codes, and standards

3.1.2 Development of Cleanup Standards

MTCA Method A cleanup levels for soil and groundwater have been established as the cleanup level for groundwater at the Site. The table below provides the MTCA Method A cleanup level for soil and groundwater for each COC that has historically been detected at a concentration exceeding its respective cleanup level, as well as the Site-specific benzene concentration in soil that would be protective of occupational vapor intrusion scenarios.

CLEANUP LEVELS PROPOSED FOR SITE REMEDIATION ACTIVITIES

Cleanup Level	Remedial Action Objective
GROUNDWATER ▪ 800 µg/L—GRPH ▪ 500 µg/L—DRPH ▪ 500 µg/L—ORPH ▪ 5 µg/L—Benzene ▪ 1,000 µg/L—Toluene ▪ 700 µg/L—Ethylbenzene ▪ 1,000 µg/L—Total Xylenes ▪ 160 µg/L—Naphthalene ▪ 20 µg/L—MTBE	Reduce concentrations of COCs in groundwater to achieve the respective MTCA Method A cleanup levels.
SOIL ▪ 30 mg/kg—GRPH ▪ 2,000 mg/kg—DRPH ▪ 2,000 mg/kg—ORPH ▪ 0.03 mg/kg—Benzene ▪ 7 mg/kg—Toluene ▪ 6 mg/kg—Ethylbenzene ▪ 9 mg/kg—Total Xylenes ▪ 5 mg/kg—Naphthalene ▪ 0.1 mg/kg—MTBE	Reduce concentrations of COCs in soil to achieve the respective MTCA Method A cleanup levels.

NOTES:
µg/L = micrograms per liter

3.1.3 Remedial Action Objectives

RAOs are general administrative goals for a cleanup action that address the overall MTCA cleanup process. The purpose of establishing RAOs for a site is to provide remedial alternatives that protect human health and the environment (WAC 173-340-350). In addition, RAOs are designated in order to:

- Implement administrative principles for cleanup (WAC 173-340-130).
- Meet the requirements, procedures, and expectations for conducting an FS and developing cleanup action alternatives as discussed in WAC 173-340-350 through 173-340-370.
- Develop cleanup levels (WAC 173-340-700 through 173-340-760) and remedial alternatives that are protective of human health and the environment.

In particular, RAOs must include the following threshold requirements from WAC 173-340:

- Protect human health and the environment.
- Comply with cleanup levels.
- Comply with applicable state and federal laws.

- Provide for compliance monitoring.

The remedial action objectives for the Site are to mitigate risks to human health and the environment and to obtain regulatory closure from Ecology.

3.2 IDENTIFICATION AND EVALUATION OF REMEDIAL COMPONENTS

As part of this FS, SoundEarth evaluated remediation components for the Site with respect to the cleanup requirements set forth in MTCA. According to MTCA, a cleanup alternative must satisfy all of the following threshold criteria as specified in WAC 173-340-360(2):

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

These criteria represent the minimum standards for an acceptable cleanup action.

WAC 173 340-360 (2b) also requires the cleanup action alternative to:

- Use permanent solutions to the maximum extent practicable.
- Provide for a reasonable restoration time frame.
- Consider public concerns on the proposed cleanup action alternative.

In addition to the MTCA criteria discussed above, the future use of the properties were considered during technology screening. As indicated in Section 2.3, there are no known land uses changes planned for the Site.

Using the above criteria, several remedial technologies were evaluated to produce a short list for further evaluation. Because the remediation methods that will be used for each of the three separate properties may differ, three remedial areas were designated for the Site: those portions of the Site associated with the Time Oil property, those portions of the Site associated with the Cenex property, and those portions of the Site associated with the Colfax Grange property (Tables 3 through 5, respectively).

3.3 DEVELOPMENT AND COMPARISON OF CLEANUP ALTERNATIVES

This section describes present value cost estimating, the potential cleanup alternatives that could be assembled from the retained remedial components, and a comparative evaluation of these alternatives using the MTCA evaluation criteria.

3.3.1 Cleanup Action Alternative Cost Estimating

In considering an alternative's cost effectiveness, the following components are evaluated (EPA 2000):

- **Capital Costs.** These costs include expenditures for equipment, labor, and material necessary to install a remedial action. Indirect costs may be incurred for

engineering, financial, or other services not directly involved with installation of remedial alternatives but necessary for completion of this activity.

- **Operation and Maintenance (O&M) Costs.** These are post-construction costs necessary to provide effective implementation of the alternative. Such costs may include, but are not limited to, operating labor; maintenance materials and labor; disposal of residues; and administrative, insurance, and licensing costs.
- **Monitoring Costs.** These costs are incurred from monitoring activities associated with remedial activities. Cost items may include sampling labor, laboratory, analyses, and report preparation.
- **Present Worth Analysis.** Present worth analysis provides a method of evaluating and comparing costs that occur over different time periods by discounting future expenditures to the present year. The present worth cost or value represents the amount of money which, if invested in year 0 and disbursed as needed, would be sufficient to cover all costs associated with a remedial alternative. The assumptions necessary to derive a present worth cost are inflation rate, discount rate, and period of performance. A discount rate, which is similar to an interest rate, is used to account for the time value of money. EPA policy on the use of discount rates for FS/DCA cost analyses is stated in the preamble to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) published in Volume 55 of Federal Register 8722 and in Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-20 titled *Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis* (EPA 1993). Based on the NCP and this directive, a discount rate of 7 percent is recommended in developing present value cost estimates for remedial action alternatives during the FS. This specified rate of 7 percent represents a "real" discount rate in that it approximates the marginal pretax rate of return on an average investment in the private sector in recent years and has been adjusted to eliminate the effect of expected inflation. For this FS, a more conservative real discount rate was selected based on the December 2009 revisions to Appendix C of the OMB Circular A-94. The real discount rates used to estimate the present worth of annual operating costs are based on the estimated restoration time frame (life cycle) for each alternative and are extrapolated from the referenced OMB Circular, which is published annually. Because it is assumed that all capital costs are incurred in year 0, the present worth analysis is performed only on annual O&M and monitoring costs. The total present worth for a given alternative is equal to the sum of the capital costs and the present worth of annual O&M and monitoring costs over the anticipated life cycle of the alternative.

3.3.2 Development of Cleanup Alternatives

Preliminary screening was performed using engineering judgment to assess the effectiveness of each technology in reducing Site and specific property risks. A number of remediation technologies were eliminated during the preliminary screening process as set forth in MTCA 173-340-350(8)(b). Justification for the elimination of various technologies is provided in Tables 3 through 5. Technologies that passed the preliminary screening were further qualitatively screened based generally on effectiveness, implementability, and cost. SoundEarth also considered a "no action" alternative, but this did not meet the RAOs protectiveness criteria or

permanence minimum requirements. Tables 3, 4, and 5 present the full suite of remedial alternatives that were considered as part of this FS for the Time Oil, Cenex, and Colfax Grange properties, respectively.

3.4 ALTERNATIVE EVALUATION PROCESS

This section presents the evaluation of potentially feasible cleanup alternatives with respect to the RAOs established for the Site. Remedial components were identified per the requirements set forth in MTCA under WAC 173-340-350(8)(b) and the focused screening of potential remedial components using the requirements and procedures for selecting cleanup actions as set forth in MTCA under WAC 173-340-360(2)(a)(b). The criteria used by SoundEarth to evaluate and compare applicable cleanup alternatives when conducting the disproportionate cost analysis were derived from WAC 173-340-360(3)(f) and include:

- **Protectiveness.** The overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, the time required to reduce risk at each facility and attain cleanup standards, specific on-property risks resulting from implementing the alternative, and improvement of overall environmental quality of each property.
- **Permanence.** The degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated during the treatment process.
- **Cost.** The cost to implement the alternative, including the cost of construction, the net present value of long-term costs, and Ecology oversight costs. Long-term costs that were considered include those associated with O&M, monitoring, equipment replacement, reporting, and maintaining institutional controls. It is important to note that the costs presented for each of the three properties that comprise the Site were prepared separately from each other and are based on the assumption that they would be performed independently from any potential remedial activity that may occur on the other properties.
- **Effectiveness over the long term.** The degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time over which hazardous substances are expected to remain on the Site, and the magnitude of residual risk associated with the contaminated soil and/or groundwater components. The following types of cleanup action components, presented in descending order, may be used as a guide when assessing the relative degree of long-term effectiveness of the chosen alternative: reuse or recycling; destruction or detoxification; immobilization or solidification; on-property or off-property disposal in an engineered, lined, and monitored facility; on-property isolation or containment with attendant engineering controls; and institutional controls and monitoring.
- **Management of short-term risks.** The risk to human health and the environment associated with the alternative during its construction and implementation, and the effectiveness of measures that will be taken to manage such risks.
- **Technical and administrative implementability.** The ability to implement the alternative; includes consideration of the technical feasibility of the alternative, administrative and regulatory requirements, permitting, scheduling, size, complexity, monitoring requirements,

access for construction operations and monitoring, and integration with the future development plans for each property.

- **Consideration of public concerns.** The consideration of community concerns regarding the alternative and, if there are concerns, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, federal and state agencies, or another organization that may have an interest in or knowledge of each property.

3.5 FOCUSED EVALUATION OF CLEANUP ALTERNATIVES

The focused evaluation of cleanup alternatives considered practicable remedial components that have been confirmed to be effective at treating petroleum hydrocarbons in the affected media of concern. SoundEarth also considered whether property-specific constraints would preclude application of a remediation technology due to the creation of a greater risk to human health and/or the environment, or that such constraints could result in substantial costs without proportional benefit.

The key assumptions used by SoundEarth in the focused evaluation of cleanup alternatives included the following:

- Active groundwater remedial technologies were not evaluated for the Time Oil property as the residual impacts appear to be limited primarily to PCS beneath the southwestern portion of the Time Oil property and the easternmost portion of the North Main Street ROW. Although elevated concentrations of ORPH have been detected in recent groundwater samples collected from monitoring well MW26, the concentrations exceeded the MTCA Method A cleanup level of 500 micrograms per liter (µg/L) only during the March and June 2010 and February 2011 monitoring events (830 µg/L, 540 µg/L, and 760 µg/L, respectively) and were below the MTCA Method A cleanup level for each of the six other monitoring events between June 2009 and May 2011. However, groundwater samples will continue to be collected on a quarterly basis from this and other wells in order to observe the trend in contaminant concentrations over time. If future monitoring events reveal persistent ORPH concentrations that exceed the MTCA Method A cleanup level, active remedial technologies, such as in situ and ex situ chemical oxidation and/or in situ bioremediation, would be considered.
- Active groundwater remedial technologies were not evaluated for the Cenex property as the residual impacts appear to be limited to a “rind” of PCS that was left in place following the excavation of the 1985-vintage USTs.
- MTCA Method A unrestricted cleanup levels for soil and groundwater will be used as the target cleanup levels for COCs at each property within the Site.

3.5.1 Time Oil Property Remediation Technology Alternatives

Residual impacts associated with the Time Oil property are currently limited to PCS beneath the southwestern portion of the property and the easternmost portion of the North Main Street ROW, as well as ORPH-contaminated groundwater in the vicinity of monitoring well MW26. Based on the key assumptions described above, the cumulative results of the previous subsurface investigations and the RI conducted on the Time Oil property and the adjacent parcels, as well as the incremental cost comparisons of similar alternatives, three cleanup components were retained for further consideration.

- **Cleanup Alternative 1.** Maintenance of a containment cap (currently asphalt and concrete) with monitored natural attenuation and implementation of an institutional control such as a management plan or contaminant contingency plan for residual PCS.
- **Cleanup Alternative 2.** In situ bioremediation of soil via soil vapor extraction (SVE) with maintenance of the containment cap.
- **Cleanup Alternative 3.** Excavation with shoring and off-property disposal of PCS.

Cleanup Alternatives 1, 2, and 3 meet the criteria under MTCA for protection of human health and the environment, compliance with cleanup standards, permanence of the remedy, and completion within a reasonable time frame. A description of the components of each cleanup alternative is presented below.

3.5.1.1 Cleanup Alternative 1

Cleanup Alternative 1 includes the maintenance of a containment cap (currently asphalt and concrete) over the Time Oil property and implementation of an institutional control such as a management plan or contaminant contingency plan to limit access and/or administer proper protocol for dealing with soil beneath portions of the property. This cleanup alternative would also include monitoring of groundwater to demonstrate that the natural attenuation process is taking place at a reasonable rate.

Modeling the fate of benzene in the vadose zone through natural attenuation (Section 2.8.2 and Appendix A) indicated that benzene will attenuate to below the cleanup level in 5 years (i.e., by 2013); however, ORPH concentrations in soil beneath the Time Oil property are expected to attenuate more slowly by virtue of their physical and chemical properties that preclude volatilization as a significant removal mechanism for these compounds. To account for the slower attenuation rate of the ORPH compounds, the expected duration to achieve soil cleanup levels for all COCs ranges from 7 to 13 years with an average of 10 years.

With the exception of ORPH, the COCs in groundwater wells associated with the Time Oil property are below their respective MTCA Method A cleanup levels; however, quarterly groundwater monitoring would be conducted until a minimum of four consecutive quarters of groundwater samples indicate concentrations of COCs that are compliant with their respective MTCA Method A cleanup levels. As demonstrated on Chart 1 in the *Remedial Investigation Addendum* (SoundEarth 2012), a regression analysis performed for the Site suggest that the seasonally elevated ORPH concentrations detected in monitoring well MW26 will attenuate and remain below the MTCA Method A cleanup level in approximately Fourth Quarter 2012. Subsequent groundwater monitoring events would be required to monitor the progress of the natural attenuation process, the frequency of which would be defined more fully in the CAP. At such time as the property owner may be interested in removing the institutional control, the property owner and/or potentially liable party (PLP) would consult with Ecology regarding the request for a status change. Ecology would establish the testing requirements and expectations for the removal and/or modification of the institutional controls at the property. Figure 3 provides a conceptual illustration of selected wells for implementation and monitoring of this cleanup alternative.

Using the criteria listed in WAC 173-340-370(7) and referenced in Section 2.8.2 of this report, monitored natural attenuation is considered an active remedial measure for the Time Oil property for the following reasons:

- At the Time Oil property, the bulk of the residual soil contamination in the vadose zone has been removed to the maximum extent practicable and residual vadose zone contamination is situated beneath or in the immediate vicinity of aboveground and below-ground improvements associated with the ongoing business operations (GEI 2000; Time Oil Co. 2002). Additional source removal would require the removal of these improvements and the disruption of business operations at the property.
- Acknowledging that residual groundwater contamination appears limited to the vicinity of monitoring well MW26, which is located in the North Main Street ROW, along with the lack of a vapor migration pathway and the existing engineering controls (i.e., pavement and concrete) that limit direct contact with residual PCS, leaving contaminants on the Site does not pose an unacceptable threat to human health or the environment.
- The petroleum contamination historically present in groundwater has, with the exception of MW26, already attenuated to below MTCA Method A cleanup levels. Additionally, as indicated in the Second Quarter 2011 Groundwater Monitoring Report (SoundEarth 2011) and *the* Remedial Investigation Addendum (SoundEarth 2012), the results of four consecutive quarters of sampling of groundwater natural attenuation parameters indicates that natural attenuation has been occurring at the Site and additional groundwater sampling will be performed to demonstrate that natural biodegradation will continue to occur at a reasonable rate.
- In addition to monitoring changes in concentrations of COCs beneath the property, critical parameters to be measured may include the following, although the specific requirements of the groundwater monitoring program will be identified in the CAP:
  - pH
  - Dissolved oxygen
  - Oxidation-reduction potential
  - Metals scan (total iron, ferrous iron, calcium, magnesium, dissolved manganese)
  - Anion scan (chloride, sulfate, nitrate included)
  - Methane
  - Total organic carbon

Key assumptions for this cleanup action include the following:

- Implementation of an institutional control such as a management plan or contaminant contingency plan in accordance with WAC 173-340-440 to preclude unacceptable human health or environmental exposures. The institutional control would also provide for continued monitoring and maintenance of engineering controls, to the extent they are required.

- Whether natural biodegradation of COCs in groundwater occurs would be evaluated based on laboratory analytical data.
- A minimum of four consecutive quarters of groundwater monitoring data indicating that concentrations of COCs are below the applicable MTCA Method A cleanup levels for groundwater would be required for the property, and subsequent groundwater monitoring may also be required to assess the progress of natural biodegradation. For the purposes of the disproportionate cost analysis (DCA), the subsequent groundwater monitoring is assumed to occur on an annual basis.
- For the purposes of the DCA, the wells associated with the Time Oil property that would be included in the groundwater monitoring program were assumed to include MW01, MW02, MW03, MW07, MW09, MW11, MW12, MW13, MW26, MW27, and CMW05.
- For the purposes of the DCA, the institutional controls were assumed to remain in place for a period of 10 years or until such time as soil sampling and analysis are performed that demonstrate compliance with the MTCA Method A cleanup levels. The actual duration of the institutional controls would depend upon the property owner's land use plans.

The present worth cost to complete Cleanup Alternative 1, assuming a 2.2 percent annual rate of return and a life cycle of 10 years for groundwater monitoring associated with monitored natural attenuation and maintenance of institutional controls, is approximately $238,145 (Table 6-1). In the event that the cleanup levels were not achieved within the anticipated duration of 10 years, the total present value cost for this alternative with an additional 10 years of operation and monitoring would be approximately $323,420.

3.5.1.2 Cleanup Alternative 2

Cleanup Alternative 2 would involve the installation of an in situ bioremediation system that would be designed to reduce COC concentrations in soil. The selected in situ technology is SVE. SVE is a well-documented and proven technology used to address TPH contamination in the vadose zone. Figure 4 provides a conceptual illustration of how this cleanup alternative might be implemented.

This cleanup alternative would consist of converting existing monitoring wells to function as SVE or passive venting wells. The mechanical components of the system would induce a vacuum on the subsurface through the SVE wells to remove soil vapor from the contaminated areas. Adjacent passive vent wells would provide additional clean air flow through the subsurface to increase the aerobic bioremediation rate for the COCs. Passive vent wells function to increase the air flow in the subsurface providing additional oxygen for aerobic organisms to degrade residual petroleum hydrocarbons.

Remedial system piping was installed at the Time Oil property by GEI in October 1999 in anticipation of the need for an active remediation system (GEI 2000). GEI and Time Oil jointly completed a conceptual remedial system design that was partially installed by GEI at the conclusion of remedial activities and prior to final grading. At seven locations around the property, GEI installed 18-inch-diameter, 3-foot-long corrugated well boxes (Figure 4). Each well box was manifolded to a central treatment area located near the central and eastern portion of

the property using lengths of 2-inch-diameter and 4-inch-diameter polyvinyl chloride piping. Assuming that the remedial piping and well boxes are in good condition, there would likely be sufficient coverage for SVE and passive vent wells to positively affect the environmental quality of soil throughout impacted portions of the property.

During the operation of the remediation system, vapors from the system would be monitored regularly to assess the effectiveness and progress of remediation. Confirmation soil samples could be used to demonstrate that the RAOs were attained at the presumed conclusion of remediation or prior to the performance of any subsurface work. The compliance monitoring plan would be finalized in the CAP.

Key assumptions for this component of the cleanup alternative include the following:

- A pilot test would be recommended prior to designing and installing the remainder of the remediation system to calculate the appropriate well spacing and mechanical equipment sizing.
- Investigation of the existing remedial piping would be performed to evaluate whether the components are in good condition, the results of which would confirm that the integrity of the piping has not been affected by past activities on the property.
- The inclusion of seven wells, as originally proposed for the GEI remedial system, would be sufficient for effective implementation of SVE at the property.
- Installation of the SVE system would not significantly impact current business operations at the Time Oil property.
- A minimum of four consecutive quarters of groundwater monitoring data indicating that concentrations of COCs are below the applicable MTCA Method A cleanup levels for groundwater would be required for the property.
- For the purposes of the DCA, the wells associated with the Time Oil property that would be included in the groundwater monitoring program were assumed to include MW01, MW09, MW10, MW11, MW13, MW26, and MW27.
- The life cycle for this cleanup alternative was assumed to be 3 years for the purpose of estimating the present worth cost. This duration should not be construed as a guaranteed remediation time frame.

The present worth cost to complete Cleanup Alternative 2, assuming a 0.9 percent annual rate of return and a life cycle of 3 years, is approximately $362,978 (Table 6-2).

3.5.1.3 Cleanup Alternative 3

Cleanup Alternative 3 would involve the bulk excavation and off-property disposal of soil containing concentrations of COCs exceeding the specified cleanup levels. As shown on Figure 5, the existing soil analytical results suggest that the excavation would extend beneath the southwestern portion of the Time Oil property and a small portion of the west-adjacent North Main Street ROW. Clean structural fill would be imported and compacted to restore the property to its original grade. A shoring system would be required along the southern and eastern extent of the excavation on the Time Oil property, as well as in the North Main Street ROW to the west of the property. In order to excavate the impacts associated with the Time Oil

property, it would be necessary to demolish the concrete and asphalt surface cover and at least two of the existing pump islands. It would also be necessary to decommission the subsurface conveyance piping and associated components to access the underlying soil. To excavate beneath North Main Street, traffic detours would be necessary to route traffic around the excavation, and demolition of the road and sidewalk would be required to access the underlying soil. Contaminated material would be hauled to a Subtitle D landfill facility for disposal.

The anticipated vertical limits of the soil excavation would extend to depths of approximately 12 feet, the uppermost 5 feet of which would be stockpiled as clean overburden. Much of the excavation would require shoring in order to maintain the structural stability of the adjacent ROWs and on-property improvements. Additionally, a temporary dewatering system would likely be necessary as soil targeted for excavation is located below the documented groundwater table.

The estimated total volume of soil that would be excavated is approximately 1,243 bank cubic yards (bcy). Approximately 58 percent or 725 bcy of the excavated soil is assumed to concentrations of COCs that exceed the cleanup levels and would be hauled off the property for disposal at a Subtitle D landfill facility. The remaining 42 percent, or 518 bcy of clean overburden soil, would be stockpiled at the property for use as backfill. An additional 943 loose cubic yards of structural backfill (the approximate equivalent of 725 bcy) would be imported to replace the PCS that would be removed from the property for disposal.

During excavation activities, compliance soil sampling would be performed to evaluate disposal options for the material being hauled off the property and to document that the specified cleanup levels were attained, where accessible.

Key assumptions for this cleanup alternative include the following:

- Shoring would consist of soldier piles to allow access to soils at depths extending deeper than the static groundwater table. Because of the shallow bedrock observed in the vicinity of the excavation, soldier pile shoring is the most feasible shoring option.
- The volume of imported fill would be equivalent to the contaminated soil volume hauled off the property (725 bcy).
- Utilities would be affected by the excavation activities and would require access, capping, and reactivation.
- A minimum of three groundwater monitoring wells would require decommissioning prior to excavation activities as they are located within the excavation limits.
- A minimum of three groundwater monitoring wells would be installed following excavation activities to supplement the groundwater monitoring program.
- Access agreements would be granted to excavate within the ROW, including incorporation of a detour off of North Main Street.
- Dewatering and disposal of groundwater would be required below depths of 8 feet.
- A minimum of 40 compliance soil samples would be required to confirm that soil containing concentrations of COCs exceeding the applicable MTCA Method A

cleanup levels had been removed from the property. A 24-hour turnaround time would be required for confirmation samples.

- Loss of rent/revenue during the excavation would not exceed the cost of construction.
- All wells will be decommissioned at the conclusion of the 1 year of quarterly groundwater monitoring.

The present worth cost to complete Cleanup Alternative 3, assuming a 0.9 percent annual rate of return and a life cycle of 1 year, is approximately $1,020,910 (Table 6-3).

3.5.2 Cenex Property Remediation Technology Alternatives

The extent of petroleum-contamination at the Cenex property is defined by a "rind" of soil left in place following the excavation of the 1985-vintage USTs. The impacted soil associated with the Cenex property also extends beneath the East Tyler Street ROW. Based on the key assumptions described above, the cumulative results of the previous subsurface investigations and the RI conducted on the property and the adjacent parcels, as well as the incremental cost comparisons of similar alternatives, three cleanup components were retained for further consideration:

- **Cleanup Alternative 1.** Maintenance of a containment cap (currently asphalt and concrete) with monitored natural attenuation and implementation of an institutional control such as a management plan or contaminant contingency plan for residual PCS.
- **Cleanup Alternative 2.** In situ bioremediation of soil via SVE with maintenance of the containment cap.
- **Cleanup Alternative 3.** Excavation with shoring and off-property disposal of PCS.

Cleanup Alternatives 1, 2, and 3 meet the criteria under MTCA for protection of human health and the environment, compliance with cleanup standards, permanence of the remedy, and completion within a reasonable time frame. A description of the components of each cleanup alternative is presented below.

3.5.2.1 Cleanup Alternative 1

Cleanup Alternative 1 includes the maintenance of a containment cap (currently asphalt and concrete) over the Cenex property and implementation of an institutional control such as a management plan or contaminant contingency plan to limit access and/or administer proper protocol for dealing with soil beneath portions of the property. This cleanup alternative would also include monitoring of groundwater to demonstrate that the natural attenuation process is taking place at a reasonable rate.

As with the Time Oil property, modeling of the fate of benzene in the vadose zone through natural attenuation (Section 2.8.2 and Appendix A) indicated that benzene beneath the Cenex property will attenuate naturally to below the cleanup level in 5 years (i.e., by 2013). However, for the reasons stated in Section 3.5.1.1, residual ORPH concentrations in soil beneath the Cenex property are expected to attenuate more slowly. To account for the slower attenuation rate of

the ORPH compounds, the expected duration to achieve soil cleanup levels for all COCs ranges from 7 to 13 years with an average of 10 years.

The concentrations of COCs in groundwater wells associated with the Cenex property have remained below their respective MTCA Method A cleanup levels for four or more consecutive quarters; however, subsequent groundwater monitoring events may also be required to monitor the progress of the natural attenuation process, the frequency of which would be defined more fully in the CAP. At such time as the property owner may be interested in removing the institutional control, the property owner and/or PLP will consult with Ecology regarding the request for a status change. Ecology will establish the testing requirements and expectations for the removal and/or modification of the institutional control at the property. Figure 6 provides a conceptual illustration of selected wells for implementation and monitoring of this cleanup alternative.

Using the criteria listed in WAC 173-340-370(7) and referenced in Section 2.8.2 of this report, monitored natural attenuation is considered an active remedial measure for the Cenex property for the following reasons:

- The bulk of the soil contamination historically present in the vadose zone beneath the Cenex property has been removed to the maximum extent practicable and residual vadose zone contamination is situated beneath or in the immediate vicinity of aboveground and below-ground improvements associated with the business operations. Additional source removal would require the removal of these improvements and the disruption of business operations at the property.
- Considering the demonstrated absence of residual impacts in groundwater, the lack of a vapor migration pathway, and the existing engineering controls (i.e., pavement and concrete) to limit direct contact, leaving contaminants on the Site does not pose an unacceptable threat to human health or the environment.
- The petroleum contamination historically present in groundwater has already attenuated to below MTCA Method A cleanup levels. Additionally, as indicated in the Second Quarter 2011 Groundwater Monitoring Report (SoundEarth 2011) and the Remedial Investigation Addendum (SoundEarth 2012), the results of four consecutive quarters of sampling of groundwater natural attenuation parameters indicates that natural attenuation has been occurring at the Site and additional groundwater sampling will be performed to demonstrate that natural biodegradation will continue to occur at a reasonable rate.
- In addition to monitoring changes in concentrations of COCs beneath the property, critical parameters to be measured may include the following, although the specific requirements of the groundwater monitoring program will be identified in the CAP:
  - pH
  - Dissolved oxygen
  - Oxidation-reduction potential
  - Metals scan (total iron, ferrous iron, calcium, magnesium, dissolved manganese)
  - Anion scan (chloride, sulfate, nitrate included)

- Methane
- Total organic carbon

Key assumptions for this cleanup alternative include the following:

- Implementation of an institutional control such as a management plan or contaminant contingency plan in accordance with WAC 173-340-440 to preclude unacceptable human health or environmental exposures. The institutional control would also provide for continued monitoring and maintenance of engineering controls, to the extent they are required.
- Whether natural biodegradation of COCs in groundwater occurs would be evaluated based on laboratory analytical data.
- A minimum of four consecutive quarters of groundwater monitoring data indicating that concentrations of COCs are below the applicable MTCA Method A cleanup levels for groundwater would be required for the property, and subsequent groundwater monitoring may also be required to assess the progress of natural biodegradation. For the purposes of the DCA, the subsequent groundwater monitoring is assumed to occur on an annual basis.
- For the purposes of the DCA, the wells associated with the Cenex property that would be included in the groundwater monitoring program were assumed to include MW09, MW12, MW16, MW17, MW18, and MW19, and CMW05.
- For the purposes of the DCA, the institutional controls were assumed to remain in place for a period of 10 years or until such time as soil sampling and analysis are performed that demonstrate compliance with the MTCA Method A cleanup levels. The actual duration of the institutional controls would depend upon the property owner's land use plans.

The present worth cost to complete Cleanup Alternative 1, assuming a 2.2 percent annual rate of return and a life cycle of 10 years for groundwater monitoring associated with monitored natural attenuation and maintenance of institutional controls, is approximately $238,145 (Table 7-1). In the event that the cleanup levels were not achieved within the anticipated duration of 10 years, the total present value cost for this alternative with an additional 10 years of operation and monitoring would be approximately $323,420.

3.5.2.2 Cleanup Alternative 2

Cleanup Alternative 2 would involve the installation of an in situ bioremediation system that would be designed to reduce COC concentrations in soil. The selected in situ technology is SVE, a well-documented and proven technology used to address TPH contamination in the vadose zone. Figure 7 provides a conceptual illustration of how this cleanup alternative might be implemented.

This cleanup alternative would consist of installing seven wells to a depth of approximately 15 feet bgs to function as SVE or passive venting wells. Monitoring well CMW03 would be converted into an SVE well as the eighth well for the system. The mechanical components of the system would induce a vacuum on the subsurface through the SVE wells to remove soil vapor from the contaminated areas. Passive vent wells would provide additional clean air flow through

the subsurface to increase the aerobic bioremediation rate for the COCs. Passive vent wells function to increase the air flow in the subsurface providing additional oxygen for aerobic organisms to degrade residual petroleum hydrocarbons.

During the operation of the remediation system, vapors from the system would be monitored regularly to assess the effectiveness and progress of remediation. Confirmation soil samples could be used to confirm the RAOs were attained at the presumed conclusion of remediation or prior to the performance of any subsurface work. The compliance monitoring plan would be finalized in the CAP.

Key assumptions for this component of the alternative include the following:

- A pilot test would be recommended prior to designing and installing the remediation system to calculate the appropriate well spacing and mechanical equipment sizing.
- An SVE system that incorporates monitoring well CMW03 and the seven additional wells would be sufficient for effective implementation of SVE at the property. The cost to install the seven proposed wells, whether acting as SVE or passive venting wells, is included in the FS cost estimate in Table 7-2.
- Installation of the SVE system would not significantly impact current business operations at the Cenex property.
- A minimum of four consecutive quarters of groundwater monitoring data indicating that concentrations of COCs are below the applicable MTCA Method A cleanup levels for groundwater would be required for the property.
- For the purposes of the DCA, the wells associated with the Cenex property that would be included in the groundwater monitoring program were assumed to include MW09, MW10, MW12, MW16, MW17, MW18, and MW19.
- The life cycle for this alternative was assumed to be 3 years for the purpose of estimating the present worth cost. This duration should not be construed as a guaranteed remediation time frame.

The present worth cost to complete Cleanup Alternative 2, assuming a 0.9 percent annual rate of return and a life cycle of 3 years, is approximately $520,908 (Table 7-2).

3.5.2.3 Cleanup Alternative 3

Cleanup Alternative 3 would involve the bulk excavation and off-property disposal of soil containing concentrations of COCs exceeding the specified cleanup levels. As shown on Figure 8, the existing soil analytical results suggest that the excavation would extend beneath much of the central portion of the property, as well as a portion of the north-adjacent East Tyler Street ROW. Clean structural fill would be imported and compacted to restore the property to its original grade. A shoring system would be required along the northern and southern extent of the excavation on the Cenex property, as well as in the East Tyler Street ROW to the north of the property. In order to excavate the impacts associated with the Cenex property, it would be necessary to demolish the concrete and asphalt surface cover and the existing gasoline and diesel pump islands. It would also be necessary to decommission and replace the three 12,000 gallon USTs and associated subsurface conveyance piping and components. To excavate

beneath East Tyler Street, traffic detours would be necessary to route traffic around the excavation, and demolition of the road and sidewalk would be required to access the underlying soil. Contaminated material would be hauled off the property for disposal in a Subtitle D landfill facility.

The anticipated vertical limits of the soil excavation would extend to depths of approximately 13 feet, the uppermost 7 feet of which would be stockpiled as clean overburden. Much of the excavation would require shoring in order to maintain the structural stability of the adjacent ROWs, the railroad tracks to the south, and the on-property improvements. Additionally, a temporary dewatering system would likely be necessary as soil targeted for excavation is located below the documented groundwater table.

The estimated total volume of soil that would be excavated is approximately 3,900 bcy. Approximately 46 percent or 1,800 bcy of the excavated soil is assumed to contain concentrations of COCs that exceed the cleanup levels and would be hauled off the property for disposal at a Subtitle D landfill facility. The remaining 54 percent or 2,100 bcy of clean overburden soil would be stockpiled at the property for use as backfill. An additional 2,340 loose cubic yards of structural backfill (the approximate equivalent of 1,800 bcy) would be imported to replace the PCS that would be removed from the property for disposal.

During excavation activities, compliance soil sampling would be performed to evaluate disposal options for the material being hauled off the property and to document that the specified cleanup levels were attained, where accessible.

Key assumptions for this cleanup alternative include the following:

- Shoring would consist of soldier piles to allow access to soils at depths extending deeper than the static groundwater table. Because of the shallow bedrock observed in the vicinity of the excavation, soldier pile shoring is the most feasible shoring option.
- The volume of imported fill would be equivalent to the contaminated soil volume hauled off the property (1,800 bcy).
- Utilities would be affected by the excavation activities and would require access, capping, and reactivation.
- A minimum of three groundwater monitoring wells would require decommissioning prior to excavation activities as they are located with the excavation limits.
- A minimum of three groundwater monitoring wells would be installed following excavation activities to supplement the groundwater monitoring program.
- Access agreements would be granted to excavate within the ROW, including incorporation of a detour off of North Main Street.
- Dewatering and disposal of groundwater would be required below depths of 8 feet.
- A minimum of 40 compliance soil samples would be required to confirm that soil containing concentrations of COCs exceeding the applicable MTCA Method A cleanup levels had been removed from the property. A 24-hour turnaround time would be required for confirmation samples.

- Loss of rent/revenue during the excavation would not exceed the cost of construction.
- All wells will be decommissioned at the conclusion of the 1 year of quarterly groundwater monitoring.

The present worth cost to complete Cleanup Alternative 3, assuming a 0.9 percent annual rate of return and a life cycle of 1 year, is approximately $1,754,907 (Table 7-3).

3.5.3 Colfax Grange Property Remediation Technology Alternatives

Residual impacts to the Site associated with the Colfax Grange property appear to be limited to PCS extending between monitoring wells MW29 and MW16. The impacts are the result of releases associated with the operation of a retail gasoline station on the southwest portion of the property. No indication as to whether the USTs were removed or remain in place beneath the concrete pad in the southwest corner of the Colfax Grange property was identified during subsequent investigations. Based on the key assumptions described above, the cumulative results of the previous subsurface investigations and the RI conducted on the property and the adjacent parcels, as well as the incremental cost comparisons of similar alternatives, three cleanup components were retained for further consideration:

- **Cleanup Alternative 1.** Installation and maintenance of a containment cap (asphalt and concrete) with monitored natural attenuation and implementation of an institutional control such as a management plan or contaminant contingency plan for residual PCS.
- **Cleanup Alternative 2.** In situ remediation of soil and groundwater via chemical oxidation with maintenance of the containment cap.
- **Cleanup Alternative 3.** Excavation with shoring and off-property disposal of PCS.

Cleanup Alternatives 1, 2, and 3 meet the criteria under MTCA for protection of human health and the environment, compliance with cleanup standards, permanence of the remedy, and completion within a reasonable time frame. A description of the components of each cleanup alternative is presented below.

3.5.3.1 Cleanup Alternative 1

Cleanup Alternative 1 includes the installation and maintenance of a containment cap (asphalt and concrete) over the Colfax Grange property and implementation of an institutional control such as a management plan or contaminant contingency plan to limit access and/or administer proper protocol for dealing with soil beneath portions of the property. This alternative would also include monitoring of groundwater to demonstrate that the natural attenuation process is taking place.

Because soil beneath the Colfax Grange property exhibits concentrations of the more easily biodegradable GRPH compounds above the cleanup levels but does not exhibit the more recalcitrant ORPH compounds, the anticipated remedial duration via natural attenuation is shorter for this property when compared to the Time Oil and Cenex properties, both of which exhibit ORPH compounds above cleanup levels. The SESOIL modeling previously presented for the Time Oil and Cenex properties indicated that benzene concentrations in vadose zone soil would attenuate naturally within 5 years. Since benzene is representative of aromatic

compounds comprising GRPH, remedial completion could reasonably be anticipated within 5 years. However, for the purpose of conservatively estimating the remedial duration to account for a potentially slower attenuation rate for the higher molecular weight components of GRPH, the planned duration to achieve MTCA Method A soil cleanup levels through natural attenuation is 10 years.

The COCs in groundwater wells associated with the Colfax Grange property have remained below their respective MTCA Method A cleanup levels for four or more consecutive quarters; however, subsequent groundwater monitoring events would be required to monitor the progress of the natural attenuation process, the frequency of which would be defined more fully in the CAP. At such time as the property owner may be interested in removing the institutional control, the property owner and/or PLP will consult with Ecology regarding the request for a status change. Ecology will establish the testing requirements and expectations for the removal and/or modification of the institutional control at the property. Figure 9 provides a conceptual illustration of selected wells for implementation and monitoring of this cleanup alternative.

Using the criteria listed in WAC 173-340-370(7) and referenced in Section 2.8.2 of this report, monitored natural attenuation is considered an active remedial measure for the Colfax Grange property for the following reasons:

- Residual soil contamination in the vadose zone has not been encountered, which suggests that the bulk of the source material has been removed. Further, the residual contamination in the saturated zone is situated beneath or in the immediate vicinity of aboveground and belowground improvements associated with the business operations. Additional source removal would require excavating beneath the water table and could require the removal of the improvements and the disruption of business operations at the property.
- Considering the demonstrated absence of residual impacts in groundwater, the lack of a vapor migration pathway, and the engineering controls (i.e., pavement or concrete) that could be installed to limit direct contact, leaving contaminants on the Site does not pose an unacceptable threat to human health or the environment.
- The petroleum contamination historically present in groundwater has already attenuated to below MTCA Method A cleanup levels. Additionally, as indicated in the Second Quarter 2011 Groundwater Monitoring Report (SoundEarth 2011) and the Remedial Investigation Addendum (SoundEarth 2012), the results of four consecutive quarters of sampling of groundwater natural attenuation parameters indicates that natural attenuation has been occurring at the Site and additional groundwater sampling will be performed to demonstrate that natural biodegradation will continue to occur at a reasonable rate.
- In addition to monitoring changes in concentrations of COCs beneath the property, critical parameters to be measured may include the following, although the specific requirements of the groundwater monitoring program will be identified in the CAP:
  - pH
  - Dissolved oxygen
  - Oxidation-reduction potential

- Metals scan (total iron, ferrous iron, calcium, magnesium, dissolved manganese)
- Anion scan (chloride, sulfate, nitrate included)
- Methane
- Total organic carbon

Key assumptions for this cleanup action include the following:

- Implementation of an institutional control such as a management plan or contaminant contingency plan in accordance with WAC 173-340-440 to preclude unacceptable human health or environmental exposures. The institutional control would also provide for continued monitoring and maintenance of engineering controls, to the extent they are required.
- Whether natural biodegradation of COCs in groundwater occurs would be evaluated based on laboratory analytical data.
- A minimum of four consecutive quarters of groundwater monitoring data indicating that concentrations of COCs are below the applicable MTCA Method A cleanup levels for groundwater would be required for the property, and subsequent groundwater monitoring may also be required to assess the progress of natural biodegradation. For the purposes of the DCA, the subsequent groundwater monitoring is assumed to occur on an annual basis.
- For the purposes of the DCA, the wells associated with the Colfax Grange property that would be included in the groundwater monitoring program were assumed to include MW16, MW17, MW18, MW19, MW25, MW28, MW29, and MW32.
- For the purposes of the DCA, the institutional controls were assumed to remain in place for a period of 10 years or until such time as soil sampling and analysis are performed that demonstrate compliance with the MTCA Method A cleanup levels. The actual duration of the institutional controls would depend upon the property owner's land use plans.

The present worth cost to complete Cleanup Alternative 1, assuming a 2.2 percent annual rate of return and a life cycle of 10 years for groundwater monitoring associated with monitored natural attenuation and maintenance of institutional controls, is approximately $249,945 (Table 8-1). In the event that the cleanup levels were not achieved within the anticipated duration of 10 years, the total present value cost for this alternative with an additional 10 years of operation and monitoring would be approximately $335,220.

3.5.3.2 Cleanup Alternative 2

Cleanup Alternative 2 would involve the application of an in situ remedial technology that would be designed to reduce COC concentrations in soil and groundwater to below the applicable MTCA Method A cleanup levels, as well as installation and maintenance of a containment cap (asphalt and concrete). The selected in situ remedial technology is chemical oxidation using pH-activated sodium persulfate. This chemical oxidant is marketed by the FMC Corporation under the trade name of Klözur. Figure 10 provides a conceptual illustration of how this cleanup alternative might be implemented.

Klözur is an advanced chemical oxidation technology used for the treatment of subsurface petroleum hydrocarbon contamination. Klözur activated persulfate generates the sulfate radical, one of the strongest oxidizing species available, enabling destruction of recalcitrant contaminants. Klözur is injected into the subsurface through either existing monitoring wells or using common and readily available drilling or direct-push equipment. Once introduced into the subsurface, Klözur targets petroleum hydrocarbons in groundwater and soil.

For the Colfax Grange property, Klözur would be injected on 10-foot centers at approximately 37 locations using direct-push equipment. Approximately 110 pounds of injectate would be mixed with approximately 150 gallons of water prior to being injected. The density of the 10-foot center injection points would be necessary for complete coverage of the tighter silty or clayey fine sands. For the purpose of the DCA, the mobilization, setup, injection and demobilization are estimated to be completed in six full-day injection events.

Source area chemical oxidation can be completed in a relatively short time frame. As with other in situ treatment components, it is generally unable to achieve 100 percent removal/destruction of contaminant mass and may require implementation of a secondary or tertiary technology. The feasibility of implementing this technology often depends on the permeability of subsurface soil conditions and the available time frame allowed for achieving the RAOs. The proposed 10-foot centers for injection points should provide coverage within the soil underlying the proposed target area at the property. Confirmation soil samples could be used to demonstrate that the RAOs were attained at the presumed conclusion of remediation or prior to the performance of any subsurface work. The compliance monitoring plan would be finalized in the CAP.

Key assumptions for this cleanup alternative include the following:

- A single injection event would be sufficient to reduce the COC concentrations in soil beneath the impacted portions of the Colfax Grange property to below their applicable MTCA Method A cleanup levels.
- A minimum of four consecutive quarters of groundwater monitoring data indicating that concentrations of COCs are below the applicable MTCA Method A cleanup levels for groundwater would be required for the property, and subsequent groundwater monitoring may also be required to assess the progress of natural biodegradation. For the purposes of the DCA, the subsequent groundwater monitoring is assumed to occur on an annual basis.
- For the purposes of the DCA, the wells associated with the Colfax Grange property that would be included in the groundwater monitoring program were assumed to include MW16, MW17, MW18, MW19, MW25, MW28, MW29, and MW32.
- The life cycle for this alternative is assumed to be 3 years for the purpose of estimating the present worth cost. This duration should not be construed as a guaranteed remediation time frame.

The present worth cost to complete Cleanup Alternative 2, assuming a 0.9 percent annual rate of return and a life cycle of 3 years, is approximately $281,683 (Table 8-2).

3.5.3.3 Cleanup Alternative 3

Cleanup Alternative 3 involves the bulk excavation and off-property disposal of soil containing concentrations of COCs exceeding the specified cleanup levels. Clean structural fill would be imported and compacted to restore the property to its original grade. A shoring system would be required along the western portion of the Colfax Grange building as well as along the East Harrison Street ROW to the south of the property. Demolition of the concrete pad to the south of the Colfax Grange building would also be required to access underlying soil. Contaminated material would be hauled off the property for disposal in a Subtitle D landfill facility. Figure 11 provides a conceptual illustration of how this cleanup alternative might be implemented.

The vertical limits of the soil excavation would extend between 7.5 and 12.5 feet bgs. Shoring would be required along the East Harrison Street ROW and to support the western portion of the Colfax Grange Building. Shoring was deemed a necessary addition to this alternative due to the total depth of the excavation, the excavation of contaminated soil below the groundwater table, and the close proximity of the excavation to the ROW and building foundation. Additionally, a temporary dewatering system would likely be necessary as soil targeted for excavation is located below the documented groundwater table.

The estimated total volume of soil that would be excavated is approximately 1,345 bcy. Approximately 46 percent or 620 bcy of the excavated soil is assumed to be above the cleanup levels and would be hauled off the property for disposal at a Subtitle D landfill facility. The remaining 54 percent or 725 bcy of clean overburden soil would be stockpiled at the property for use as backfill. An additional 806 loose cubic yards of structural backfill (the approximate equivalent of 620 bcy) would be imported to replace the PCS that would be removed from the property for disposal.

During excavation activities, compliance soil sampling would be performed to evaluate disposal options for the material being hauled off the property and to document that the specified cleanup levels were attained where accessible.

Key assumptions for this cleanup alternative include the following:

- Shoring would consist of soldier piles and wood lagging for the adjacent ROWs and pin pile shoring for the west end of the Colfax Grange building. Pin pile shoring would allow access to residual PCS beneath the building.
- The volume of imported fill would be equivalent to the contaminated soil volume hauled off the property (620 bcy).
- Utilities would not be affected by the excavation activities.
- A minimum of three groundwater monitoring wells would require decommissioning prior to excavation activities as they are located with the excavation limits.
- A minimum of three groundwater monitoring wells would be installed following excavation activities to supplement the groundwater monitoring program.
- Access agreements would be granted to install tiebacks beneath the East Harrison Street ROW.
- Dewatering and disposal of groundwater would be required below depths of 8 feet.

- A minimum of 40 compliance soil samples would be required to confirm that soil containing concentrations of COCs exceeding the applicable MTCA Method A cleanup levels had been removed from the property. A 24-hour turnaround time would be required for confirmation samples.
- Loss of rent/revenue during the excavation would not exceed the cost of construction.
- Shoring near the existing building foundation would be less expensive than demolition and replacement.
- All wells will be decommissioned at the conclusion of the 1 year of quarterly groundwater monitoring.

The present worth cost to complete Cleanup Alternative 3, assuming a 0.9 percent annual rate of return and a life cycle of 1 year, is approximately $846,422 (Table 8-3).

3.6 COMPARISON OF CLEANUP ALTERNATIVES

A summary of the evaluation of the cleanup alternatives using the seven MTCA evaluation criteria (WAC 173-340-360[3][f]) is presented in Tables 9 through 11. Each cleanup alternative has been ranked on a scale of 1 to 10 for each of the applicable MTCA evaluation criteria. A score of 1 indicates the cleanup alternative exhibits a low degree of compliance with the evaluation criterion, while a score of 10 indicates the cleanup alternative exhibits a high degree of compliance with the evaluation criterion.

3.6.1 Time Oil Property Remediation Comparison of Cleanup Alternatives

The comparison of Cleanup Alternatives 1, 2, and 3 for the Time Oil property in accordance with the seven MTCA evaluation criteria is presented in Table 9 and described in detail below:

- **Protectiveness.** Each of the cleanup alternatives would eventually reduce the contaminant concentrations to unrestricted levels, thereby resulting in the highest degree of protectiveness of human health and the environment. Cleanup Alternative 1 reduces risk by eliminating the direct-contact pathway through institutional controls and monitoring the attenuation of COCs from the subsurface until the concentrations are below their respective MTCA Method A cleanup levels. Cleanup Alternative 2 reduces risk to an acceptable level by actively removing the COCs from the subsurface until the concentrations are below their respective MTCA Method A cleanup levels. Cleanup Alternative 3 reduces risk through the physical removal of impacted soil from the property. The projected time frames to achieve adequate protectiveness for Cleanup Alternatives 1 and 2 are 10 years and 3 years, respectively. The projected time frame for Cleanup Alternative 3 would be immediate, although a time frame of 1 year has been used as a basis for the cost estimate and to include the final year of groundwater compliance monitoring. These estimated time frames are based on the results of attenuation modeling and our experience on numerous sites with similar media and COCs; the estimates are considered to be reasonable time frames for the remedial process. Because the three alternatives will eventually result in the reduction of contaminant concentrations to below their respective MTCA Method A cleanup levels, the overall environmental quality would be improved by implementing any of the alternatives. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 9, 9, and 10,

respectively, for the degree of protectiveness of human health and the environment.

- **Permanence.** Each of the three cleanup alternatives provides a permanent solution in the reduction of the toxicity, mobility, and volume of COCs through either biological or physical means. Cleanup Alternative 3 would provide a faster means of achieving the cleanup levels than the other alternatives through the physical removal of the impacted soil. Cleanup Alternative 1 would likely require a longer time frame than Cleanup Alternative 2 by virtue of monitored natural attenuation, but would still provide a similar level of permanence as either Cleanup Alternatives 2 or 3. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 7, 8, and 10, respectively, for the degree of permanence in the reduction of the toxicity, mobility, and volume of COCs through biological or physical means.
- **Effectiveness over the long term.** The long-term effectiveness of Cleanup Alternatives 1 and 2 would be less than Cleanup Alternative 3 due to the uncertainty with respect to the time required to achieve the specified cleanup levels via monitored natural attenuation. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 7, 7, and 10, respectively, for the long-term effectiveness of the respective alternative.
- **Management of short-term risks.** The short-term risks associated with Cleanup Alternatives 1 and 2 would be significantly lower than Cleanup Alternative 3 as the latter involves invasive activities and material handling hazards. Maintenance of the containment cap and implementation of an institutional control would be sufficient to manage short-term risks at the property. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 9, 7, and 6, respectively, for the management of short-term risks associated with each respective alternative.
- **Technical and administrative implementability.** Implementation of Cleanup Alternative 1 would be significantly more straightforward than that of Cleanup Alternatives 2 and 3 as no state or local permitting would be required, nor would it require that invasive activities be performed. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 8, 6, and 3, respectively, for the technical and administrative implementability of each respective alternative.
- **Consideration of public concerns.** The public comment process has not been initiated; therefore, public concerns have not yet been evaluated for these alternatives.
- **Disproportionate Cost Analysis.** Charts 1-1 and 1-2 plot the relative cost and ranking scores for the three alternatives, as well as the cost-to-benefit ratios as tools to evaluate the relative cost and benefits afforded by each alternative, respectively. The charts illustrate that Cleanup Alternative 1 ranks the highest using the evaluation criteria and is the least expensive; therefore, it exhibits the lowest cost-to-benefit ratio. Graphically depicting the cost-to-benefit ratio indicates that the cost to implement Cleanup Alternatives 2 and 3 is higher than Cleanup Alternative 1 in achieving a corresponding benefit ($362,978 and $1,020,910 versus $238,145, respectively).

3.6.2 Cenex Property Remediation Comparison of Cleanup Alternatives

The comparison of Cleanup Alternatives 1, 2, and 3 for the Cenex property in accordance with the seven MTCA evaluation criteria is presented in Table 10 and described in detail below:

- **Protectiveness.** Each of the cleanup alternatives would eventually reduce the contaminant concentrations to unrestricted levels, thereby resulting in the highest degree of protectiveness of human health and the environment. Cleanup Alternative 1 reduces risk by eliminating the direct-contact pathway through institutional controls and monitoring the attenuation of COCs from the subsurface until the concentrations are below their respective MTCA Method A cleanup levels. Cleanup Alternative 2 reduces risk to an acceptable level by actively removing the COCs from the subsurface until the concentrations are below their respective MTCA Method A cleanup levels. Cleanup Alternative 3 reduces risk through the physical removal of impacted soil from the property. The projected time frames to achieve adequate protectiveness for Cleanup Alternatives 1 and 2 are 10 years and 3 years, respectively. The projected time frame for Cleanup Alternative 3 would be immediate, although a time frame of 1 year has been used as a basis for the cost estimate and to include the final year of groundwater compliance monitoring. These estimated time frames are based on the results of attenuation modeling and our experience at numerous sites with similar media and COCs; the estimates are considered to be reasonable time frames for the remedial process. Because the three alternatives will eventually result in the reduction of contaminant concentrations to below their respective MTCA Method A cleanup levels, the overall environmental quality would be improved by implementing any of the alternatives. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 9, 9, and 10, respectively, for the degree of protectiveness of human health and the environment.
- **Permanence.** Each of the three cleanup alternatives provides a permanent solution in the reduction of the toxicity, mobility, and volume of COCs through either biological or physical means. Cleanup Alternative 3 would provide a faster means of achieving the cleanup levels than the other alternatives through the physical removal of the impacted soil. Cleanup Alternative 1 would likely require a longer time frame than Cleanup Alternative 2 by virtue of monitored natural attenuation, but would still provide a similar level of permanence as either Cleanup Alternatives 2 or 3. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 7, 8, and 10, respectively, for the degree of permanence in the reduction of the toxicity, mobility, and volume of COCs through biological or physical means.
- **Effectiveness over the long term.** The long-term effectiveness of Cleanup Alternatives 1 and 2 would be less than Cleanup Alternative 3 due to the uncertainty with respect to the time required to achieve the specified cleanup levels via monitored natural attenuation. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 7, 7, and 10, respectively, for the long-term effectiveness of the respective alternative.
- **Management of short-term risks.** The short-term risks associated with Cleanup Alternatives 1 and 2 would be significantly lower than Cleanup Alternative 3 as the

latter involves invasive activities and material handling hazards. Maintenance of the containment cap and implementation of an institutional control would be sufficient to manage short-term risks at the property. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 9, 7, and 6, respectively, for the management of short-term risks associated with each respective alternative.

- **Technical and administrative implementability.** Implementation of Cleanup Alternative 1 would be significantly more straightforward than that of Cleanup Alternatives 2 and 3 as no state or local permitting would be required, nor would it require that invasive activities be performed. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 8, 6, and 3, respectively, for the technical and administrative implementability of each respective alternative.
- **Consideration of public concerns.** The public comment process has not been initiated; therefore, public concerns have not been evaluated for these alternatives.
- **Disproportionate Cost Analysis.** Charts 2-1 and 2-2 plot the relative cost and ranking scores for the three cleanup alternatives, as well as the cost-to-benefit ratios as tools to evaluate the relative cost and benefits afforded by each alternative, respectively. The charts illustrate that Cleanup Alternative 1 ranks the highest using the weighted criteria and is the least expensive; therefore, it exhibits the lowest cost-to-benefit ratio. Graphically depicting the cost-to-benefit ratio indicates that the cost to implement Cleanup Alternatives 2 and 3 are disproportionately higher than Cleanup Alternative 1 in achieving a corresponding benefit ($520,908 and $1,754,907 versus $238,145, respectively).

3.6.3 Colfax Grange Property Remediation Comparison of Cleanup Alternatives

The comparison of Cleanup Alternatives 1, 2, and 3 for the Colfax Grange property in accordance with the seven MTCA evaluation criteria is presented in Table 11 and described in detail below:

- **Protectiveness.** Each of the cleanup alternatives would eventually reduce the contaminant concentrations to unrestricted levels, thereby resulting in the highest degree of protectiveness of human health and the environment. Cleanup Alternative 1 reduces risk by eliminating the direct-contact pathway through institutional controls and monitoring the attenuation of COCs from the subsurface until the concentrations are below their respective MTCA Method A cleanup levels. Cleanup Alternative 2 reduces risk to an acceptable level by actively removing the COCs from the subsurface until the concentrations are below their respective MTCA Method A cleanup levels. Cleanup Alternative 3 reduces risk through the physical removal of impacted soil from the property. The projected time frames to achieve adequate protectiveness for Cleanup Alternatives 1 and 2 are 10 years and 3 years, respectively. The projected time frame for Cleanup Alternative 3 would be immediate, although a time frame of 1 year has been used as a basis for the cost estimate and to include the final year of groundwater compliance monitoring. These estimated time frames are based on the results of attenuation modeling and on our experience at numerous sites with similar media and COCs; the estimates are considered to be reasonable time frames for the remedial process. Because the three alternatives will eventually result in the reduction of contaminant

concentrations to below their respective MTCA Method A cleanup levels, the overall environmental quality would be improved by implementing any of the alternatives. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 9, 9, and 10, respectively, for the degree of protectiveness of human health and the environment.

- **Permanence.** Each of the three cleanup alternatives provides a permanent solution in the reduction of the toxicity, mobility, and volume of COCs through either biological or physical means. Cleanup Alternative 3 would provide a faster means of achieving the cleanup levels than the other alternatives through the physical removal of the impacted soil. Cleanup Alternative 1 would likely require a longer time frame than Cleanup Alternative 2 by virtue of monitored natural attenuation, but would still provide a similar level of permanence as either Cleanup Alternatives 2 or 3. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 7, 7, and 10, respectively, for the degree of permanence in the reduction of the toxicity, mobility, and volume of COCs through biological or physical means.
- **Effectiveness over the long term.** The long-term effectiveness of Cleanup Alternatives 1 and 2 would be less than Cleanup Alternative 3 due to the uncertainty with respect to the time required to achieve the specified cleanup levels via monitored natural attenuation and chemical oxidation. Cleanup Alternative 3 would offer the highest degree of certainty with respect to effectiveness over the long term as it would permanently remove contaminated media from the property. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 7, 7, and 10, respectively, for the long-term effectiveness of the respective alternative.
- **Management of short-term risks.** The short-term risks associated with Cleanup Alternatives 1 and 2 would be significantly lower than Cleanup Alternative 3 as the latter involves invasive activities and material handling hazards. Maintenance of the containment cap and implementation of an institutional control would be sufficient to manage short-term risks at the property. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 9, 7, and 6, respectively, for the management of short-term risks associated with each respective alternative.
- **Technical and administrative implementability.** Implementation of Cleanup Alternative 1 would be significantly more straightforward than that of Cleanup Alternatives 2 and 3 as no state or local permitting would be required, nor would it require that invasive activities be performed. Implementation of Cleanup Alternative 2 would likely be more technically and administratively feasible than Cleanup Alternative 3 due to the need to install shoring and obtain permits in order to perform the excavation activities. Cleanup Alternatives 1, 2, and 3 exhibited ranking scores of 8, 5, and 3, respectively, for the technical and administrative implementability of each respective alternative.
- **Consideration of public concerns.** The public comment process has not been initiated for this document; therefore, public concerns have not been evaluated for these alternatives.
- **Disproportionate Cost Analysis.** Charts 3-1 and 3-2 plot the relative cost and ranking scores for the three cleanup alternatives, as well as the cost-to-benefit

ratios as tools to evaluate the relative cost and benefits afforded by each alternative, respectively. The charts illustrate that Cleanup Alternative 1 ranks the highest using the weighted criteria, and is the least expensive; therefore, it exhibits the lowest cost-to-benefit ratio. Graphically depicting the cost-to-benefit ratio indicates that the cost to implement Cleanup Alternative 3 is disproportionately higher than Cleanup Alternatives 1 and 2 in achieving a corresponding benefit ($846,422, versus $249,945 and $281,683, respectively).

3.7 RECOMMENDED CLEANUP ALTERNATIVES

After performing the comparative analysis and ranking of alternatives in accordance with the MTCA evaluation criteria, the following identifies the recommended cleanup alternative for each property at the Site.

3.7.1 Time Oil Property Recommended Cleanup Alternative

Cleanup Alternative 1 is the recommended alternative for the Time Oil property. Cleanup Alternative 1 meets the threshold requirements for cleanup actions set forth in WAC 173-340-360(3) and WAC 173-340-370, is protective of human health and the environment, is more easily implemented than the competing alternatives, will not impact the nearby commercial or residential tenants, and provides a permanent solution for reducing concentrations of COCs at the property. Although the time frame to achieve the MTCA Method A cleanup levels via monitored natural attenuation is estimated to be longer than the time frames associated with Cleanup Alternatives 2 and 3, none of the MTCA criteria are violated with respect to feasibility. Attenuation modeling performed for the Site estimates that the time frame for natural attenuation of lighter-end hydrocarbons is approximately 5 years. To allow for the additional time needed for the natural attenuation of heavier-end hydrocarbons, an average of 10 years was estimated based on a range of between 7 and 13 years (minimum to maximum). Additionally, because the groundwater beneath the property currently complies with the cleanup levels, with the exception of MW26 in the North Main Street ROW, and because the historical soil concentrations did not significantly exceed the cleanup levels, the necessity to actively address residual impacts beneath the property is low. Cleanup Alternative 1 also exhibits a lower cost-to-benefit ratio relative to the other two cleanup alternatives.

3.7.2 Cenex Property Recommended Cleanup Alternative

Cleanup Alternative 1 is the recommended alternative for the Cenex property. Cleanup Alternative 1 meets the threshold requirements for cleanup actions set forth in WAC 173-340-360(3) and WAC 173-340-370, is protective of human health and the environment, is more easily implemented than the competing alternatives, will not impact the nearby commercial or residential tenants, and provides a permanent solution for reducing concentrations of COCs at the property. Although the time frame to achieve the MTCA Method A cleanup levels via monitored natural attenuation is estimated to be longer than the time frames associated with Cleanup Alternatives 2 and 3, none of the MTCA criteria are violated with respect to feasibility. Attenuation modeling performed for the Site estimates that the time frame for natural attenuation of lighter-end hydrocarbons is approximately 5 years. To allow for the additional time needed for the natural attenuation of heavier-end hydrocarbons, an average of 10 years was estimated based on a range of between 7 and 13 years (minimum to maximum). In addition, because groundwater beneath the property currently complies with the MTCA Method

A cleanup levels, and because the historical soil concentrations did not significantly exceed the cleanup levels, the necessity to actively address residual impacts beneath the property is low. Cleanup Alternative 1 also exhibits a lower cost-to-benefit ratio relative to the other two cleanup alternatives.

3.7.3 Colfax Grange Property Recommended Cleanup Alternative

Cleanup Alternative 1 is the recommended alternative for the Colfax Grange property. Cleanup Alternative 1 meets the threshold requirements for cleanup actions set forth in WAC 173-340-360(3) and WAC 173-340-370, is protective of human health and the environment, is more easily implemented than the competing alternatives, will not impact the nearby commercial or residential tenants, and provides a permanent solution for reducing concentrations of COCs at the property. Although the time frame to achieve the MTCA Method A cleanup levels via monitored natural attenuation is estimated to be longer than the time frames associated with Cleanup Alternatives 2 and 3, none of the MTCA criteria are violated with respect to feasibility. The SESOIL modeling previously presented for the Time Oil and Cenex properties indicated that benzene concentrations in vadose zone soil would attenuate naturally within 5 years. Since benzene is representative of aromatic compounds comprising GRPH, remedial completion could reasonably be anticipated within 5 years. However, for the purpose of conservatively estimating the remedial duration to account for a potentially slower attenuation rate for the higher molecular weight components of GRPH, the planned duration to achieve MTCA Method A soil cleanup levels through natural attenuation is 10 years. Additionally, because groundwater beneath the Colfax Grange property currently complies with the MTCA Method A cleanup levels, the necessity to actively address residual impacts beneath the property is low. Cleanup Alternative 1 also exhibits the lowest cost-to-benefit ratio compared to the competing alternatives.

Details concerning the implementation of the recommended cleanup alternative and the decision process used to evaluate whether modifications to the selected approach are warranted will be provided in the CAP.

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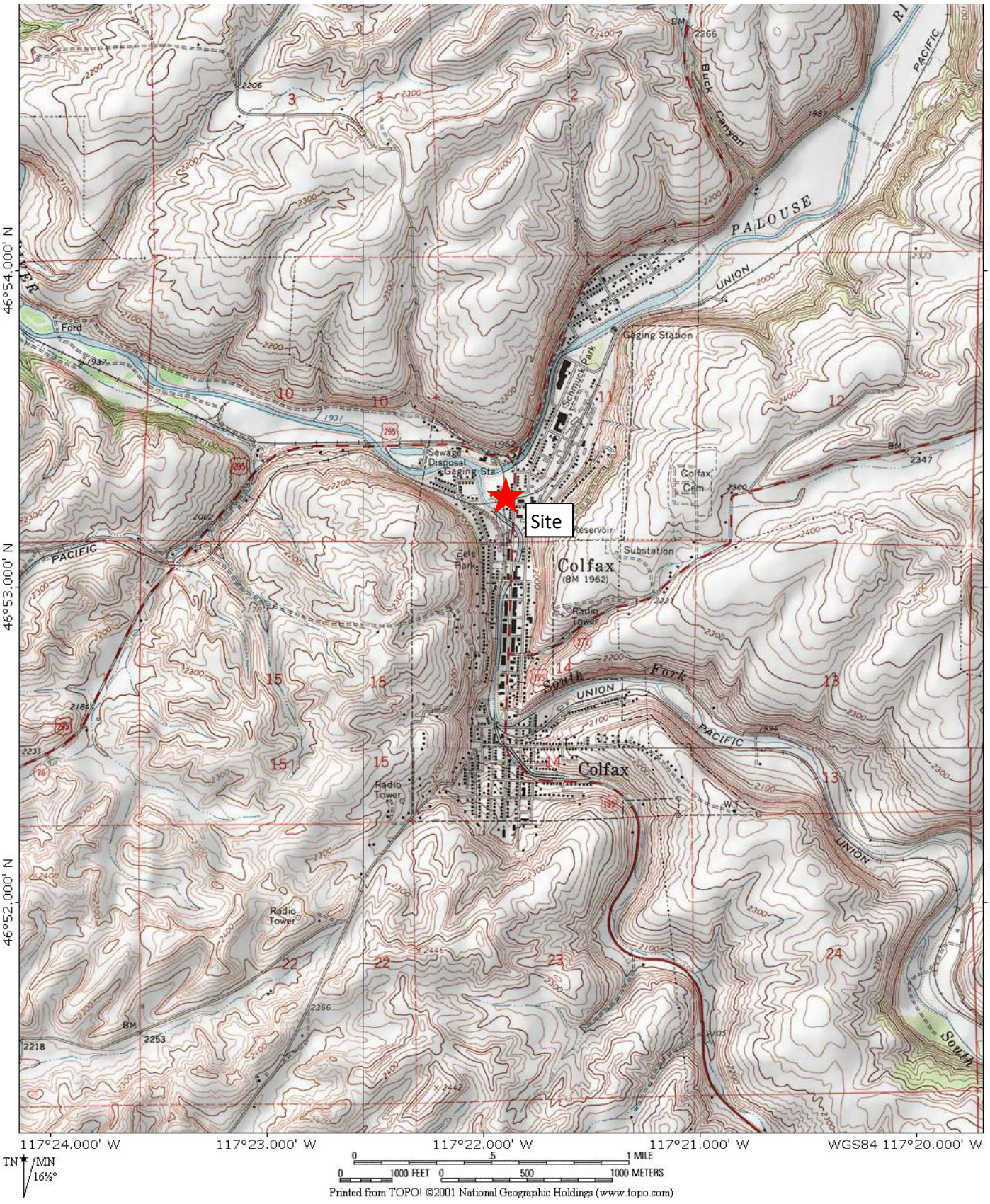
5.0 LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

FIGURES



SoundEarth Strategies	N	Date: August 19, 2008 Drawn By: RLH Chk By: RKB Project No.: 0592-001 File ID: 0592_fig1_to.doc	North Colfax Petroleum Contamination Site North Main Street and East Tyler Street Colfax, Washington	**FIGURE 1** Site Location Map

10/13/2011

N

SIDEWALK

B32

B15/MW15

FORMER PUMP ISLAND

B14

B14A/MW14

STERLING PROPERTY

SIDEWALK

MW11

B13/MW13

B27/MW27

NORTH MAIN STREET (U.S. HIGHWAY 195)

FORMER GAS & OIL STATION

B28/MW28

SEWER MANHOLE

FORMER GAS & OIL STATION

B26/MW26

FORMER BURIED OIL DRUMS

STORM DRAIN

SP04

PLANTER

SP03

PLANTER

SP06

SIDEWALK

PLANTER

MW05

SP05

MW06

MW07

TIME OIL PROPERTY

GEOENGINEERS 1999 EXCAVATION

SP01

B22/MW22

CONCRETE

B24/MW24

TP01

TP03

TP02

B16/MW16

FORMER GAS & OIL STATION

CENEX PROPERTY

SP16

B23/MW23

MW12

SP12

T6/9

T7/9

T9/9

FORMER GREASE ROOM

UTILITY POLE

SUL BTM COMP SOUTH

SP09

SP08

MW03

MW04

DISPENSER ISLANDS

FORMER GREASE PITS

TACO TIME RESTAURANT

B25/MW25

B29/MW29

COLFAX GRANGE PROPERTY (105 EAST HARRISON STREET)

CMW01

SP15

DISPENSER ISLAND

MW01

T3/9

T6/9

T4/9

T1/12

T5/9

GRAVEL LOT

RESIDENCE

MW10

SP17

FORMER GAS & OIL STATION

B17/MW17

P4

N1

CMW05

SP11

MW02

VAULT

MW08

ALLEY

B33/MW32

FORMER HEATING OIL UST

CMW02

UL BTM COMP

P1

N2

CMW04

MW09

COLFAX GRANGE BUILDING

FORMER 1985 VINTAGE UST

T2

OTE-E2

SP19

SP07

RESIDENCES

ASPHALT-PAVED LOT

CONCRETE SLAB

EAST HARRISON STREET

PARKING

CONCRETE

OTE-SE1

SP14

SP18

EAST TYLER STREET

EAST 1ST STREET

FORMER ASTs (KEROSENE, SOLVENTS, AND STOVE OIL)

B18/MW18

SP10

NTE-M

NTE-NE

CT-DW CARD WEST 3

CLOSED-IN-PLACE UST

QUANTUM 2006 EXCAVATION

NTE-SE

CMW03

SP13

DIESEL PUMP ISLAND

SUMP

CT-GE CARD EAST 3

B19/MW19

GASOLINE UST

B21/MW21

B20/MW20

NORTH MORTON STREET

B30/MW30

B31/MW31

MANHOLE

SHELL PROPERTY

FORMER SHELL OIL COMPANY

RESIDENCE

COLFAX GRANGE BUILDING NO. 2

RV PARK

HARLO APARTMENTS

EASTERN COLFAX GRANGE PROPERTY

LEGEND

- B13/MW13 — MONITORING WELL (SOUNDEARTH 2008-2009)
- MW04 — MONITORING WELL (GEI 2001-2002)
- CMW05 — MONITORING WELL (QE 2004)
- CMW01 — DECOMMISSIONED MONITORING WELL
- SP09 — PUSH-PROBE BORING (SOUNDEARTH 2008)
- SP19 — PUSH-PROBE BORING (SOUNDEARTH 2010)
- T6/9 — EXCAVATION SOIL SAMPLES (GEI 1999)
- OTE-E2 — EXCAVATION SOIL SAMPLES (QE 2006)
- TP03 — TEST PIT (SOUNDEARTH 2009)
- RAILROAD
- PROPERTY BOUNDARIES
- REVISED SITE BOUNDARY
- WATER LINE
- SANITARY SEWER LINE
- STORMWATER LINE
- ANCESTRAL DRAINAGE
- FORMER EXCAVATIONS
- FORMER FEATURES
- SHALLOW GROUNDWATER FLOW DIRECTION (MAY 16, 2011)
- AST — ABOVEGROUND STORAGE TANK
- GEI — GEOENGINEERS, INC.
- QE — QUANTUM ENGINEERING
- UST — UNDERGROUND STORAGE TANK
- ESTIMATED CURRENT EXTENT OF PETROLEUM-CONTAMINATED SOIL AND GROUNDWATER BENEATH THE SITE

SoundEarth Strategies

1996 1998 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

Q1 Q1 Q1 Q3 Q1 Q3 Q1 Q3 Q1 Q3 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1

PROJECT TIMELINE

TIMELINE LEGEND | GROUNDWATER MONITORING | EXCAVATION | TANK REMOVAL | WELL INSTALLATION | WELL DECOMMISSION | SUBSURFACE INVESTIGATION

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DATE: 06/22/11
DRAWN BY: NAC/JQC
CHECKED BY: RKB
CAD FILE: 0592_2011FS_SBD

PROJECT NAME: NCPC SITE
PROJECT NUMBER: 0592-001
STREET ADDRESS: NORTH MAIN STREET AND EAST TYLER STREET
CITY, STATE: COLFAX, WASHINGTON

REGION:

0 30 60 120
APPROXIMATE SCALE IN FEET

FIGURE 2
SITE BOUNDARY DEFINITION

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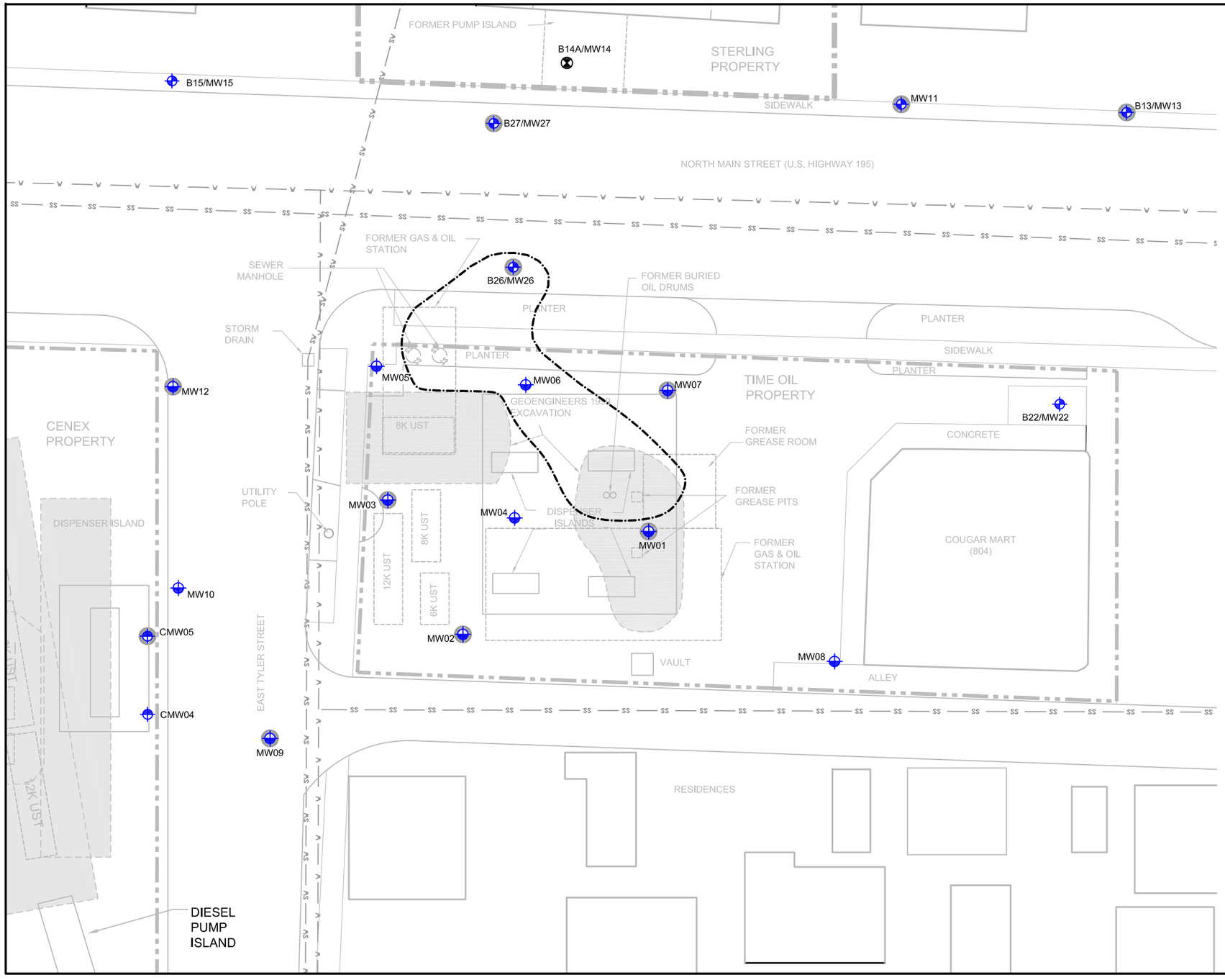
8/2/2011



N

LEGEND

B13/MW13	MONITORING WELL (SOUNDEARTH 2008-2009)
MW04	MONITORING WELL (GEI 2001-2002)
CMW05	MONITORING WELL (QE 2004)
B14A/MW14	DECOMMISSIONED MONITORING WELL
B26/MW26	MONITORING WELLS TO BE INCLUDED IN THE GROUNDWATER PROGRAM FOR CLEANUP ALTERNATIVE 1
	PROPERTY BOUNDARY
w	WATER LINE
ss	SANITARY SEWER LINE
sw	STORMWATER LINE
	FORMER EXCAVATIONS
	FORMER FEATURES
UST	UNDERGROUND STORAGE TANK
12K	12,000-GALLON
8K	8,000-GALLON
6K	6,000-GALLON
GEI	GEOENGINEERS, INC.
QE	QUANTUM ENGINEERING, INC.
	AREA OF INSTITUTIONAL CONTROL

SoundEarth Strategies
WWW.SOUNDEARTHINC.COM

DATE: 07/08/11
DRAWN BY: NAC/JQC
CHECKED BY: RKB
CAD FILE: 0592_2011FS_TO1

PROJECT NAME: NCPC SITE
PROJECT NUMBER: 0592-001
STREET ADDRESS: NORTH MAIN STREET AND EAST TYLER STREET
CITY, STATE: COLFAX, WASHINGTON

REGION:

0 15 30 60
APPROXIMATE SCALE IN FEET

FIGURE 3

TIME OIL PROPERTY CLEANUP ALTERNATIVE 1: MONITORED NATURAL ATTENUATION WITH INSTITUTIONAL CONTROL

P:\0592 NORTH COLFAX GROUP\TECHNICAL\CAD\2011FS\0592_2011FS_TO1.DWG

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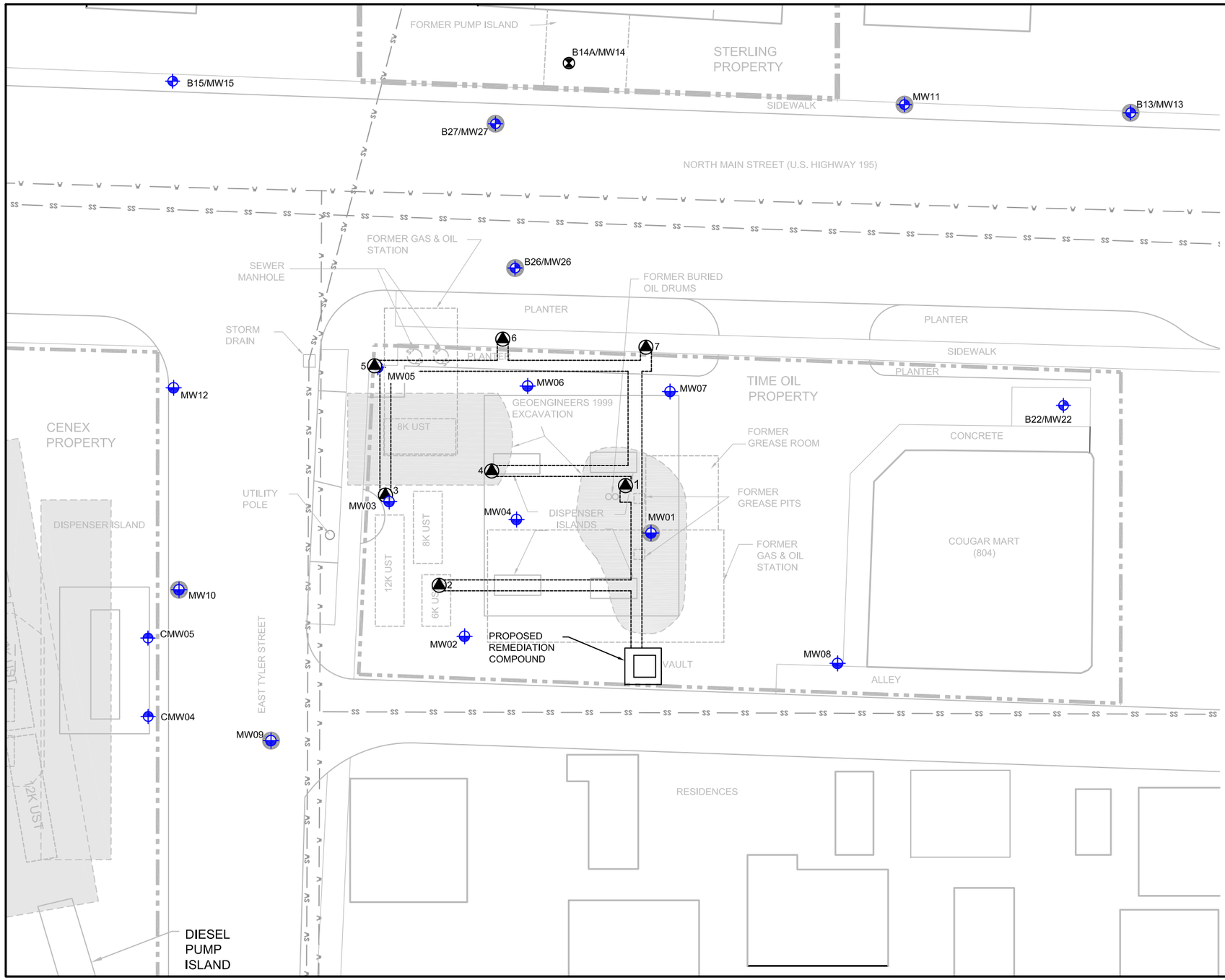
8/2/2011



N

LEGEND

B13/MW13	MONITORING WELL (SOUNDEARTH 2008-2009)
MW04	MONITORING WELL (GEI 2001-2002)
CMW05	MONITORING WELL (QE 2004)
B14A/MW14	DECOMMISSIONED MONITORING WELL
7	REMEDIAL SYSTEM WELL BOX AND NUMBER
B26/MW26	MONITORING WELLS TO BE INCLUDED IN THE GROUNDWATER PROGRAM FOR CLEANUP ALTERNATIVE 2
- - - - - - -	REMEDIAL SYSTEM PIPING
	PROPERTY BOUNDARY
— w —	WATER LINE
— ss —	SANITARY SEWER LINE
— sw —	STORMWATER LINE
	FORMER EXCAVATIONS
	FORMER FEATURES
UST	UNDERGROUND STORAGE TANK
12K	12,000-GALLON
8K	8,000-GALLON
6K	6,000-GALLON
GEI	GEOENGINEERS, INC.
QE	QUANTUM ENGINEERING, INC.

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CHECKED BY: RKB
CAD FILE: 0592_2011FS_TO2

PROJECT NAME: NCPC SITE
PROJECT NUMBER: 0592-001
STREET ADDRESS: NORTH MAIN STREET AND EAST TYLER STREET
CITY, STATE: COLFAX, WASHINGTON

REGION:

0 15 30 60
APPROXIMATE SCALE IN FEET

FIGURE 4
TIME OIL PROPERTY CLEANUP ALTERNATIVE 2: IN SITU BIOREMEDIATION VIA SOIL VAPOR EXTRACTION

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FORMER PUMP ISLAND

B14A/MW14

STERLING PROPERTY

B15/MW15

MW11

B13/MW13

SIDEWALK

B27/MW27

NORTH MAIN STREET (U.S. HIGHWAY 195)

FORMER GAS & OIL STATION

SEWER MANHOLE

B26/MW26

FORMER BURIED OIL DRUMS

PLANTER

STORM DRAIN

PLANTER

SIDEWALK

PLANTER

MW05

MW06

MW07

TIME OIL PROPERTY

MW12

GEOENGINEERS 1999 EXCAVATION

B22/MW22

CENEX PROPERTY

8K UST

1:1 SLOPE

CONCRETE

FORMER GREASE ROOM

UTILITY POLE

MW03

FORMER GREASE PITS

DISPENSER ISLAND

MW04

8K UST

MW01

FORMER GAS & OIL STATION

COUGAR MART (804)

DISPENSER ISLAND

12K UST

6K UST

MW10

MW02

CMW05

VAULT

MW08

ALLEY

CMW04

EAST TYLER STREET

MW09

12K UST

RESIDENCES

DIESEL PUMP ISLAND

N

LEGEND

B13/MW13	MONITORING WELL (SOUNDEARTH 2008-2009)
MW04	MONITORING WELL (GEI 2001-2002)
CMW05	MONITORING WELL (QE 2004)
	PROPERTY BOUNDARY
	SHORING
— w —	WATER LINE
— ss —	SANITARY SEWER LINE
— sw —	STORMWATER LINE
	FORMER EXCAVATIONS
	FORMER FEATURES
UST	UNDERGROUND STORAGE TANK
12K	12,000-GALLON
8K	8,000-GALLON
6K	6,000-GALLON
GEI	GEOENGINEERS, INC.
QE	QUANTUM ENGINEERING, INC.

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DRAWN BY: NAC/JQC
CHECKED BY: RKB
CAD FILE: 0592_2011FS_TO3

PROJECT NAME: NCPC SITE
PROJECT NUMBER: 0592-001
STREET ADDRESS: NORTH MAIN STREET AND EAST TYLER STREET
CITY, STATE: COLFAX, WASHINGTON

REGION:

0 15 30 60
APPROXIMATE SCALE IN FEET

FIGURE 5
TIME OIL PROPERTY CLEANUP ALTERNATIVE 3: BULK EXCAVATION WITH SHORING

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10/13/2011

B28/MW28
B24/MW24
FORMER GAS & OIL STATION
TP01
TP02
TP03
B16/MW16
CENEX PROPERTY
B23/MW23
MW12
TACO TIME RESTAURANT
B25/MW25
B29/MW29
COLFAX GRANGE PROPERTY (105 EAST HARRISON STREET)
CMW01
MW10
B33/MW32
B17/MW17
FORMER HEATING OIL UST
CMW02
CMW05
FORMER 1985-VINTAGE 8K USTs
CMW04
MW09
ASPHALT-PAVED LOT
CONCRETE SLAB
COLFAX GRANGE BUILDING
FORMER ASTs (KEROSENE, SOLVENTS, AND STOVE OIL)
CONCRETE
B18/MW18
EAST HARRISON STREET
PARKING
CLOSED-IN-PLACE UST
QUANTUM 2006 EXCAVATION
CMW03
DIESEL PUMP ISLAND
SUMP
B19/MW19
GASOLINE UST
B21/MW21
EAST TYLER STREET
12K UST
8K UST
DISPENSER ISLAND

N

LEGEND

B13/MW13	MONITORING WELL (SOUNDEARTH 2008-2009)
MW04	MONITORING WELL (GEI 2001-2002)
CMW05	MONITORING WELL (QE 2004)
CMW01	DECOMMISSIONED MONITORING WELL
MW09	MONITORING WELLS TO BE INCLUDED IN THE GROUNDWATER PROGRAM FOR CLEANUP ALTERNATIVE 1
TP02	TEST PIT EXCAVATIONS (SOUNDEARTH 2009)
	RAILROAD
	PROPERTY BOUNDARY
W	WATER LINE
SS	SANITARY SEWER LINE
SW	STORMWATER LINE
	FORMER EXCAVATIONS
	FORMER FEATURES
AST	ABOVEGROUND STORAGE TANK
GEI	GEOENGINEERS, INC.
QE	QUANTUM ENGINEERING, INC.
UST	UNDERGROUND STORAGE TANK
8K	8,000-GALLON
12K	12,000-GALLON
	AREA OF INSTITUTIONAL CONTROL

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DATE: 07/08/11
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CHECKED BY: RKB
CAD FILE: 0592_2011FS_CE1

PROJECT NAME: NCPC SITE
PROJECT NUMBER: 0592-001
STREET ADDRESS: NORTH MAIN STREET AND EAST TYLER STREET
CITY, STATE: COLFAX, WASHINGTON

REGION:

0 15 30 60
APPROXIMATE SCALE IN FEET

FIGURE 6

CENEX PROPERTY CLEANUP ALTERNATIVE 1: MONITORED NATURAL ATTENUATION WITH INSTITUTIONAL CONTROL

P:\0592 NORTH COLFAX GROUP\TECHNICAL\CAD\2011FS\0592_2011FS_CE1.DWG

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10/13/2011

B28/MW28
B24/MW24
FORMER GAS & OIL STATION
TP01
TP02
TP03
B16/MW16
CENEX PROPERTY
B23/MW23
PROPOSED REMEDIATION COMPOUND
MW12
PROPOSED TRENCHING FOR BURIED SVE PIPING
TACO TIME RESTAURANT
B25/MW25
B29/MW29
COLFAX GRANGE PROPERTY (105 EAST HARRISON STREET)
RW07
RW06
CMW01
MW10
B17/MW17
B33/MW32
FORMER HEATING OIL UST
CMW05
RW04
CMW02
RW05
FORMER 1985-VINTAGE 8K USTs
DISPENSER ISLAND
EAST TYLER STREET
CMW04
MW09
ASPHALT-PAVED LOT
CONCRETE SLAB
COLFAX GRANGE BUILDING
FORMER ASTs (KEROSENE, SOLVENTS, AND STOVE OIL)
CONCRETE
RW03
RW02
B18/MW18
EAST HARRISON STREET
PARKING
CLOSED-IN-PLACE UST
QUANTUM 2006 EXCAVATION
CMW03
RW01
DIESEL PUMP ISLAND
SUMP
B19/MW19
GASOLINE UST
B21/MW21

N

LEGEND

B13/MW13	MONITORING WELL (SOUNDEARTH 2008-2009)
MW04	MONITORING WELL (GEI 2001-2002)
CMW05	MONITORING WELL (QE 2004)
CMW01	DECOMMISSIONED MONITORING WELL
RW07	PROPOSED SOIL VAPOR EXTRACTION OR PASSIVE VENT WELL
MW12	MONITORING WELLS TO BE INCLUDED IN THE GROUNDWATER PROGRAM FOR CLEANUP ALTERNATIVE 2
TP02	TEST PIT EXCAVATIONS (SOUNDEARTH 2009)
	RAILROAD
	REMEDIAL SYSTEM PIPING
	PROPERTY BOUNDARY
W	WATER LINE
SS	SANITARY SEWER LINE
SW	STORMWATER LINE
	ANCESTRAL DRAINAGE
	FORMER EXCAVATIONS
	FORMER FEATURES
AST	ABOVEGROUND STORAGE TANK
GEI	GEOENGINEERS, INC.
QE	QUANTUM ENGINEERING, INC.
UST	UNDERGROUND STORAGE TANK
8K	8,000-GALLON
12K	12,000-GALLON

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DATE: 07/08/11
DRAWN BY: NAC
CHECKED BY: RKB
CAD FILE: 0592_2011FS_CE2

PROJECT NAME: NCPC SITE
PROJECT NUMBER: 0592-001
STREET ADDRESS: NORTH MAIN STREET AND EAST TYLER STREET
CITY, STATE: COLFAX, WASHINGTON

REGION:

0 15 30 60
APPROXIMATE SCALE IN FEET

FIGURE 7
CENEX PROPERTY CLEANUP ALTERNATIVE 2: IN SITU BIOREMEDIATION VIA SOIL VAPOR EXTRACTION

P:\0592 NORTH COLFAX GROUP\TECHNICAL\CAD\2011FS\0592_2011FS_CE2.DWG

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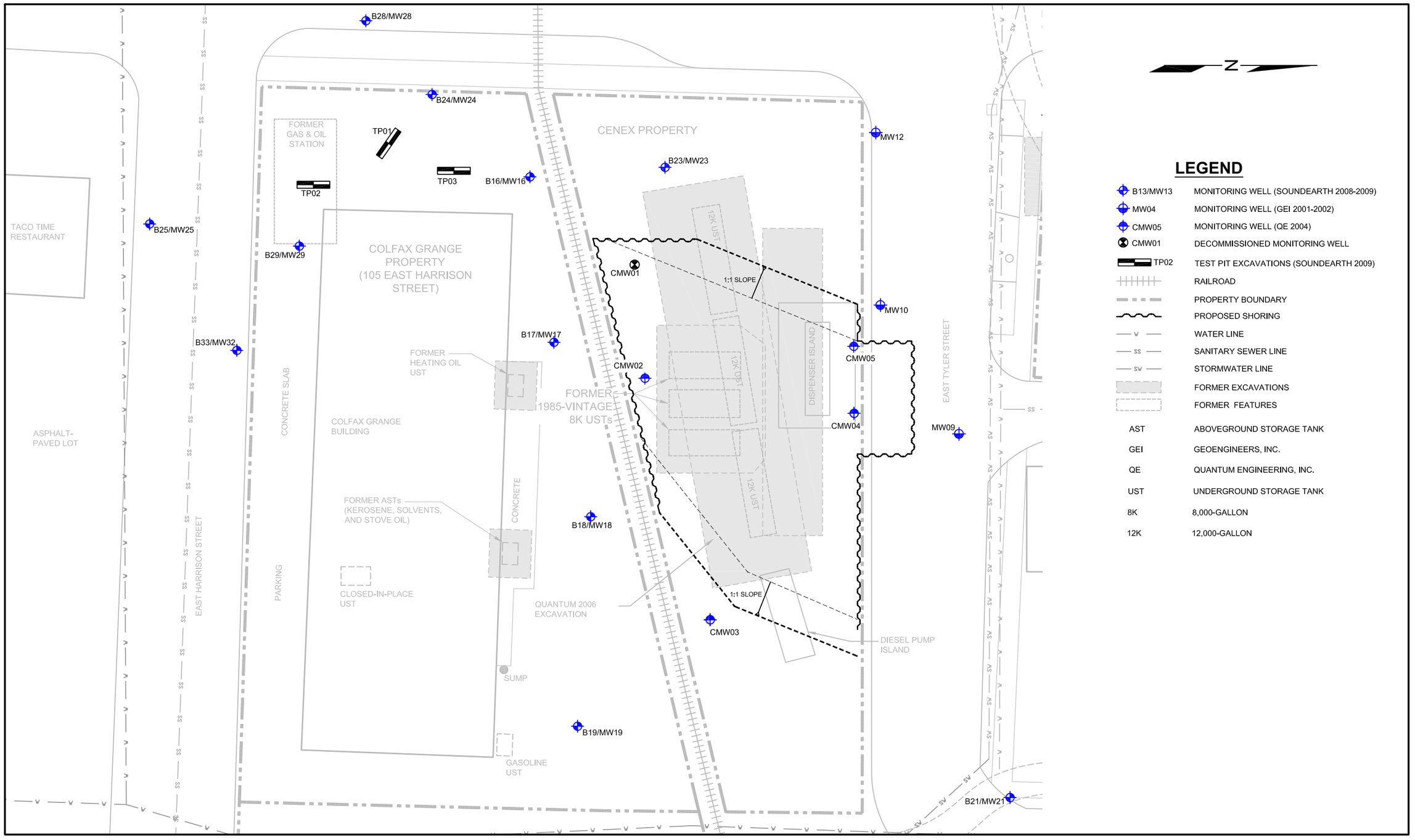
10/13/2011



LEGEND

B13/MW13	MONITORING WELL (SOUNDEARTH 2008-2009)
MW04	MONITORING WELL (GEI 2001-2002)
CMW05	MONITORING WELL (QE 2004)
CMW01	DECOMMISSIONED MONITORING WELL
TP02	TEST PIT EXCAVATIONS (SOUNDEARTH 2009)
	RAILROAD
	PROPERTY BOUNDARY
	PROPOSED SHORING
W	WATER LINE
SS	SANITARY SEWER LINE
SW	STORMWATER LINE
	FORMER EXCAVATIONS
	FORMER FEATURES
AST	ABOVEGROUND STORAGE TANK
GEI	GEOENGINEERS, INC.
QE	QUANTUM ENGINEERING, INC.
UST	UNDERGROUND STORAGE TANK
8K	8,000-GALLON
12K	12,000-GALLON

SoundEarth Strategies
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DATE: 07/08/11
DRAWN BY: NAC/JQC
CHECKED BY: RKB
CAD FILE: 0592_2011FS_CE3

PROJECT NAME: NCPC SITE
PROJECT NUMBER: 0592-001
STREET ADDRESS: NORTH MAIN STREET AND EAST TYLER STREET
CITY, STATE: COLFAX, WASHINGTON

REGION:

0 15 30 60
APPROXIMATE SCALE IN FEET

FIGURE 8
CENEX PROPERTY CLEANUP ALTERNATIVE 3: BULK EXCAVATION WITH SHORING

P:\0592 NORTH COLFAX GROUP\TECHNICAL\CAD\2011FS\0592_2011FS_CE3.DWG

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10/13/2011

B28/MW28
B24/MW24
TP01
FORMER GAS & OIL STATION
TP02
TP03
B16/MW16
CENEX PROPERTY
MW12
B23/MW23
TACO TIME RESTAURANT
B25/MW25
B29/MW29
COLFAX GRANGE PROPERTY (105 EAST HARRISON STREET)
CMW01
12K UST
MW10
B33/MW32
FORMER HEATING OIL UST
B17/MW17
CMW02
CMW05
DISPENSER ISLAND
EAST TYLER STREET
CONCRETE SLAB
FORMER 1985-VINTAGE 8K USTs
CMW04
MW09
ASPHALT-PAVED LOT
COLFAX GRANGE BUILDING
FORMER ASTs (KEROSENE, SOLVENTS, AND STOVE OIL)
CONCRETE
B18/MW18
EAST HARRISON STREET
PARKING
CLOSED-IN-PLACE UST
QUANTUM 2006 EXCAVATION
CMW03
DIESEL PUMP ISLAND
SUMP
B19/MW19
GASOLINE UST
B21/MW21

N

LEGEND

B13/MW13	MONITORING WELL (SOUNDEARTH 2008-2009)
MW04	MONITORING WELL (GEI 2001-2002)
CMW05	MONITORING WELL (QE 2004)
CMW01	DECOMMISSIONED MONITORING WELL
B29/MW29	MONITORING WELLS TO BE INCLUDED IN THE GROUNDWATER PROGRAM FOR CLEANUP ALTERNATIVE 1
TP02	TEST PIT EXCAVATIONS (SOUNDEARTH 2009)
	RAILROAD
	PROPERTY BOUNDARY
W	WATER LINE
SS	SANITARY SEWER LINE
SW	STORMWATER LINE
	FORMER EXCAVATIONS
	FORMER FEATURES
AST	ABOVEGROUND STORAGE TANK
GEI	GEOENGINEERS, INC.
QE	QUANTUM ENGINEERING, INC.
UST	UNDERGROUND STORAGE TANK
8K	8,000-GALLON
12K	12,000-GALLON
	AREA OF INSTITUTIONAL CONTROL

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DATE: 07/08/11
DRAWN BY: NAC/JQC
CHECKED BY: RKB
CAD FILE: 0592_2011FS_CG1

PROJECT NAME: NCPC SITE
PROJECT NUMBER: 0592-001
STREET ADDRESS: NORTH MAIN STREET AND EAST TYLER STREET
CITY, STATE: COLFAX, WASHINGTON

REGION:

0 15 30 60
APPROXIMATE SCALE IN FEET

FIGURE 9
COLFAX GRANGE PROPERTY CLEANUP
ALTERNATIVE 1: MONITORED NATURAL ATTENUATION WITH INSTITUTIONAL CONTROL

P:\0592 NORTH COLFAX GROUP\TECHNICAL\CAD\2011FS\0592_2011FS_CG1.DWG

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10/13/2011

B28/MW28
B24/MW24
TP01
TP03
TP02
B16/MW16
B25/MW25
B29/MW29
B33/MW32
B17/MW17
B18/MW18
B19/MW19
B23/MW23
CMW01
CMW02
CMW03
CMW04
CMW05
MW10
MW12
MW09
B21/MW21
TACO TIME RESTAURANT
ASPHALT-PAVED LOT
FORMER GAS & OIL STATION
COLFAX GRANGE PROPERTY (105 EAST HARRISON STREET)
COLFAX GRANGE BUILDING
CONCRETE SLAB
FORMER HEATING OIL UST
FORMER 1985-VINTAGE 8K USTs
CENEX PROPERTY
12K UST
DISPENSER ISLAND
EAST TYLER STREET
EAST HARRISON STREET
PARKING
CONCRETE
FORMER ASTs (KEROSENE, SOLVENTS, AND STOVE OIL)
CLOSED-IN-PLACE UST
QUANTUM 2006 EXCAVATION
SUMP
GASOLINE UST
DIESEL PUMP ISLAND
SS
SV
W

N

LEGEND

B13/MW13	MONITORING WELL (SOUNDEARTH 2008-2009)
MW04	MONITORING WELL (GEI 2001-2002)
CMW05	MONITORING WELL (QE 2004)
CMW01	DECOMMISSIONED MONITORING WELL
	PROPOSED CHEMICAL OXIDATION INJECTION POINT
B16/MW16	MONITORING WELLS TO BE INCLUDED IN THE GROUNDWATER PROGRAM FOR CLEANUP ALTERNATIVE 2
TP02	TEST PIT EXCAVATIONS (SOUNDEARTH 2009)
	RAILROAD
	PROPERTY BOUNDARY
W	WATER LINE
SS	SANITARY SEWER LINE
SW	STORMWATER LINE
	ANCESTRAL DRAINAGE
	FORMER EXCAVATIONS
	FORMER FEATURES
AST	ABOVEGROUND STORAGE TANK
GEI	GEOENGINEERS, INC.
QE	QUANTUM ENGINEERING, INC.
UST	UNDERGROUND STORAGE TANK
8K	8,000-GALLON
12K	12,000-GALLON

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DATE: 07/08/11
DRAWN BY: NAC/JQC
CHECKED BY: RKB
CAD FILE: 0592_2011FS_CG2

PROJECT NAME: NCPC SITE
PROJECT NUMBER: 0592-001
STREET ADDRESS: NORTH MAIN STREET AND EAST TYLER STREET
CITY, STATE: COLFAX, WASHINGTON

REGION:

0 15 30 60
APPROXIMATE SCALE IN FEET

FIGURE 10

COLFAX GRANGE PROPERTY CLEANUP
ALTERNATIVE 2: IN SITU REMEDIATION VIA CHEMICAL OXIDATION

P:\0592 NORTH COLFAX GROUP\TECHNICAL\CAD\2011FS\0592_2011FS_CG2.DWG

SOUNDEARTHINC.COM

10/13/2011

B28/MW28

B24/MW24

TP01

TP02

TP03

B16/MW16

FORMER GAS & OIL STATION

1:1 SLOPE

CENEX PROPERTY

MW12

B23/MW23

TACO TIME RESTAURANT

B25/MW25

B29/MW29

COLFAX GRANGE PROPERTY (105 EAST HARRISON STREET)

CMW01

12K UST

MW10

B33/MW32

B17/MW17

CMW05

FORMER HEATING OIL UST

CMW02

DISPENSER ISLAND

EAST TYLER STREET

FORMER 1985-VINTAGE 8K USTs

CMW04

MW09

ASPHALT-PAVED LOT

CONCRETE SLAB

COLFAX GRANGE BUILDING

FORMER ASTs (KEROSENE, SOLVENTS, AND STOVE OIL)

CONCRETE

B18/MW18

EAST HARRISON STREET

PARKING

CLOSED-IN-PLACE UST

QUANTUM 2006 EXCAVATION

CMW03

DIESEL PUMP ISLAND

SUMP

B19/MW19

GASOLINE UST

B21/MW21

N

LEGEND

B13/MW13	MONITORING WELL (SOUNDEARTH 2008-2009)
MW04	MONITORING WELL (GEI 2001-2002)
CMW05	MONITORING WELL (QE 2004)
CMW01	DECOMMISSIONED MONITORING WELL
TP02	TEST PIT EXCAVATIONS (SOUNDEARTH 2009)
	RAILROAD
	PROPERTY BOUNDARY
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W	WATER LINE
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	ANCESTRAL DRAINAGE
	FORMER EXCAVATIONS
	FORMER FEATURES
AST	ABOVEGROUND STORAGE TANK
GEI	GEOENGINEERS, INC.
QE	QUANTUM ENGINEERING, INC.
UST	UNDERGROUND STORAGE TANK
8K	8,000-GALLON
12K	12,000-GALLON

SoundEarth Strategies
WWW.SOUNDEARTHINC.COM

DATE: 07/08/11
DRAWN BY: NAC/JQC
CHECKED BY: RKB
CAD FILE: 0592_2011FS_CG3

PROJECT NAME: NCPC SITE
PROJECT NUMBER: 0592-001
STREET ADDRESS: NORTH MAIN STREET AND EAST TYLER STREET
CITY, STATE: COLFAX, WASHINGTON

REGION:

0 15 30 60
APPROXIMATE SCALE IN FEET

FIGURE 11
COLFAX GRANGE PROPERTY CLEANUP
ALTERNATIVE 3:
BULK EXCAVATION WITH SHORING

P:\0592 NORTH COLFAX GROUP\TECHNICAL\CAD\2011FS\0592_2011FS_CG3.DWG

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TABLES

SoundEarth Strategies

Table 1
Summary of Soil Analytical Results for TPH and VOCs
North Colfax Petroleum Contamination Site
Colfax, Washington

Boring Number/Sample Area	Sample Identification	Date Sampled	Sample Depth (feet)[1]	Sampled By	Analyzed By	Analytical Results (mg/kg)											
						NWTPH-HCID[2]	DRPH[3]	ORPH[3]	GRPH[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[5]	EDC[5]	VOCs[6]
TIME OIL 1999 EXCAVATION																	
New UST Excavation	TOC - 1/10	09/03/99	10	GEI	Anatek	—	<25.0	—	0.27	<0.283	<0.283	<0.283	0.003	—	—	—	—
Former Service Bay Installation	GP-01	09/09/99	2			—	<25.0	280	—	—	—	—	—	—	—	—	—
	GP-02		10-11			—	<25.0	173	—	—	—	—	—	—	—	—	—
	GP-03		10-11			—	75.8	1,900	—	<0.005	0.093	<0.005	0.037	—	—	—	<CUL
	T-1/12	09/14/99	12			—	<25.0	<100.0	—	—	—	—	—	—	—	—	—
	T-3/9		9			—	<25.0	<100.0	—	—	—	—	—	—	—	—	—
	T-4/9		9			—	<25.0	<100.0	—	—	—	—	—	—	—	—	—
	T-5/9		9			—	26.4	<100.0	—	—	—	—	—	—	—	—	—
	T-6/9		9			—	<25.0	<100.0	—	—	—	—	—	—	—	—	—
	T-7/9	09/18/99	9			—	<25.0	**2,770**	—	—	—	—	—	—	—	—	—
	T-8/9		9			—	<25.0	**3,260**	—	—	—	—	—	—	—	—	—
	T-9/6		6			—	<25.0	157.6	—	—	—	—	—	—	—	—	—
Former Service Bay Installation Stockpile Samples	TOC-SP-1	09/03/99	—			—	<25.0	—	**2,370**	**0.083**	0.0292	**14.2**	**34.4**	—	—	—	—
	COMPOSITE (SP-2 through 6)		—			—	<25.0	—	**146**	0.029	0.013	1.30	2.20	—	—	—	—
	SS-01-100199	10/01/99	—			—	<25.0	<100.0	—	—	—	—	—	—	—	—	—
GEOENGINEERS AND QUANTUM SOIL BORINGS																	
MW02	MW-2-7	02/06/01	7	GEI	NCA	—	<10.0	<25.0	<5.00	<0.0500	<0.0500	<0.0500	<0.100	–	—	—	—
MW03	MW-3-5		5			—	34.5	27.7	<5.00	<0.0500	<0.0500	<0.0500	<0,100	–	—	—	—
	MW-3-10		10			—	<10.0	<25.0	<5.00	<0.0500	<0.0500	<0.0500	<0.100	–	—	—	—
MW04	MW-4-5	02/09/01	5			—	<10.0	<25.0	<5.00	<0.0500	<0.0500	<0.0500	<0.100	–	—	—	—
MW05	MW-5-5	02/07/01	5			—	15.9	30.9	**40.3**	<0.0500	<0.0500	<0.0500	<0.100	–	—	—	—
MW06	MW-6-5	02/08/01	5			—	464	<575	**4,300**	<2.09	<2.09	<7.11	<30.1	–	—	—	—
MW07	MW-7-5	02/07/01	5			—	<10.0	<25.0	<5.00	<0.0500	<0.0500	<0.0500	<0.100	–	—	—	—
CMW04	CMW4 5-6	12/03/04	5-6	QE	TA	—	—	—	<10.0	<0.0250	<0.200	<0.200	<0.600	—	—	—	—
	CMW4 7.5-9		7.5-9			—	—	—	<10.0	<0.0250	<0.200	<0.200	<0.600	—	—	—	—
	CMW4 12-13.5		12-13.5			—	—	—	<10.0	<0.0250	<0.200	<0.200	<0.600	—	—	—	—
CMW05	CMW5 5-6		5-6			—	—	—	<10.0	<0.0250	<0.200	<0.200	<0.600	—	—	—	—
	CMW5 10-10.5		10-10.5			—	—	—	<10.0	<0.0250	<0.200	<0.200	<0.600	—	—	—	—
QUANTUM 2004 EXCAVATION																	
Colfax Grange Sump Excavation Area	ULIP 0-6	11/01/04	0.5	QE	NCA	—	—	—	**1,820**	**7.24**	**59.5**	**24.5**	**158**	—	—	—	—
	ULIP 15"		1			—	—	—	**1,690**	**2.69**	**25.8**	**15.7**	**145**	—	—	—	—
	SULIP 0-6"		0.5			—	—	—	<10.0	<0.0250	<0.200	<0.200	<0.600	—	—	—	—
	SULIP 15		1			—	—	—	<10.0	<0.0250	<0.200	<0.200	<0.600	—	—	—	—
	SUL Pump 0-6"		0.5			—	—	—	<10.0	<0.0250	<0.200	<0.200	<0.600	—	—	—	—
	UL Pump 0-6"		0.5			—	—	—	**524**	**0.397**	0.237	0.596	3.19	—	—	—	—
	SUL-IP Vault	11/15/04	—			—	—	—	<10.0	<0.0250	<0.200	<0.200	<0.600	—	—	—	—
	Diesel IP Vault		—			—	178	<25.0	**990**	<0.0250	<0.200	2.73	**93.6**	—	—	—	—
	SUL Turbine		—			—	—	—	24.6	**0.0685**	<0.200	<0.200	<0.600	—	—	—	—
	East Diesel IP - After		—			—	589	<25.0	<40	<0.100	<0.800	<0.800	<2.40	—	—	—	—
	West Diesel IP-After		—			—	70.8	<25.0	**231**	<0.250	<2.00	<2.00	8.89	—	—	—	—
	ULIP Vault		—			—	—	—	**604**	<0.250	<2.00	<2.00	**22.2**	—	—	—	—
	Diesel Turbine		—			—	**7,660**	1,450	**595**	**0.395**	1.25	0.981	**12.9**	—	—	—	—
	UL Turbine		—			—	—	—	**5,030**	**4.28**	**30.1**	**16.4**	**205**	—	—	—	—
MTCA Method A Cleanup Level for Soil[7]						**NE**	**2,000**	**2,000**	**30**	**0.03**	**7**	**6**	**9**	**0.1**	**0.005**	**11[a]**	**NE**

SoundEarth Strategies

Table 1
Summary of Soil Analytical Results for TPH and VOCs
North Colfax Petroleum Contamination Site
Colfax, Washington

Boring Number/Sample Area	Sample Identification	Date Sampled	Sample Depth (feet)[1]	Sampled By	Analyzed By	Analytical Results (mg/kg)											
						NWTPH-HCID[2]	DRPH[3]	ORPH[3]	GRPH[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[5]	EDC[5]	VOCs[6]
CENEX 2006 EXCAVATION																	
Cenex UST Excavation Area	SUL BTM Comp South	10/25/06	10	QE	TA	—	—	—	**188**	<0.0530	<0.424	<0.424	<1.27	<0.106	—	—	—
	UL Turbine		1.5			—	—	—	<11.3	<0.0282	0.226	0.226	0.677	<.113	—	—	—
	UL BTM Comp		10			—	—	—	**1,230**	<0.264	5.36	**10.2**	**69.3**	<2.11	—	—	—
	D Pump		1.5			—	1,640	394	—	**0.269**	**23.1**	**20.1**	**129**	—	—	—	—
	Diesel Tank BTM N		10			—	780	27.9	—	<0.329	<4.39	**7.35**	**18.6**	—	—	—	—
	Diesel Tank BTM S		10			—	**3,860**	165	—	**3.86**	**44.0**	**27.5**	**128**	—	—	—	—
	West Disp		1.5			—	—	—	**1,730**	**3.92**	**40.7**	**22.9**	**151**	<0.252	—	—	—
	Center Disp		1.5			—	—	—	**235**	<0.0263	<0.210	<0.210	2.5	<0.105	—	—	—
	East Disp		1.5			—	—	—	**600**	<0.267	**10.7**	**10.6**	**73.2**	<0.107	—	—	—
	West Card Diesel		1.5			—	**3,850**	601	—	<0.0182	<0.243	<0.243	<0.729	—	—	—	—
	East Card Diesel		1.5			—	—	—	20.7	<0.0311	<0.249	<0.249	<0.747	<0.125	—	—	—
	UL Fill		1.5			—	—	—	<10.4	<0.0261	<0.209	<0.209	<0.626	<0.104	—	—	—
	UL IP		1.5			—	—	—	<10.6	<0.0265	<0.212	<0.212	<0.636	<0.106	—	—	—
	UL Turbine 2		2			—	—	—	**3,260**	**13**	**189**	**68.7**	**397**	<2.18	—	—	—
	D Fill		1.5			—	735	286	—	<0.0165	<0.220	<0.220	<0.661	—	—	—	—
	D IP		1.5			—	43.5	<26.1	—	<0.0157	<0.209	<0.209	<0.627	—	—	—	—
	Drop Island	10/27/06	2			—	23.2	214	<11.5	<0.0286	<0.229	<0.229	<0.687	<0.115	—	—	—
	P1		5-10			—	24.2	<44.8	22.2	<0.0321	<0.256	<0.256	<0.769	<0.128	—	—	—
	P2		9-11			—	898	43.6	**145**	<0.0267	<0.213	<0.213	<0.640	<0.107	—	—	—
	P4		5-10			—	—	—	<12.3	<0.0308	<0.247	<0.247	<0.740	<0.123	—	—	—
	P5/P6		4-8			—	—	—	<13.1	<0.0327	<0.262	<0.262	<0.785	<0.131	—	—	—
	P9		9-11			—	—	—	**41.5**	<0.0310	<0.248	<0.248	<0.743	<0.124	—	—	—
	P10		10-11			—	—	—	<12.9	<0.0321	<0.257	<0.257	<0.771	<0.129	—	—	—
	P11		5-10			—	141	<42.8	**1,050**	**0.0561**	0.352	2.45	**17.2**	<1.30	—	—	—
	P12		10-11			—	<15.2	<37.9	<12.8	<0.0320	<0.256	<0.256	<0.767	<0.128	—	—	—
	OTE-SE1-6	11/10/06	6		Anatek	—	<25	<100	**139**	0.013	0.021	0.108	1.802	<0.010	—	—	—
	OTE-E2-11		11			—	<25	<100	7.1	**0.063**	0.01	0.02	0.062	<0.010	—	—	—
	OTE-E3-6		6			—	<25	<100	18.2	**0.131**	0.059	0.056	0.352	<0.010	—	—	—
	OTE-E4-6		6			—	<25	102	**39.6**	**0.544**	0.322	0.336	1.329	<0.010	—	—	—
	OTE-W6-6		6			—	<25	<100	11.0	**0.052**	0.032	0.014	0.03	<0.010	—	—	—
	OTE-SE1-11		11			—	<25	<100	7.6	0.027	0.012	<0.005	0.067	<0.010	—	—	—
	OTE-E2-6		6			—	<25	173	8.0	0.023	0.014	0.009	0.084	<0.010	—	—	—
	OTE-W5-5		5			—	<25	<100	9.7	0.029	0.015	0.011	0.093	<0.010	—	—	—
	OTE-W5-10		10			—	<25	<100	9.5	0.026	0.025	0.015	0.097	<0.010	—	—	—
	OTE-W6-11		11			—	<25	<100	6.4	0.016	0.006	<0.005	0.017	<0.010	—	—	—
	N1-11	11/13/06	11			—	465	<100	**642**	**0.099**	0.249	1.14	7.16	<0.025	—	—	—
	N2-11		11			—	<25	<100	**46.2**	**0.058**	0.074	0.15	0.636	<0.025	—	—	—
	CT-DW-3.0		3			—	<25	<100	<2.50	<0.025	<0.025	<0.025	<0.075	<0.025	—	—	—
	CT-GE-3.0		3			—	—	—	<2.50	<0.025	<0.025	<0.025	<0.075	<0.025	—	—	—
	NTE-NE 3-6	11/14/06	3-6			—	<25	<100	<2.50	**0.083**	0.058	<0.025	<0.075	<0.025	—	—	—
	NTE-NE 6-9		6-9			—	<25	<100	4.29	**0.228**	0.483	0.03	0.175	<0.025	—	—	—
	NTE-M 3-6		3-6			—	<25	<100	10.5	**0.49**	1.3	0.073	0.806	<0.025	—	—	—
	NTE-M 6-9		6-9			—	<25	<100	<2.50	**0.044**	0.101	<0.025	<0.075	<0.025	—	—	—
MTCA Method A Cleanup Level for Soil[7]						**NE**	**2,000**	**2,000**	**30**	**0.03**	**7**	**6**	**9**	**0.1**	**0.005**	**11[a]**	**NE**

SoundEarth Strategies

Table 1
Summary of Soil Analytical Results for TPH and VOCs
North Colfax Petroleum Contamination Site
Colfax, Washington

Boring Number/Sample Area	Sample Identification	Date Sampled	Sample Depth (feet)[1]	Sampled By	Analyzed By	Analytical Results (mg/kg)											
						NWTPH-HCID[2]	DRPH[3]	ORPH[3]	GRPH[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[5]	EDC[5]	VOCs[6]
CENEX 2006 EXCAVATION																	
Cenex UST Excavation Area	NTE-SE 3-6	11/14/06	3-6			—	<25	<100	3.27	<0.025	<0.025	<0.025	<0.075	<0.025	—	—	—
	NTE-SE 6-9		6-9			—	<25	<100	<2.50	<0.025	0.031	<0.025	<0.075	<0.025	—	—	—
	Card West 3	11/20/06	3			—	77.6	<45.0	<12.0	<0.0299	<0.239	<0.239	<0.718	—	—	—	—
	Card East 3		3			—	13.1	<29.7	<11.9	<0.0297	<0.237	<0.237	<0.712	—	—	—	—
Cenex Facility Imported Backfill	Backfill Comp.	11/20/06	NA			—	<10.4	<26.0	<10.4	<0.0260	<0.208	<0.208	<0.623	—	—	—	—
SOUNDEARTH SOIL BORINGS																	
SP01	SP01-06.5-07.5	04/09/08	6.5-7.5	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP01-11-12		11-12			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP01-13-14		13-14			ND	<50	<250	<20	—	—	—	—	—	—	—	—
SP02	SP02-03-04	04/09/08	3-4	SoundEarth	F&B	—	150[x]	<250	**670**	**1.6**	**11**	**10**	**64**	—	—	—	—
	SP02-07-08		7-8			—	850[x]	<250	**3,300**	**3.3**	**62**	**78**	**480**	**2.0**	<0.05	<0.05	<CUL
	SP02-13-14		13-14			—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
SP03	SP03-07-08	04/09/08	7-8	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP03-10-11		10-11			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP03-12-13		12-13			ND	<50	<250	<20	—	—	—	—	—	—	—	—
SP04	SP04-07-08	04/09/08	7-8	SoundEarth	F&B	—	<50	<250	**34**	<0.02	0.03	0.12	0.35	—	—	—	—
	SP04-10-11		10-11			—	160[x]	<250	**1,100**	<0.02	1.2	**24**	**24**	—	—	—	—
	SP04-12-13		12-13			—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
SP05	SP05-07-08	04/09/08	7-8	SoundEarth	F&B	—	1,200[x]	<250	**2,400**	<0.03	<0.05	0.48	<0.15	<0.05	<0.05	<0.05	<CUL
	SP05-10-11		10-11			—	120[x]	<250	**280**	<0.02	0.12	3.5	2	—	—	—	—
	SP05-13-14		13-14			—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
SP06	SP06-03-04	04/09/08	3-4	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP06-07-08		7-8			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP06-11-12		11-12			ND	<50	<250	<20	—	—	—	—	—	—	—	—
SP07	SP07-03-04	04/09/08	3-4	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP07-07-08		7-8			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP07-12.5-13.5		12.5-13.5			ND	<50	<250	<20	—	—	—	—	—	—	—	—
SP08	SP08-05-06	04/10/08	5-6	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP08-10-11		10-11			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP08-13-14		13-14			ND	<50	<250	<20	—	—	—	—	—	—	—	—
SP09	SP09-06-07	04/10/08	6-7	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP09-09-10		9-10			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP09-13-14		13-14			ND	<50	<250	<20	—	—	—	—	—	—	—	—
SP10	SP10-05-06	04/10/08	5-6	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP10-09-10		9-10			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP10-14-15		14-15			ND	<50	<250	<20	—	—	—	—	—	—	—	—
SP11	SP11-03-04	04/09/08	3-4	SoundEarth	F&B	—	<50	<250	11	**0.37**	0.02	0.05	0.59	—	—	—	—
	SP11-05-06		5-6			—	<50	<250	6	**0.29**	<0.05	<0.05	0.15	<0.05	<0.05	<0.05	<CUL
	SP11-09.5-10.5		9.5-10.5			—	<50	<250	2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
	SP11-13-14		13-14			—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
MTCA Method A Cleanup Level for Soil[7]						**NE**	**2,000**	**2,000**	**30**	**0.03**	**7**	**6**	**9**	**0.1**	**0.005**	**11[a]**	**NE**

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Summary of Soil Analytical Results for TPH and VOCs
North Colfax Petroleum Contamination Site
Colfax, Washington

Boring Number/Sample Area	Sample Identification	Date Sampled	Sample Depth (feet)[1]	Sampled By	Analyzed By	Analytical Results (mg/kg)											
						NWTPH-HCID[2]	DRPH[3]	ORPH[3]	GRPH[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[5]	EDC[5]	VOCs[6]
SOUNDEARTH SOIL BORINGS																	
SP12	SP12-06.5-08	04/10/08	6.5-8	SoundEarth	F&B	—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
	SP12-10-12		10-12			—	<50	<250	**140**	**0.034**	<0.05	0.75	2.97	<0.05	<0.05	<0.05	<CUL
	SP12-13-14		13-14			—	<50	<250	**66**	<0.02	0.26	0.6	2.9	—	—	—	—
	SP12-14-15		14-15			—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
SP13	SP13-05.5-06.5	04/10/08	5.5-6.5	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP13-09-10		9-10			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP13-12.5-13.5		12.5-13.5			ND	<50	<250	<20	—	—	—	—	—	—	—	—
SP14	SP14-04.5-05.5	04/10/08	4.5-5.5	SoundEarth	F&B	—	<50	<250	3.0	**0.11**	0.02	0.02	<0.06	—	—	—	—
	SP14-07-08		7-8			—	<50	<250	<2	**0.074**	<0.05	<0.05	<0.15	<0.05	<0.05	<0.15	<CUL
	SP14-13-14		13-14			—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
SP15	SP15-06-07	04/10/08	6-7	SoundEarth	F&B	—	<50	<250	3.0	**0.21**	<0.05	<0.05	0.29	<0.05	<0.05	<0.15	<CUL
	SP15-10-11		10-11			—	<50	<250	<2	0.03	<0.02	<0.02	0.06	—	—	—	—
	SP15-13-14		13-14			—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
SP16	SP16-09.5-10	04/10/08	9.5-10	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP16-13-14		13-14			ND	<50	<250	<20	—	—	—	—	—	—	—	—
SP17	SP17-05-07	04/09/08	5-7	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP17-10-11		10-11			ND	<50	<250	<20	—	—	—	—	—	—	—	—
SP18	SP18-4-5	08/16/10	4-5	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP18-9-10		9-10			ND	<50	<250	<20	—	—	—	—	—	—	—	—
SP19	SP19-3-4	08/16/10	3-4	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	SP19-7-8		7-8			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B13/MW13	B13-7-8	06/02/08	7-8	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B13-11-12		11-12			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B13-13-14		13-14			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B14	B14-7-8	06/02/08	7-8	SoundEarth	F&B	—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
	B14-11-12		11-12			—	<50	<250	**140**	<0.03	<0.05	0.26	<0.15	<0.05	<0.05	<0.05	<CUL
	B14-13-14		13-14			—	95[x]	<250	**84**	<0.02	2	0.22	0.42	—	—	—	—
B14A/MW14	B14A-07.5	03/03/09	7.5	SoundEarth	F&B	—	230[x]	<250	24	<0.03	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<CUL
	B14A-10		10			—	260[x]	<250	**1,300**	<0.03	0.057	**45**	2.1	<0.05	<0.05	<0.05	<CUL
B15/MW15	B15-7-8	06/02/08	7-8	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B15-11-12		11-12			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B15-13-14		13-14			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B16/MW16	B16-6-7	06/02/08	6-7	SoundEarth	F&B	—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
	B16-11-12		11-12			—	<50	<250	**140**	<0.03	<0.05	0.26	<0.15	<0.05	<0.05	<0.05	<CUL
	B16-14-15		14-15			—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
B17/MW17	B17-6-7	06/02/08	6-7	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B17-9.5-10.5		9.5-10.5			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B17-13-14		13-14			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B18/MW18	B18-6-7	06/02/08	6-7	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B18-11-12		11-12			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B18-13-14		13-14			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B19/MW19	B19-6-7	06/02/08	6-7	SoundEarth	F&B	—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	—
	B19-7-8		7-8			—	<50	<250	<2	<0.02	<0.02	<0.02	<0.06	—	—	—	<CUL
	B19-11.5-12.5		11.5-12.5			—	<50	<250	2	<0.03	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<CUL
MTCA Method A Cleanup Level for Soil[7]						**NE**	**2,000**	**2,000**	**30**	**0.03**	**7**	**6**	**9**	**0.1**	**0.005**	**11[a]**	**NE**

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SOUNDEARTH SOIL BORINGS																	
B20/MW20	B20-06	06/04/08	6	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B20-07.5		7.5			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B21/MW21	B21-9-10	06/02/08	9-10	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B21-11-12		11-12			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B21-12-13		12-13			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B22/MW22	B22-5-6	06/02/08	5-6	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B22-7-8		7-8			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B22-11-12		11-12			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B23/MW23	B23-6-7	06/02/08	6-7	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B23-14-15		14-15			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B24/MW24	B24-02.5	03/02/09	2.5	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B24-07.5		7.5			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B24-12.5		12.5			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B25/MW25	B25-05	03/03/09	5	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B25-07.5		7.5			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B25-12.5		12.5			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B26/MW26	B26-4	05/18/09	4	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B26-10		10			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B26-14		14			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B27/MW27	B27-04	05/18/09	4	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B27-08		8			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B27-12		12			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B27-14.5		14.5			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B28/MW28	B28-04	05/18/09	4	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B28-10.5		10.5			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B28-15		15			—	<50	<250	13	<0.02	0.03	<0.02	0.07	—	—	—	—
B29/MW29	B29-04	05/18/09	4	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B29-11		11			—	<50	<250	**310**	<0.02	0.91	3.9	2.7	—	—	—	—
	B29-15		15			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B30/MW30	B30-04	05/18/09	4	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B30-08		8			—	1,200	<250	27	<0.02	<0.02	0.14	0.12	—	—	—	—
	B30-11		11			—	770	<250	25	—	—	—	—	<0.05	<0.05	<0.05	—
B31/MW31	B31-04	05/18/09	4	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B31-08		8			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B31-10		10			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B32	B32-04	05/18/09	4	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B32-08		8			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B32-12		12			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B32-15		15			ND	<50	<250	<20	—	—	—	—	—	—	—	—
B33/MW32	B33-04	05/18/09	4	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B33-11		11			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	B33-14		14			ND	<50	<250	<20	—	—	—	—	—	—	—	—
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SOUNDEARTH TEST PITS																	
TP01	TP01-07	03/02/09	7	SoundEarth	F&B	—	<50	<250	<20	—	—	—	—	—	—	—	—
	TP01-12		12			—	390[x]	<250	**700**	<0.03	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<CUL
TP02	TP02-04	03/02/09	4	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	TP02-09.5		9.5			ND	<50	<250	<20	—	—	—	—	—	—	—	—
	TP02-12.5		12			—	<50	<250	**190**	<0.03	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<CUL
TP03	TP03-07.5	03/02/09	7.5	SoundEarth	F&B	ND	<50	<250	<20	—	—	—	—	—	—	—	—
	TP03-11		11			—	<50	<250	16	<0.03	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<CUL
Test Pit Stockpile	SP Comp	03/02/09	—	SoundEarth	F&B	—	<50	<250	**38**	<0.03	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	—
MTCA Method A Cleanup Level for Soil[7]						**NE**	**2,000**	**2,000**	**30**	**0.03**	**7**	**6**	**9**	**0.1**	**0.005**	**11[a]**	**NE**

NOTES:

Red denotes concentration exceeds MTCA Method A Cleanup Levels for soil.

[1]Depth in feet below ground surface.

[2]Analyzed by NWTPH Method for HCID. Detection Limits are 20 mg/kg for GRPH, 50 mg/kg for DRPH and 250 mg/kg for ORPH.

[3]Analyzed by Method NWTPH-Dx or HCID.

[4]Analyzed by Method NWTPH-Gx or HCID.

[5]Analyzed by EPA Method 8021B or 8260B.

[6]Analzyed by EPA Method 8260B.

[7]MTCA Method A Soil Cleanup Levels, Table 740-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised November 2007.

[a]Cleanup Levels and Risk Calculations Database, Method B, Standard Formula Value

Laboratory Notes:

[x]Pattern of peaks present is not indicative of diesel.

= sample location overexcavated

< = not detected at concentration above the laboratory reporting limit

— = unknown/not analyzed

Anatek = Anatek Laboratories, Inc. of Moscow, Idaho

CUL = cleanup level

DRPH = diesel-range petroleum hydrocarbons

EDB = 1,2-dibromoethane

EDC = 1,2-dichloroethane

EPA = United States Environmental Protection Agency

F&B = Friedman and Bruya, Inc. of Seattle, Washington.

GEI = GeoEngineers, Inc.

GRPH = gasoline-range petroleum hydrocarbons

HCID = Hydrocarbon Identification

mg/kg = milligrams per kilogram

MTBE = methyl tertiary-butyl ether

MTCA = Washington State Model Toxics Control Act

NWTPH = Northwest Total Petroleum Hydrocarbon

NCA = North Creek Analytical of Spokane, Washington

ND = not detected at concentration above the laboratory reporting limit

NE = not established

ORPH = oil-range petroleum hydrocarbons

QE = Quantum Engineering and Geologic Consulting

QUANTUM = Quantum Engineering and Geologic Consulting

SoundEarth = SoundEarth Strategies, formerly Sound Environmental Strategies

TA = TestAmerica Laboratories of Spokane, Washington

TIME OIL = Time Oil Co.

TPH = total petroleum hydrocarbon

UST = underground storage tank

VOCs = volatile organic compounds

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)													
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7] Dissolved	Lead[7] Total
MW01	02/20/01	5.95	1,890.62	103.0	<250	--	<750	--	<0.500	<0.500	<0.500	1.60	--	--	--	--	--
TOC: 1,896.57 feet	08/08/01	6.78	1,889.79	56.2	506	--	1,060	--	3.84	<0.500	<0.500	<1.00	--	--	--	--	--
	11/12/01	7.10	1,889.47	221	576	--	1,500	--	66.9	0.920	8.95	1.30	--	--	--	--	--
	02/28/02	5.65	1,890.92	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	05/07/02	6.23	1,890.34	<50.0	439	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	08/13/02	6.96	1,889.61	539	402	--	<500	--	130	0.730	6.61	2.29	--	--	--	--	--
	11/07/02	7.84	1,888.73	129	262	--	<500	--	22.8	<0.500	0.755	<1.00	--	--	--	--	--
	02/18/03	5.60	1,890.97	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	05/22/03	6.57	1,890.00	<50.0	1,140	--	4,380	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	08/12/03	7.67	1,888.90	181	512	--	1,720	--	42.5	<0.500	2.38	<1.00	--	--	--	--	--
	11/21/03	7.75	1,888.82	<50.0	1,580	--	4,610	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	02/25/04	5.55	1,891.02	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	<1.00	--	--	--	--
	04/30/04	6.43	1,890.14	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	10/21/04	7.40	1,889.17	<50.0	--	--	--	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	11/18/04	7.38	1,889.19	<50.0	--	--	--	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	09/08/05	7.73	1,888.84	67.1	--	--	--	--	20.5	<1.00	<1.00	<3.00	<5.00	<1.00	<1.00	--	--
	03/16/06	5.71	1,890.86	<50.0	--	--	--	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	08/10/06	7.37	1,889.20	<100	--	--	--	--	10.4	<0.500	<0.500	<3.00	5.23	<0.500	<0.500	--	--
	09/26/06	7.62	1,888.95	<50.0[HT-1]	<236	--	<472	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	12/15/06	6.40	1,890.17	<50	58	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	03/14/07	5.78	1,890.79	<100	<50	--	<250	--	<1	<1	<1	<3	1.1	<1	<1	--	--
	06/27/07	7.16	1,889.41	<100	94	--	<250	--	<1	<1	<1	<3	1.8	<1	<1	--	--
	09/25/07	7.94	1,888.63	<100	<50	--	<250	--	<1	<1	<1	<3	3.7	<1	<1	--	--
	12/19/07	6.51	1,890.06	<100	69[x]	--	<250	--	<1	<1	<1	<3	2.0	<1	<1	--	--
	03/04/08	5.45	1,891.12	<100	69[x]	--	<250	--	<1	<1	<1	<3	2.5	<1	<1	--	<1
	06/10/08	6.49	1,890.08	<100	<50	--	<250	--	<1	<1	<1	<3	1.3[J]	<1	<1	--	--
	09/10/08	7.37	1,889.20	<100	<50	--	<250	--	<1	<1	<1	<3	4.5	<1	<1	<1	<1
	12/10/08	7.00	1,889.57	<100	53	--	<250	--	<1	<1	<1	<3	3.0	<1	<1	<1	<1
	03/04/09	5.53	1,891.04	<100	630	--	300	--	<1	<1	<1	<3	1.2	<0.01	<1	<1	3.79
	06/11/09	5.80	1,890.77	<100	90[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	--	--
	09/10/09	7.46	1,889.11	<100	120[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	12/09/09	7.15	1,889.42	<100	<100[dv]	--	<500[dv]	--	<1	<1	<1	<3	<5	--	--	--	--
	03/10/10	6.57	1,890.00	<100	140[x]	--	410	--	<1	<1	<1	<3	--	--	--	--	--
	06/09/10	6.25	1,890.32	--	64[x]	--	<250	--	--	--	--	--	--	--	--	--	--
	08/17/10	7.61	1,888.96	--	<50	--	<250	--	--	--	--	--	--	--	--	--	--
	11/18/10	7.37	1,889.20	--	<50	--	<250	--	--	--	--	--	--	--	--	--	--
	02/16/11	5.90	1,890.67	--	<50	--	<250	--	--	--	--	--	--	--	--	--	--
	05/17/11	5.75	1,890.82	--	<50	--	<250	--	--	--	--	--	--	--	--	--	--
MW02	02/20/01	5.62	1,891.54	134	364	--	<750	--	<0.500	<0.500	0.915	8.53	--	--	--	--	--
TOC: 1,897.16 feet	08/08/01	7.10	1,890.06	1,270	386	--	<500	--	193	9.04	142	42.9	--	--	--	--	--
	11/12/01	7.18	1,889.98	684	288	--	<500	--	81.8	3.61	34.4	28.9	--	--	--	--	--
	02/28/02	5.85	1,891.31	87.8	279	--	<500	--	0.765	<0.500	<0.500	<1.00	--	--	--	--	--
	05/07/02	6.28	1,890.88	85.0	422	--	<500	--	0.873	<0500	<0.500	<1.00	--	--	--	--	--
	08/13/02	6.96	1,890.20	3,650	686	--	<500	--	338	45.8	137	88.6	--	--	--	--	--
	11/07/02	8.09	1,889.07	295	580	--	<500	--	27.0	<0.500	4.99	1.88	--	--	--	--	--
	02/18/03	5.93	1,891.23	79.7	297	--	<500	--	1.27	<0.500	1.03	1.16	--	--	--	--	--
	05/22/03	6.73	1,890.43	141	604	--	<500	--	1.77	<0.500	4.28	3.21	--	--	--	--	--
	08/12/03	7.85	1,889.31	1,210	<250	--	<500	--	437	3.520	67.0	28.0	--	--	--	--	--
	11/21/03	7.97	1,889.19	122	<250	--	<500	--	0.896	<0.500	2.34	<1.00	--	--	--	--	--
	02/25/04	5.90	1,891.26	68.5	<250	--	<500	--	<0.500	<0.500	0.678	2.03	1.48	--	--	--	--
	04/30/04	6.43	1,890.73	87.7	<250	--	<500	--	0.542	<0.500	0.623	<1.00	--	--	--	--	--
	10/21/04	7.37	1,889.79	64.9	--	--	--	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	11/18/04	7.51	1,889.65	69.0	--	--	--	--	0.66	<0.500	<0.500	<1.00	--	--	--	--	--
	09/08/05	7.78	1,889.38	65.4	--	--	--	--	384	2.56	156	12.4	10.6	<1.00	<1.00	--	--
	03/16/06	5.97	1,891.19	76.0	--	--	--	--	0.670	<0.500	0.590	<3.00	<5.00	<0.500	<0.500	--	--
	08/10/06	7.28	1,889.88	1,940	--	--	--	--	68.0	6.01	324	187	12.3	<0.500	<0.500	--	--
	09/27/06	7.81	1,889.35	239[A-01]	669[D-06]	--	<472	--	211	<0.500	9.43	<3.00	9.34	<0.500	<0.500	--	--
	12/16/06	6.27	1,890.89	71	100	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	03/14/07	6.04	1,891.12	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	06/27/07	7.20	1,889.96	1,600	730[x]	--	<250	--	11	1.4	150	105	2.6	<1	<1	--	--
	09/25/07	8.06	1,889.10	580	400[x]	--	<250	--	15	<1	81	8.6	5.7	<1	<1	--	--
	12/19/07	6.70	1,890.46	<100	<250[dv]	--	<1,200[dv]	--	24	<1	<1	<2	<1	<1	<1	--	--
	03/04/08	5.90	1,891.26	1,000	520[x]	--	<250	--	110	<1	18	8.4	3.8	<1	<1	--	<1
	03/04/08 (Duplicate)	--	--	980	520[x]	--	<250	--	110	<1	18	8.1	3.4	<1	<1	--	<1
MTCA Method A Cleanup Level for Groundwater[a]				**1,000/800[b]**	**500**		**500**		**5**	**1,000**	**700**	**1,000**	**20**	**0.01**	**5**	**15**	

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)													
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7]	
																Dissolved	Total
MW02	06/10/08	6.62	1,890.54	<100	240[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
Continued	09/10/08	8.38	1,888.78	**9,400**[d]	**2,600**[x]	--	<250	--	**92**	9.2	620	**1,110**	1.2	<1	<1	<1	<1
TOC: 1,897.16 feet	12/10/08	6.94	1,890.22	330	350	--	<250	--	<1	<1	5.8	2.9	<1	<1	<1	<1	<1
	03/04/09	5.65	1,891.51	<100	220[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	03/04/09 (Duplicate)	--	--	<100	200[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/11/09	6.40	1,890.76	<100	120[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/11/09 (Duplicate)	--	--	<100	130[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	--	--
	09/10/09	7.69	1,889.47	<100	210[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	12/07/09	7.37	1,889.79	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/10/10	6.76	1,890.40	<100	210[x]	--	<250	--	<1	<1	<1	<3	--	--	--	--	--
	06/07/10	6.48	1,890.68	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	7.95	1,889.21	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	7.66	1,889.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/16/11	6.14	1,891.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	5.89	1,891.27	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW03	02/07/01	5.69	1,891.65	**3,170**	**638**	--	<750	--	**106**	13.1	65.0	146	--	--	--	--	--
TOC: 1,897.34 feet	08/08/01	7.26	1,890.08	**8,590**	**739**	--	<500	--	**724**	60.6	631	865	--	--	--	--	--
	11/12/01	7.41	1,889.93	**6,990**	343	--	<500	--	**884**	40.2	633	488	--	--	--	--	--
	02/28/02	6.15	1,891.19	**3,560**	358	--	<500	--	**356**	26.0	303	242	--	--	--	--	--
	05/07/02	6.58	1,890.76	**4,670**	**607**	--	<500	--	**492**	30.9	289	199	--	--	--	--	--
	08/13/02	7.24	1,890.10	**5,520**	**832**	--	<500	--	**502**	75.9	274	331	--	--	--	--	--
	11/07/02	8.31	1,889.03	**2,410**	385	--	<500	--	**308**	3.99	105	9.20	--	--	--	--	--
	02/18/03	6.22	1,891.12	568	414	--	<500	--	**53.3**	7.26	16.5	15.5	--	--	--	--	--
	05/22/03	6.99	1,890.35	778	497	--	<500	--	**156**	<2.50	32.7	13.7	--	--	--	--	--
	08/12/03	8.04	1,889.30	**3,900**	265	--	<500	--	**964**	18.9	244	61.4	--	--	--	--	--
	11/21/03	8.20	1,889.14	436	<250	--	<500	--	**57.2**	<0.500	6.72	3.89	--	--	--	--	--
	02/25/04	6.18	1,891.16	429	<250	--	<500	--	**26.2**	<0.500	7.59	6.23	9.73	--	--	--	--
	04/30/04	6.66	1,890.68	**1,380**	<250	--	<500	--	**123**	2.37	34.5	25.10	--	--	--	--	--
	10/21/04	7.56	1,889.78	**810**	--	--	--	--	**173**	<2.50	1.08	<1.00	--	--	--	--	--
	11/18/04	7.73	1,889.61	164	--	--	--	--	**7.95**	<0.500	<0.500	<1.00	--	--	--	--	--
	09/09/05	8.00	1,889.34	**3,650**	--	--	--	--	**832**	21.8	51.1	75.50	16.8	<1.00	<1.00	--	--
	03/16/06	6.21	1,891.13	99.9	--	--	--	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	08/10/06	7.46	1,889.88	**1,810**	--	--	--	--	**381**	5.17	74.0	15.5	9.54	<0.500	<0.500	--	--
	09/27/06	7.64	1,889.70	**1,950**[HT-1]	**641**[D-06]	--	<472	--	**32.8**	3.3	226	43.4	9.74	<0.500	<0.500	--	--
	12/16/06	6.48	1,890.86	68	120	--	<250	--	<1	<1	<1	<3	1.2	<1	<1	--	--
	03/14/07	6.30	1,891.04	<100	230	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	06/27/07	7.38	1,889.96	<100	190	--	<250	--	<1	<1	<1	<3	2.0	<1	<1	--	--
	09/25/07	8.21	1,889.13	<100	<50	--	<250	--	<1	<1	<1	<3	2.2	<1	<1	--	--
	12/19/07	6.92	1,890.42	<100	300	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	03/04/08	6.15	1,891.19	<100	230	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	06/10/08	6.86	1,890.48	<100	150[x]	--	<250	--	<1	<1	<1	<3	1.6[J]	<1	<1	--	--
	09/10/08	7.58	1,889.76	<100	180	--	<250	--	1.6	<1	1.5	<3	2.9	<1	<1	<1	<1
	12/10/08	7.16	1,890.18	<100	140	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/04/09	5.93	1,891.41	<100	170[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/11/09	6.54	1,890.80	<100	370[x]	--	<250	--	<1	<1	3	<3	<5	<0.01	--	<1	<1
	09/09/09	7.90	1,889.44	<100	140[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	12/08/09	7.62	1,889.72	<100	220[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	03/10/10	6.70	1,890.64	<100	170[x]	--	<250	--	<1	<1	<1	<3	--	--	--	--	--
	06/07/10	6.72	1,890.62	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	8.14	1,889.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/18/10	7.88	1,889.46	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/17/11	6.45	1,890.89	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	6.25	1,891.09	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW04	02/20/01	5.81	1,890.85	179	254	--	<750	--	**31.0**	2.63	6.17	26.8	--	--	--	--	--
TOC: 1,896.66 feet	08/08/01	6.70	1,889.96	**1,460**	361	--	<500	--	**256**	8.91	103	58.3	--	--	--	--	--
	11/12/01	6.90	1,889.76	**1,680**	<250	--	<500	--	**361**	9.26	194	40.5	--	--	--	--	--
	02/28/02	5.55	1,891.11	146	294	--	<500	--	**14.7**	<0.500	8.8	1.15	--	--	--	--	--
	05/07/02	5.99	1,890.67	184	470	--	<500	--	**24.4**	0.564	10.8	1.18	--	--	--	--	--
	08/13/02	6.86	1,889.80	**2,990**	**552**	--	<500	--	**437**	37.6	170	76.7	--	--	--	--	--
	11/07/02	7.03	1,889.63	343	460	--	<500	--	**29.0**	<0.500	3.53	<1.00	--	--	--	--	--
	02/18/03	5.63	1,891.03	61.4	<250	--	<500	--	0.545	<0.500	<0.500	<1.00	--	--	--	--	--
	05/22/03	6.34	1,890.32	66.9	**502**	--	<500	--	4.97	<0.500	<0.500	<1.00	--	--	--	--	--
	08/12/03	7.43	1,889.23	**1,190**	<250	--	<500	--	**554**	5.40	72.2	3.85	--	--	--	--	--
	11/21/03	7.58	1,889.08	71.80	<250	--	<500	--	0.516	<0.500	<0.500	<1.00	--	--	--	--	--
	02/25/04	5.60	1,891.06	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	9.53	--	--	--	--
	04/30/04	6.07	1,890.59	55.2	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	10/21/04	6.97	1,889.69	183	--	--	--	--	4.33	<0.500	<0.500	<1.00	--	--	--	--	--
	11/18/04	7.11	1,889.55	113	--	--	--	--	0.658	<0.500	<0.500	<1.00	--	--	--	--	--
MTCA Method A Cleanup Level for Groundwater[8]				**1,000/800**[b]	**500**		**500**		**5**	**1,000**	**700**	**1,000**	**20**	**0.01**	**5**	**15**	

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)													
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7] Dissolved	Lead[7] Total
MW04	09/08/05	7.35	1,889.31	**965**	--	--	--	--	**271**	4.7	6.98	<4.37	19.7	<1.00	<1.00	--	--
Continued	03/16/06	5.61	1,891.05	<50.0	--	--	--	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
TOC: 1,896.66 feet	08/10/06	6.87	1,889.79	624	--	--	--	--	**166**	1.52	22.5	<3.00	11.4	<0.500	<0.500	--	--
	09/26/06	8.19	1,888.47	327[HT-1]	463[D-06]	--	<472	--	**12.6**	<0.500	<0.500	<3.00	12.3	<0.500	<0.500	--	--
	12/15/06	7.31	1,889.35	<50	59	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	03/14/07	5.69	1,890.97	<100	120	--	<250	--	<1	<1	<1	<3	3.1	<1	<1	--	--
	06/27/07	6.78	1,889.88	<100	260	--	<250	--	<1	<1	<1	<3	5.2	<1	<1	--	--
	09/25/07	7.63	1,889.03	<100	140[x]	--	<250	--	<1	<1	<1	<3	4.7	<1	<1	--	--
	12/19/07	6.30	1,890.36	<100	210	--	<250	--	<1	<1	<1	<3	3.8	<1	<1	--	--
	03/04/08	5.53	1,891.13	<100	180	--	<250	--	1.3	<1	<1	<3	3.6	<1	<1	--	<1
	06/10/08	6.24	1,890.42	<100	200[x]	--	<250	--	<1	<1	<1	<3	4.9[J]	<1	<1	--	--
	09/10/08	6.98	1,889.68	<100	280	--	<250	--	1.8	<1	8.7	<9.5	7.2	<1	<1	<1	<1
	12/10/08	6.49	1,890.17	<100	160	--	<250	--	<1	<1	<1	<3	4.3	<1	<1	<1	<1
	03/04/09	5.33	1,891.33	<100	170	--	<250	--	<1	<1	<1	<3	3.4	<0.01	<1	<1	<1
	06/08/09	6.15	1,890.51	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/08/09	7.30	1,889.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/07/09	7.01	1,889.65	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/10/10	6.41	1,890.25	<100	190[x]	--	<250	--	<1	<1	<1	<3	--	--	--	--	--
	06/07/10	6.14	1,890.52	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	7.55	1,889.11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	7.26	1,889.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/14/11	5.86	1,890.80	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	5.66	1,891.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW05	02/07/01	5.81	1,892.03	327	282	--	<750	--	**5.90**	3.27	2.64	12.0	--	--	--	--	--
TOC: 1,897.84 feet	08/08/01	7.83	1,890.01	**3,210**	**560**	--	<500	--	**479**	32.5	403	148	--	--	--	--	--
	11/12/01	8.00	1,889.84	**3,930**	306	--	<500	--	**544**	20.4	287	195	--	--	--	--	--
	02/28/02	6.76	1,891.08	**5,270**	407	--	<500	--	**556**	48.2	443	356	--	--	--	--	--
	05/07/02	7.22	1,890.62	**5,310**	**732**	--	<500	--	**654**	36.8	360	241	--	--	--	--	--
	08/13/02	7.82	1,890.02	**4,270**	**691**	--	<500	--	**474**	62.2	264	216	--	--	--	--	--
	11/07/02	8.89	1,888.95	**2,180**	474	--	<500	--	**431**	13.6	174	15.6	--	--	--	--	--
	02/18/03	6.83	1,891.01	**858**	400	--	<500	--	**251**	0.830	15.3	1.59	--	--	--	--	--
	05/22/03	7.56	1,890.28	**2,190**	487	--	<500	--	**751**	<5.00	128	<10.0	--	--	--	--	--
	08/12/03	8.58	1,889.26	**2,360**	257	--	<500	--	**876**	7.16	117	12.7	--	--	--	--	--
	11/21/03	8.76	1,889.08	759	<250	--	<500	--	**176**	<0.500	0.572	<1.00	--	--	--	--	--
	02/25/04	6.80	1,891.04	**1,010**	<250	--	<500	--	**230**	0.748	44.30	5.10	**25.90**	--	--	--	--
	04/30/04	7.24	1,890.60	**1,620**	<250	--	<500	--	**447**	5.17	44.20	42.8	--	--	--	--	--
	10/21/04	8.11	1,889.73	654	--	--	--	--	**99.3**	<0.500	<0.500	<1.00	--	--	--	--	--
	11/18/04	8.25	1,889.59	524	--	--	--	--	**59.1**	<0.500	<0.500	1.08	--	--	--	--	--
	09/09/05	8.54	1,889.30	347	--	--	--	--	**7.28**	<1.00	<1.00	<3.00	13.9	<1.00	<1.00	--	--
	03/16/06	6.83	1,891.01	140	--	--	--	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	08/10/06	8.00	1,889.84	461	--	--	--	--	**46.3**	<0.500	17.2	<3.00	7.69	<0.500	<0.500	--	--
	09/27/06	8.34	1,889.50	105[Q-40]	<236	--	<472	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	12/15/06	8.48	1,889.36	<50	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	03/14/07	6.93	1,890.91	<100	210	--	<250	--	<1	<1	<1	<3	1.6	<1	<1	--	--
	06/27/07	7.92	1,889.92	<100	200	--	<250	--	<1	<1	<1	<3	1.6	<1	<1	--	--
	09/25/07	8.76	1,889.08	<100	61[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	12/19/07	7.49	1,890.35	<100	140	--	<250	--	<1	<1	<1	<3	1.5	<1	<1	--	--
	03/04/08	6.75	1,891.09	<100	240	--	<250	--	<1	<1	<1	<3	2.0	<1	<1	--	<1
	06/10/08	7.41	1,890.43	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	09/10/08	8.11	1,889.73	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/10/08	7.71	1,890.13	<100	86	--	<250	--	<1	<1	<1	<3	4.1	<1	<1	<1	<1
	03/04/09	6.52	1,891.32	<100	140[x]	--	<250	--	<1	<1	<1	<3	1.1	<0.01	<1	<1	<1
	06/10/09	7.10	1,890.74	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	--	--
	09/08/09	8.46	1,889.38	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/07/09	8.22	1,889.62	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/10/10	7.61	1,890.23	<100	150[x]	--	<250	--	<1	<1	<1	<3	--	--	--	--	--
	06/07/10	7.36	1,890.48	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	7.75	1,890.09	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	8.48	1,889.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/17/11	7.11	1,890.73	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	6.88	1,890.96	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Level for Groundwater[a]				**1,000/800[b]**	**500**		**500**		**5**	**1,000**	**700**	**1,000**	**20**	**0.01**	**5**	**15**	

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)													
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7] Dissolved	Lead[7] Total
MW06	02/20/01	5.95	1,890.87	923	411	--	<750	--	21.4	0.686	14.1	<5.36	--	--	--	--	--
TOC: 1,896.82 feet	08/08/01	6.85	1,889.97	1,720	456	--	<500	--	302	6.21	92.1	27.9	--	--	--	--	--
	11/12/01	7.16	1,889.66	1,800	257	--	<500	--	330	7.26	108	19.9	--	--	--	--	--
	02/28/02	5.91	1,890.91	886	354	--	<500	--	73.1	1.56	26.2	4.51	--	--	--	--	--
	05/07/02	6.35	1,890.47	1,560	882	--	<500	--	77.8	1.34	30.2	5.25	--	--	--	--	--
	08/13/02	6.94	1,889.88	2,600	667	--	<500	--	432	41.7	163	81.3	--	--	--	--	--
	11/07/02	7.96	1,888.86	1,660	568	--	<500	--	230	5.18	75.6	<10.0	--	--	--	--	--
	02/18/03	5.99	1,890.83	900	622	--	<500	--	18.2	0.552	13.2	3.09	--	--	--	--	--
	05/22/03	6.65	1,890.17	217	526	--	<500	--	5.27	<0.500	0.63	<1.00	--	--	--	--	--
	08/12/03	7.69	1,889.13	1,290	<250	--	<500	--	405	5.11	55.2	<10.0	--	--	--	--	--
	11/21/03	7.83	1,888.99	373	<250	--	<500	--	1.38	<0.500	<0.500	1.72	--	--	--	--	--
	02/25/04	5.91	1,890.91	871	<250	--	<500	--	12.8	0.506	9.10	6.54	29.00	--	--	--	--
	04/30/04	6.38	1,890.44	732	<250	--	<500	--	3.56	<0.500	2.44	4.06	--	--	--	--	--
	10/21/04	7.20	1,889.62	190	--	--	--	--	0.659	<0.500	<0.500	<1.00	--	--	--	--	--
	11/18/04	7.37	1,889.45	163	--	--	--	--	0.777	<0.500	<0.500	<1.00	--	--	--	--	--
	09/08/05	7.61	1,889.21	932	--	--	--	--	262	5.82	6.54	<3.00	18.0	<1.00	<1.00	--	--
	03/16/06	5.97	1,890.85	156	--	--	--	--	0.730	<0.500	<0.500	<3.00	5.05	<0.500	<0.500	--	--
	08/10/06	7.13	1,889.69	210	--	--	--	--	28.9	<0.500	3.85	<3.00	6.95	<0.500	<0.500	--	--
	09/27/06	7.43	1,889.39	214[Q-40]	481[D-06]	--	<472	--	0.61	<0.500	<0.500	<3.00	9.01	<0.500	<0.500	--	--
	12/15/06	6.62	1,890.20	100	<50	--	<250	--	5.3	19	1.9	10.6	<1	<1	<1	--	--
	03/14/07	6.07	1,890.75	180	180	--	<250	--	<1	<1	<1	<3	3.6	<1	<1	--	--
	06/27/07	7.06	1,889.76	130	260	--	<250	--	<1	<1	<1	<3	3.4	<1	<1	--	--
	09/25/07	7.83	1,888.99	170	210[x]	--	<250	--	<1	<1	1.2	<3	3.2	<1	<1	--	--
	12/19/07	6.60	1,890.22	240	170	--	<250	--	<1	<1	<1	<3	4.1	<1	<1	--	--
	03/04/08	5.91	1,890.91	180	220	--	<250	--	<1	<1	<1	<3	3.3	<1	<1	--	--
	06/10/08	6.63	1,890.19	<100	170[x]	--	<250	--	<1	<1	<1	<3	2.7[J]	<1	<1	--	--
	09/10/08	7.26	1,889.56	250	330	--	<250	--	1.3	<1	1.1	<3	6.4	<1	<1	<1	<1
	12/10/08	6.88	1,889.94	<100	110	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/04/09	5.71	1,891.11	350	210[x]	--	<250	--	2.5	<1	1.5	<3	5.3	<0.01	<1	<1	<1
	06/08/09	6.78	1,890.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/08/09	7.59	1,889.23	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/07/09	7.35	1,889.47	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/10/10	6.73	1,890.09	<100	170[x]	--	<250	--	<1	<1	<1	<3	--	--	--	--	--
	06/07/10	6.51	1,890.31	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	7.89	1,888.93	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	7.61	1,889.21	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/14/11	6.35	1,890.47	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	6.10	1,890.72	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW07	02/20/01	6.24	1,890.43	447	329	--	<750	--	24.9	<0.500	8.06	<1.52	--	--	--	--	--
TOC: 1,896.67 feet	08/08/01	7.42	1,889.25	732	430	--	<500	--	183	1.78	20.7	2.07	--	--	--	--	--
	11/12/01	8.00	1,888.67	1,650	<250	--	<500	--	288	5.59	104	12.1	--	--	--	--	--
	02/28/02	6.82	1,889.85	911	267	--	<500	--	110	1.72	33.0	4.34	--	--	--	--	--
	05/07/02	7.32	1,889.35	795	446	--	<500	--	32.4	<0.500	2.79	2.49	--	--	--	--	--
	08/13/02	7.91	1,888.76	2,250	648	--	<500	--	428	33.9	109	45.8	--	--	--	--	--
	11/07/02	8.74	1,887.93	1,880	442	--	<500	--	227	7.35	51.8	<10.0	--	--	--	--	--
	02/18/03	7.02	1,889.65	420	512	--	<500	--	11.5	<0.500	0.620	1.03	--	--	--	--	--
	05/22/03	7.67	1,889.00	350	463	--	<500	--	19.4	<0.500	<0.500	1.02	--	--	--	--	--
	08/12/03	8.59	1,888.08	1,160	<250	--	<500	--	371	5.89	6.53	10.1	--	--	--	--	--
	11/21/03	8.45	1,888.22	429	<250	--	<500	--	8.30	<0.500	<0.500	1.30	--	--	--	--	--
	02/25/04	6.80	1,889.87	327	<250	--	<500	--	3.92	<0.500	<0.500	1.89	13.90	--	--	--	--
	04/30/04	7.57	1,889.10	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	10/21/04	8.22	1,888.45	350	--	--	--	--	19.6	<0.500	<0.500	1.23	--	--	--	--	--
	11/18/04	8.30	1,888.37	367	--	--	--	--	13.6	<0.500	<0.500	1.81	--	--	--	--	--
	09/09/05	8.76	1,887.91	421	--	--	--	--	51.6	<1.00	<1.00	<3.00	13.9	<1.00	<1.00	--	--
	03/16/06	7.13	1,889.54	129	--	--	--	--	<0.500	<0.500	<0.500	<3.00	8.77	<0.500	<0.500	--	--
	08/10/06	8.58	1,888.09	104	--	--	--	--	1.46	<0.500	<0.500	<3.00	22.5	<0.500	<0.500	--	--
	09/27/06	8.57	1,888.10	168[HT-1]	394[D-06]	--	<472	--	<0.500	<0.500	<0.500	<3.00	8.75	<0.500	<0.500	--	--
	12/15/06	No Access	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/14/07	7.15	1,889.52	170	260	--	<250	--	<1	<1	<1	<3	7.3	<1	<1	--	--
	06/27/07	8.31	1,888.36	<100	250	--	<250	--	<1	<1	<1	<3	13	<1	<1	--	--
	09/25/07	8.88	1,887.79	150	140[x]	--	<250	--	<1	<1	<1	<3	7.1	<1	<1	--	--
	12/19/07	7.67	1,889.00	150	200	--	<250	--	<1	<1	<1	<3	8.4	<1	<1	--	--
	03/04/08	7.05	1,889.62	160	290	--	250	--	<1	<1	<1	<3	7.0	<1	<1	--	<1
	06/10/08	7.54	1,889.13	<100	220[x]	--	390	--	<1	<1	<1	<3	2.2[J]	<1	<1	--	--
MTCA Method A Cleanup Level for Groundwater[8]				**1,000/800[b]**	**500**		**500**		**5**	**1,000**	**700**	**1,000**	**20**	**0.01**	**5**	**15**	

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)													
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7]	
																Dissolved	Total
MW07	09/10/08	8.44	1,888.23	<100	200[dv]	--	<360[dv]	--	<1	<1	<1	<3	1.8	<1	<1	<1	<1
Continued	12/10/08	8.00	1,888.67	<100	98	--	<250	--	<1	<1	<1	<3	3.8	<1	<1	<1	<1
TOC: 1,896.67 feet	03/04/09	6.66	1,890.01	<100	120[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/10/09	7.08	1,889.59	<100	170[x]	--	<250	--	<1	1	1	<3	<5	<0.01	--	--	--
	09/10/09	8.47	1,888.20	<100	230[x]	--	250	--	<1	<1	<1	<3	<5	--	--	--	--
	12/07/09	8.12	1,888.55	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/10/10	7.69	1,888.98	<100	170[x]	--	<250	--	<1	<1	<1	<3	--	--	--	--	--
	06/07/10	7.36	1,889.31	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	8.63	1,888.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/18/10	8.23	1,888.44	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/15/11	7.44	1,889.23	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	7.06	1,889.61	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW08	11/07/02	9.51	1,887.98	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
TOC: 1,897.49 feet	02/18/03	7.94	1,889.55	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	05/22/03	8.43	1,889.06	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	08/12/03	9.50	1,887.99	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	11/21/03	9.52	1,887.97	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	02/25/04	7.85	1,889.64	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	1.36	--	--	--	--
	04/30/04	8.50	1,888.99	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	10/21/04	9.20	1,888.29	<50.0	--	--	--	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	11/18/04	9.21	1,888.28	<50.0	--	--	--	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	09/08/05	8.53	1,888.96	<50.0	--	--	--	--	<1.00	<1.00	<1.00	<3.00	<5.00	<1.00	<1.00	--	--
	03/16/06	8.15	1,889.34	<50.0	--	--	--	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	08/10/06	9.37	1,888.12	<100	--	--	--	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	09/26/06	9.31	1,888.18	<50.0[D-41]	<236	--	<472	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	12/15/06	8.28	1,889.21	<50	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	03/14/07	8.02	1,889.47	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	06/27/07	9.12	1,888.37	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	09/25/07	9.73	1,887.76	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	12/19/07	8.57	1,888.92	<100	<250[dv]	--	<1,200[dv]	--	<1	<1	<1	<3	<1	<1	<1	--	--
	03/04/08	8.02	1,889.47	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	<1
	06/10/08	8.30	1,889.19	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	09/10/08	9.40	1,888.09	<100	<71[dv]	--	<360[dv]	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/09/08	8.96	1,888.53	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/04/09	7.70	1,889.79	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/10/09	10.20	1,887.29	<100	140[x]	--	<250	--	<1	<1	<1	<3	<5	<0.01	--	--	--
	09/08/09	9.38	1,888.11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/07/09	8.93	1,888.56	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/08/10	8.55	1,888.94	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/07/10	8.32	1,889.17	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	9.38	1,888.11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	9.10	1,888.39	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/14/11	8.13	1,889.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	7.94	1,889.55	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW09	11/07/02	9.21	1,889.06	<50.0	375	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
TOC: 1,898.27 feet	02/18/03	7.04	1,891.23	<50.0	411	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	05/22/03	7.79	1,890.48	<50.0	**531**	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	05/22/03	8.89	1,889.38	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	11/21/03	9.06	1,889.21	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	02/25/04	6.96	1,891.31	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	1.39	--	--	--	--
	04/30/04	7.48	1,890.79	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	10/21/04	8.43	1,889.84	<50.0	--	--	--	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	11/18/04	8.51	1,889.76	<50.0	--	--	--	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	09/08/05	8.84	1,889.43	<50.0	--	--	--	--	<1.00	<1.00	<1.00	<3.00	<5.00	<1.00	<1.00	--	--
	03/16/06	7.03	1,891.24	<50.0	--	--	--	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	08/10/06	8.32	1,889.95	<100	--	--	--	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	09/26/06	8.67	1,889.60	<50.0[D-41]	**935**[D-06]	--	**667**[D-06]	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	12/16/06	7.31	1,890.96	<50	400	--	**860**	--	<1	<1	<1	<3	<1	<1	<1	--	--
	03/14/07	7.12	1,891.15	<100	150	--	320	--	<1	<1	<1	<3	<1	<1	<1	--	--
	06/27/07	8.24	1,890.03	<100	150	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	09/25/07	9.12	1,889.15	<100	60[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	12/19/07	7.77	1,890.50	<100	260[x]	--	**700**	--	<1	<1	<1	<3	<1	<1	<1	--	--
	03/04/08	6.95	1,891.32	<100	270[x]	--	**550**	--	<1	<1	<1	<3	<1	<1	<1	--	1.41
	06/10/08	7.68	1,890.59	<100	150[x]	--	370	--	<1	<1	<1	<3	<1	<1	<1	--	--
	06/10/08 (Duplicate)	--	--	<100	160[x]	--	290	--	<1	<1	<1	<3	<1	<1	<1	--	--
	09/10/08	No Access	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/08/08	No Access	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Level for Groundwater[a]				**1,000/800[b]**	**500**		**500**		**5**	**1,000**	**700**	**1,000**	**20**	**0.01**	**5**	**15**	

SoundEarth Strategies

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)													
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7]	
																Dissolved	Total
MW09	03/04/09	6.75	1,891.52	<100	110[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
Continued	06/10/09	7.25	1,891.02	<100	280[x]	--	<250	--	<1	<1	2	<3	<5	<0.01	--	<1	<1
TOC: 1,898.27 feet	06/10/09 (Duplicate)	--	--	<100	280[x]	--	<250	--	<1	<1	2	<3	<5	<0.01	--	<1	<1
	09/10/09	8.70	1,889.57	<100	290[x]	--	380	--	<1	<1	<1	<3	<5	--	--	<1	<1
	09/10/09 (Duplicate)	--	--	<100	210[x]	--	330	--	<1	<1	<1	<3	<5	--	--	<1	<1
	12/09/09	8.42	1,889.85	<100	220[x]	--	320	--	<1	<1	<1	<3	<5	--	--	<1	<1
	12/09/09 (Duplicate)	--	--	<100	250[x, dv]	--	<340[dv]	--	<1	<1	<1	<3	<5	--	--	<1	1.21
	03/09/10	7.82	1,890.45	--	160[x]	--	310	--	--	--	--	--	--	--	--	--	--
	06/09/10	7.52	1,890.75	--	160[x]	--	410[y]	--	--	--	--	--	--	--	--	--	--
	08/18/10	8.93	1,889.34	--	<50	--	<250	--	--	--	--	--	--	--	--	--	--
	11/16/10	8.71	1,889.56	--	290[x]	--	330[x]	--	--	--	--	--	--	--	--	--	--
	02/16/11	7.17	1,891.10	--	53[x]	--	<250	--	--	--	--	--	--	--	--	--	--
	05/18/11	6.96	1,891.31	--	140[x]	--	<250	--	--	--	--	--	--	--	--	--	--
MW10	11/07/02	8.91	1,889.06	4,920	571	--	<500	--	1,250	16.1	255	79.7	--	--	--	--	--
TOC: 1,897.97 feet	02/18/03	6.70	1,891.27	16,800	407	--	<500	--	2,830	1,400	663	1,350	--	--	--	--	--
	05/22/03	7.49	1,890.48	11,700	538	--	<500	--	2,490	139	634	1,270	--	--	--	--	--
	08/12/03	8.58	1,889.39	7,220	989	--	<500	--	1,800	76.3	573	260	--	--	--	--	--
	11/21/03	8.77	1,889.20	3,790	<250	--	<500	--	1,330	3.66	291	87.6	--	--	--	--	--
	02/25/04	6.63	1,891.34	14,700	<250	--	<500	--	1,780	87.6	956	2,410	68.8	--	--	--	--
	04/30/04	7.18	1,890.79	9,310	<250	--	<500	--	1,500	18.5	930	1,450	--	--	--	--	--
	10/21/04	8.11	1,889.86	8,330	--	--	--	--	2,400	25.2	589	115	--	--	--	--	--
	11/18/04	8.27	1,889.70	5,130	--	--	--	--	1,190	10.2	454	276	--	--	--	--	--
	09/08/05	8.53	1,889.44	8,160	--	--	--	--	1,420	48.1	346	453	25.3	<1	<1	--	--
	09/08/05 (Duplicate)	--	--	7,170	--	--	--	--	1,530	44.3	309	314	--	--	--	--	--
	03/16/06	7.02	1,890.95	5,720	--	--	--	--	611	17.5	616	1,030	7.55	<0.500	<0.500	--	--
	03/16/06 (Duplicate)	--	--	5,630	--	--	--	--	498	<20.0	431	593	<20.0	--	--	--	--
	08/10/06	8.02	1,889.95	3,820	--	--	--	--	670	14.8	216	83.3	11.0	<0.500	<0.500	--	--
	09/26/06	8.36	1,889.61	3,290[HT-3]	1,060[D-06]	--	<472	--	681	<10.0	207	105	<100	<10.0	<10.0	--	--
	12/16/06	7.02	1,890.95	250	130	--	<250	--	38	<1	<1	<3	1.7	<1	<1	--	--
	03/14/07	6.82	1,891.15	190	200	--	<250	--	44	<1	<1	<3	2.1	<1	<1	--	--
	03/14/07 (Duplicate)	--	--	187	<250	--	<500	--	33.0	<2.00	<1.00	<1.50	<2.00	<0.01	<2.00	--	--
	06/27/07	7.93	1,890.04	270	180[x]	--	<250	--	52	<1	<1	<3	4.2	<1	<1	--	--
	06/27/07 (Duplicate)	--	--	195	<250	--	<500	--	57.7	<2.00	<1.00	<1.50	4.32	<0.0100	<1	--	--
	09/25/07	8.80	1,889.17	<100	88[x]	--	<250	--	<1	<1	<1	<3	2.3	<1	<1	--	--
	09/25/07 (Duplicate)	--		<100	<250	--	<500	--	<0.500	<2.00	<1.00	<1.50	1.64	<0.0100	<1	--	--
	39,435.00	7.47	1,890.50	<100	83.00	--	<250	--	21.00	<1	<1	<3	3.70	<1	<1	--	--
	12/19/07 (Duplicate)	--	--	<100	<250	--	<500	--	18.8	<2.00	<1.00	<1.50	3.82	<0.0100	<1	--	--
	03/04/08	6.66	1,891.31	<100	120	--	<250	--	3.5	<1	<1	<3	3.1	<1	<1	--	<1
	06/10/08	7.45	1,890.52	<100	120[x]	--	<250	--	<1	<1	<1	<3	4.7[jl]	<1	<1	--	--
	09/10/08	No Access	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/08/08	No Access	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/04/09	6.45	1,891.52	<100	150[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/11/09	6.96	1,891.01	<100	97[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	09/10/09	8.41	1,889.56	<100	120[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	<1	<1
	12/09/09	8.12	1,889.85	<100	84[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	<1	<1
	03/09/10	7.53	1,890.44	--	<50	--	<250	--	--	--	--	--	--	--	--	--	--
	06/09/10	7.24	1,890.73	--	95[x]	--	<250	--	--	--	--	--	--	--	--	--	--
	08/17/10	8.64	1,889.33	--	<50	--	<250	--	--	--	--	--	--	--	--	--	--
	11/16/10	8.42	1,889.55	--	80[x]	--	<250	--	--	--	--	--	--	--	--	--	--
	02/16/11	6.91	1,891.06	--	56[x]	--	<250	--	--	--	--	--	--	--	--	--	--
	05/17/11	6.70	1,891.27	--	88x	--	<250	--	--	--	--	--	--	--	--	--	--
MW11	11/07/02	8.82	1,887.69	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
TOC: 1,896.51 feet	02/18/03	7.35	1,889.16	63.6	<250	--	<500	--	8.05	<0.500	<0.500	<1.00	--	--	--	--	--
	05/22/03	4.59	1,891.92	<50.0	<250	--	<500	--	<0.500	<0.500	<0.500	<1.00	--	--	--	--	--
	08/12/03	9.01	1,887.50	281	<250	--	<500	--	25.5	<0.500	<0.500	<1.00	--	--	--	--	--
	11/21/03	8.81	1,887.70	1,450	<250	--	<500	--	1.78	0.671	1.61	3.07	--	--	--	--	--
	02/25/04	7.45	1,889.06	873	<250	--	<500	--	9.20	1.76	2.50	2.76	1.70	--	--	--	--
	04/30/04	7.98	1,888.53	810	<250	--	<500	--	1.15	1.72	1.84	2.61	--	--	--	--	--
	10/21/04	8.61	1,887.90	698	--	--	--	--	1.10	<0.500	0.579	1.66	--	--	--	--	--
	11/18/04	8.66	1,887.85	724	--	--	--	--	0.84	0.548	0.668	2.49	--	--	--	--	--
	09/09/05	9.10	1,887.41	1,130	--	--	--	--	1.8	<1.00	<1.00	<3.00	<5.00	<1.00	<1.00	--	--
	03/16/06	7.62	1,888.89	676	--	--	--	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	08/10/06	8.91	1,887.60	168	--	--	--	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	09/27/06	8.75	1,887.76	879[Q-40]	351[D-06]	--	<472	--	<0.500	<0.500	<0.500	<3.00	8.16	<0.500	<0.500	--	--
	12/15/06	No Access	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/14/07	7.58	1,888.93	300	140[D-06]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	06/27/07	8.61	1,887.90	320	150[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
MTCA Method A Cleanup Level for Groundwater[a]				1,000/800[b]	500		500		5	1,000	700	1,000	20	0.01	5	15	

SoundEarth Strategies

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)													
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7]	
																Dissolved	Total
MW11	09/25/07	9.17	1,887.34	790	330[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
Continued	12/19/07	8.05	1,888.46	290	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
TOC: 1,896.51 feet	03/04/08	7.54	1,888.97	240	130[x]	--	<250	--	1.1	<1	<1	<3	<1	<1	<1	--	<1
	06/11/08	8.13	1,888.38	180	88[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	09/11/08	8.85	1,887.66	290	180[x, dv]	--	<360[dv]	--	<1	<1	<1	<3	<1	<1	<1	1.20	1.48
	12/10/08	8.42	1,888.09	160	67	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/06/09	7.20	1,889.31	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/10/09	8.80	1,887.71	<100	<50	--	<250	--	<1	2	<1	<3	<5	<0.01	--	--	--
	09/09/09	8.86	1,887.65	230	240[x]	--	<250	--	<1	5	<1	3	<5	--	--	--	--
	12/09/09	8.40	1,888.11	210	310[x]	--	<250	--	<1	4	<1	3	<5	--	--	--	--
	03/10/10	8.02	1,888.49	150	240[x]	--	<250	--	<1	4	<1	3	<5	--	--	--	--
	06/08/10	7.77	1,888.74	110	360[x]	--	<250	--	<1	1.6	<1	<3	<5	--	--	--	--
	08/18/10	8.84	1,887.67	270	180[x]	--	<250	--	<1	11	1.7	5.8	<5	--	--	--	--
	11/17/10	8.43	1,888.08	170	260[x]	--	<250	--	<1	3.1	<1	<3	<5[ca]	--	--	--	--
	02/16/11	7.68	1,888.83	<100	63[x]	--	<250	--	<1	2.1	<1	<3	<5	--	--	--	--
	05/18/11	7.49	1,889.02	<100	<50	--	<250	--	<1	<1	<1	<3	<1	--	--	--	--
MW12	11/07/02	9.26	1,889.05	**2,140**	471	--	<500	--	**278**	9.21	57.4	71.2	--	--	--	--	--
TOC: 1,898.31 feet	02/18/03	7.02	1,891.29	**5,120**	**754**	--	<500	--	**650**	71.0	184	271	--	--	--	--	--
	05/22/03	7.84	1,890.47	**6,260**	**1,160**	--	<500	--	**879**	212	159	339	--	--	--	--	--
	08/12/03	8.60	1,889.71	508	<250	--	<500	--	**114**	1.77	15.2	2.17	--	--	--	--	--
	11/21/03	9.10	1,889.21	**1,740**	<250	--	<500	--	**397**	7.68	72.8	11.9	--	--	--	--	--
	02/25/04	7.00	1,891.31	**8,250**	<250	--	<500	--	**1,400**	389	203	561	**195**	--	--	--	--
	04/30/04	7.52	1,890.79	**3,100**	<250	--	<500	--	**477**	98.7	62.4	153	--	--	--	--	--
	10/21/04	8.44	1,889.87	148	--	--	--	--	**30.2**	<0.500	0.603	<1.00	--	--	--	--	--
	11/18/04	8.60	1,889.71	182	--	--	--	--	**35.5**	<0.500	1.82	<1.00	--	--	--	--	--
	09/09/05	8.73	1,889.58	90.2	--	--	--	--	4.15	<1.00	<1.00	<3.00	<5.00	<1.00	<1.00	--	--
	03/16/06	6.97	1,891.34	**4,880**	--	--	--	--	**846**	38.3	304	473	13.4	<0.500	<0.500	--	--
	08/10/06	8.25	1,890.06	<100	--	--	--	--	<0.500	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	09/26/06	8.61	1,889.70	<50.0[Q-41]	<236	--	<472	--	0.610	<0.500	<0.500	<3.00	<5.00	<0.500	<0.500	--	--
	12/16/06	7.26	1,891.05	270	130	--	<250	--	**25**	<1	<1	<3	4.1	<1	<1	--	--
	03/14/07	7.07	1,891.24	<100	130	--	<250	--	1.7	<1	<1	<3	1.7	<1	<1	--	--
	06/27/07	8.18	1,890.13	<100	54	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	09/25/07	9.04	1,889.27	<100	<50	--	<250	--	<1	<1	<1	<3	1.1	<1	<1	--	--
	12/19/07	7.71	1,890.60	<100	<50	--	<250	--	<1	<1	<1	<3	1.0	<1	<1	--	--
	03/04/08	6.89	1,891.42	<100	68[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	<1
	06/10/08	7.61	1,890.70	<100	68[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	09/10/08	No Access	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/08/08	No Access	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/04/09	6.71	1,891.60	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/11/09	7.40	1,890.91	<100	73[x]	--	<250	--	<1	<1	<1	<3	<5	<0.01	--	<1	<1
	09/09/09	8.64	1,889.67	<100	98[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	<1	<1
	12/10/09	8.38	1,889.93	<100	70[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	<1	<1
	03/08/10	7.78	1,890.53	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/07/10	7.48	1,890.83	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	8.88	1,889.43	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/17/10	8.67	1,889.64	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/16/11	7.14	1,891.17	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	6.45	1,891.86	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW13	06/11/08	7.83	1,888.27	100	76	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
TOC: 1,896.10 feet	09/11/08	8.60	1,887.50	<100	<71[dv]	--	<360[dv]	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/10/08	8.24	1,887.86	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/06/09	7.06	1,889.04	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/10/09	7.65	1,888.45	<100	74[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	09/09/09	8.58	1,887.52	<100	70[x]	--	<250	--	<1	2	<1	<3	<5	--	--	--	--
	12/09/09	8.18	1,887.92	<100	50[x]	--	<250	--	<1	2	<1	<3	<5	--	--	--	--
	03/09/10	7.80	1,888.30	<100	140[x]	--	<250	--	<1	4	<1	<3	<5	--	--	--	--
	03/09/10 (Duplicate)	--		<100	140[x]	--	<250	--	<1	2	<1	<3	<5	--	--	--	--
	06/08/10	7.58	1,888.52	110	190[x]	--	<250	--	<1	1.9	<1	<3	<5	--	--	--	--
	08/17/10	8.55	1,887.55	<100	99[x]	--	<250	--	<1	1.9	<1	<3	<5	--	--	--	--
	08/17/10 (Duplicate)	--	--	<100	<50	--	<250	--	<1	2.4	<1	<3	<5	--	--	--	--
	11/17/10	8.18	1,887.92	<100	86[x]	--	<250	--	<1	1.6	<1	<3	5.4[ca]	--	--	--	--
	11/17/10 (Duplicate)	--	--	<100	<50	--	<250	--	<1	1.9	<1	<3	5.2[ca]	--	--	--	--
	02/16/11	7.47	1,888.63	<100	<50	--	<250	--	<1	1.4	<1	<3	<1	--	--	--	--
	02/16/11 (Duplicate)	--	--	<100	<50	--	<250	--	<1	1.2	<1	<3	<1	--	--	--	--
	05/18/11	7.29	1,888.81	<100	<50	--	<250	--	<1	<1	<1	<3	<1	--	--	--	--
	05/18/11 (Duplicate)	--	--	<100	270[x]	--	<250	--	<1	<1	<1	<3	<1	--	--	--	--
MW14	03/04/09	7.80	1,889.77	**3,600**	**1,000**[x]	--	<250	--	**18**	1.9	**750**	109	<1	<0.01	<1	2.46	2.86
TOC: 1,897.57 feet	06/09/09	8.62	1,888.95	**2,000**	**1,200**[x]	490[x]	<250	<250	**10**	1.6	450	124	1.3	<0.01	<1	8.02	7.79
	09/10/09	9.68	1,887.89	**1,800**	**730**[x]	--	<250	--	**4.5**	1.2	340	104	<1	<1	<1	5.57	5.87
	12/07/09	Decommissioned															
MTCA Method A Cleanup Level for Groundwater[8]				**1,000/800[b]**	**500**		**500**		**5**	**1,000**	**700**	**1,000**	**20**	**0.01**	**5**	**15**	

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)														
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7]	
																Dissolved	Total
MW15	06/11/08	8.35	1,890.25	<100	82[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
TOC: 1,898.60 feet	09/11/08	9.02	1,889.58	<100	110[dv]	--	<360[dv]	--	<1	<1	<1	<3	1.6	<1	<1	<1	<1
	12/10/08	8.62	1,889.98	<100	93	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/06/09	7.90	1,890.70	<100	<50	--	<250	--	<1	<1	<1	<3	1.0	<0.01	<1	<1	<1
	06/11/09	8.20	1,890.40	<100	<50	--	<250	--	<1	<1	<1	<3	<5	<0.01	--	--	--
	09/08/09	9.34	1,889.26	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/07/09	9.17	1,889.43	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/08/10	9.60	1,889.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/07/10	8.42	1,890.18	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	9.71	1,888.89	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	9.46	1,889.14	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/14/11	8.16	1,890.44	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	7.91	1,890.69	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW16	06/11/08	9.55	1,890.54	110	230[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
TOC: 1,900.09 feet	09/10/08	10.35	1,889.74	130	130[dv]	--	<360[dv]	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/09/08	9.88	1,890.21	<100	94	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/06/09	8.72	1,891.37	<100	94	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/11/09	9.15	1,890.94	<100	160[x]	--	<250	--	<1	<1	<1	<3	<5	<0.01	--	--	--
	09/09/09	10.52	1,889.57	<100	160[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	12/09/09	10.30	1,889.79	<100	140[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	03/09/10	9.72	1,890.37	<100	95[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	06/08/10	9.37	1,890.72	<100	<50	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	08/17/10	10.70	1,889.39	<100	72[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	11/16/10	10.58	1,889.51	<100	<50	--	<250	--	<1	<1	<1	<3	<5[ca]	--	--	--	--
	02/15/11	9.08	1,891.01	<100	<50	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	05/18/11	8.81	1,891.28	<100	86[x]	--	<250	--	<1	<1	<1	<3	<1	--	--	--	--
MW17	06/11/08	9.39	1,890.54	<100	190[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
TOC: 1,899.93 feet	09/10/08	10.14	1,889.79	<100	210	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/09/08	9.65	1,890.28	<100	84	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/06/09	8.44	1,891.49	<100	73	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/11/09	8.91	1,891.02	<100	130[x]	--	<250	--	<1	<1	<1	<3	<5	<0.01	--	--	--
	09/09/09	10.34	1,889.59	<100	350[x]	--	300	--	<1	<1	<1	<3	<5	--	--	--	--
	12/09/09	10.08	1,889.85	<100	180[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	03/09/10	9.51	1,890.42	<100	110[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	06/08/10	9.20	1,890.73	<100	180[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	08/17/10	10.58	1,889.35	<100	240[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	11/16/10	10.39	1,889.54	<100	300[x]	--	<250	--	<1	<1	<1	<3	<5[ca]	--	--	--	--
	02/15/11	8.88	1,891.05	<100	<50	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	05/17/11	8.69	1,891.24	<100	130[x]	--	<250	--	<1	<1	<1	<3	<1	--	--	--	--
MW18	06/11/08	9.08	1,890.54	<100	170[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
TOC: 1,899.62 feet	09/10/08	9.85	1,889.77	<100	200	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/09/08	9.34	1,890.28	<100	150	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/06/09	8.10	1,891.52	<100	130	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/11/09	8.55	1,891.07	<100	300[x]	--	<250	--	<1	<1	<1	<3	<5	<0.01	--	--	--
	09/09/09	9.98	1,889.64	<100	330[x]	--	410	--	<1	<1	<1	<3	<5	--	--	--	--
	12/08/09	9.74	1,889.88	<100	260[x]	--	270[y]	--	<1	<1	<1	<3	<5	--	--	--	--
	03/09/10	9.15	1,890.47	<100	240[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	06/08/10	8.83	1,890.79	<100	270[x]	--	320[x]	--	<1	<1	<1	<3	<5	--	--	--	--
	08/18/10	10.20	1,889.42	<100	190[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	11/16/10	10.03	1,889.59	<100	280[x]	--	<250	--	<1	<1	<1	<3	<5[ca]	--	--	--	--
	02/15/11	8.48	1,891.14	<100	120[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	05/17/11	8.29	1,891.33	<100	79[x]	--	<250	--	<1	<1	<1	<3	<1	--	--	--	--
MW19	06/11/08	7.24	1,891.63	<100	230[x]	--	310	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
TOC: 1,898.87 feet	09/10/08	7.42	1,891.45	<100	260	--	320	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/09/08	6.69	1,892.18	<100	170	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/06/09	5.48	1,893.39	<100	210	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/10/09	6.15	1,892.72	<100	250[x]	--	<250	--	<1	<1	<1	<3	<5	<0.01	--	--	--
	09/10/09	7.05	1,891.82	<100	290[x]	--	420	--	<1	<1	<1	<3	<5	--	--	--	--
	12/09/09	6.70	1,892.17	<100	230[x]	--	310[y]	--	<1	<1	<1	<3	<5	--	--	--	--
	03/09/10	6.42	1,892.45	<100	260[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	06/08/10	6.05	1,892.82	<100	320[x]	--	430[x]	--	<1	<1	<1	<3	<5	--	--	--	--
	08/18/10	7.18	1,891.69	<100	240[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	11/16/10	7.77	1,891.10	<100	200[x]	--	<250	--	<1	<1	<1	<3	<5[ca]	--	--	--	--
	02/16/11	6.01	1,892.86	<100	<50	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	05/17/11	6.54	1,892.33	<100	<50	--	<250	--	<1	<1	<1	<3	<1	--	--	--	--
MTCA Method A Cleanup Level for Groundwater[a]				**1,000/800[b]**	**500**		**500**		**5**	**1,000**	**700**	**1,000**	**20**	**0.01**	**5**	**15**	

SoundEarth Strategies

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)														
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7]	
																Dissolved	Total
MW20	06/11/08	6.80	1,890.41	200	**880**	--	330[y]	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
TOC: 1,897.21 feet	09/10/08	7.83	1,889.38	<100	300[dv]	--	<360[dv]	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/09/08	7.24	1,889.97	<100	350	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/04/09	5.60	1,891.61	210	**1,500**[x]	--	270	--	<1	<1	3.7	<3	<1	<0.01	<1	<1	<1
	06/10/09	5.83	1,891.38	210	**930**[x]	290[x]	440[y]	<250	<1	<1	4.3	<3	<1	<0.01	<1	--	--
	09/09/09	7.78	1,889.43	120	**730**[x]	--	460	--	<1	<1	<1	<3	<5	--	--	--	--
	12/10/09	7.31	1,889.90	<100	**570**[x]	--	260[y]	--	<1	<1	<1	<3	<5	--	--	--	--
	03/09/10	6.70	1,890.51	--	**710**[x]	--	270[x]	--	--	--	--	--	--	--	--	--	--
	06/09/10	6.55	1,890.66	--	**900**[x]	--	490[x]	--	--	--	--	--	--	--	--	--	--
	08/18/10	7.89	1,889.32	--	**630**[x]	--	<250	--	--	--	--	--	--	--	--	--	--
	11/16/10	7.55	1,889.66	--	160[x]	--	<250	--	--	--	--	--	--	--	--	--	--
	02/15/11	6.07	1,891.14	--	**1,100**	--	<250	--	--	--	--	--	--	--	--	--	--
	05/18/11	5.80	1,891.41	--	**750**[x]	--	<250	--	--	--	--	--	--	--	--	--	--
MW21	06/11/08	7.82	1,889.76	<100	50[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
TOC: 1,897.58 feet	09/10/08	7.46	1,890.12	<100	130	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/09/08	7.17	1,890.41	<100	62	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/04/09	5.65	1,891.93	<100	67[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/10/09	7.14	1,890.44	210	480[x]	--	360[y]	--	<1	<1	7.3	<3	<1	<0.01	<1	--	--
	09/09/09	7.82	1,889.76	<100	100[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	12/07/09	7.45	1,890.13	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/08/10	6.90	1,890.68	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/07/10	6.64	1,890.94	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	8.03	1,889.55	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	7.77	1,889.81	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/14/11	6.47	1,891.11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	5.81	1,891.77	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW22	06/11/08	9.29	1,888.40	<100	<50	--	<250	--	<1	<1	<1	<3	2.6	<1	<1	<1	<1
TOC: 1897.69 feet	09/10/08	9.03	1,888.66	<100	83[dv]	--	<360[dv]	--	<1	<1	<1	<3	4.1	<1	<1	<1	<1
	12/10/08	9.61	1,888.08	<100	<50	--	<250	--	<1	<1	<1	<3	3.4	<1	<1	<1	<1
	03/04/09	8.48	1,889.21	<100	83[x]	--	<250	--	<1	<1	<1	<3	7.6	<0.01	<1	<1	<1
	06/08/09	9.10	1,888.59	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/08/09	10.02	1,887.67	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/07/09	8.58	1,889.11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/08/10	9.24	1,888.45	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/07/10	9.04	1,888.65	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	9.96	1,887.73	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	9.63	1,888.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/14/11	8.92	1,888.77	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	8.74	1,888.95	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW23	06/11/08	10.56	1,890.53	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
TOC: 1,901.09 feet	09/10/08	11.30	1,889.79	<100	<71[dv]	--	<360[dv]	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/09/08	10.81	1,890.28	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/06/09	9.60	1,891.49	<100	52	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/10/09	10.07	1,891.02	<100	110[x]	--	<250	--	<1	<1	<1	<3	<5	<0.01	--	--	--
	09/08/09	11.50	1,889.59	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/07/09	11.23	1,889.86	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/08/10	10.62	1,890.47	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/07/10	10.32	1,890.77	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	11.71	1,889.38	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	11.53	1,889.56	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/14/11	9.98	1,891.11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	9.81	1,891.28	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW24	03/06/09	9.54	1,891.11	<100	180	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
TOC: 1,900.65 feet	06/11/09	9.86	1,890.79	<100	260[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	09/09/09	11.10	1,889.55	<100	100[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/09/09	11.00	1,889.65	<100	160[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/08/10	10.50	1,890.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/07/10	10.09	1,890.56	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	11.24	1,889.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	11.28	1,889.37	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/14/11	9.87	1,890.78	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	9.54	1,891.11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW25	03/06/09	5.79	1,892.67	<100	180	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
TOC: 1,898.46 feet	06/11/09	6.32	1,892.14	<100	310[x]	--	390[y]	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	09/10/09	7.12	1,891.34	<100	340[x]	--	420	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/10/09	6.70	1,891.76	<100	200[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/08/10	6.61	1,891.85	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/07/10	6.28	1,892.18	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	7.19	1,891.27	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/17/10	6.85	1,891.61	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/15/11	6.28	1,892.18	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	5.96	1,892.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Level for Groundwater[8]				**1,000/800[b]**	**500**		**500**		**5**	**1,000**	**700**	**1,000**	**20**	**0.01**	**5**	**15**	

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)														
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7]	
																Dissolved	Total
MW26	06/09/09	8.45	1,889.22	<100	360[x]	<50	380[y]	<250	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
TOC: 1,897.67 feet	09/09/09	8.46	1,889.21	<100	210[x]	--	250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	12/08/09	8.26	1,889.41	<100	200[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/09/10	7.67	1,890.00	<100	290[x]	--	**830**	--	<1	<1	<1	<3	<1	<1	<1	<1	3.86
	06/08/10	7.44	1,890.23	<100	400[x]	--	**540**[x]	--	<1	<1	<1	<3	<5	--	--	--	--
	08/17/10	8.79	1,888.88	<100	220[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	11/17/10	8.50	1,889.17	<100	50[x]	--	<250	--	<1	<1	<1	<3	5.8[ca]	--	--	--	--
	02/17/11	7.47	1,890.20	<100	250	--	**760**	--	<1	<1	<1	<3	<1	--	--	--	--
	05/17/11	6.97	1,890.70	<100	220[x]	--	390[x]	--	<1	<1	<1	<3	<1	--	--	--	--
MW27	06/09/09	7.75	1,889.55	<100	170[x]	--	<250	--	<1	<1	<1	<3	1.9	<0.01	<1	<1	<1
TOC: 1,897.30 feet	09/09/09	9.06	1,888.24	<100	190[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	12/08/09	8.86	1,888.44	<100	140[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	**573**
	03/09/10	8.34	1,888.96	<100	160[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	06/08/10	7.96	1,889.34	<100	150[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	<1	<1
	08/17/10	9.24	1,888.06	<100	150[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	<1	<1
	11/17/10	7.77	1,889.53	<100	180[x]	--	<250	--	<1	<1	<1	<3	<5[ca]	--	--	<1	<1
	02/17/11	7.82	1,889.48	<100	140[x]	--	<250	--	<1	<1	<1	<3	<1	--	--	<1	<1
	05/19/11	7.40	1,889.90	<100	130[x]	--	<250	--	<1	<1	<1	<3	<1	--	--	<1	<1
MW28	06/09/09	10.20	1,890.55	<100	<50	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
TOC: 1,900.75 feet	09/09/09	11.28	1,889.47	150	160[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	12/08/09	11.21	1,889.54	150	160[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/09/10	10.74	1,890.01	120	95[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	06/08/10	10.26	1,890.49	120	120[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	08/17/10	11.35	1,889.40	230	150[x]	--	<250	--	1.8	<1	1.6	3.2	<5	--	--	--	--
	11/17/10	11.98	1,888.77	250	58[x]	--	<250	--	<1	<1	<1	3.0	<5[ca]	--	--	--	--
	02/16/11	10.08	1,890.67	<100	<50	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	05/17/11	9.66	1,891.09	<100	<50	--	<250	--	<1	<1	<1	<3	<1	--	--	--	--
MW29	06/11/09	6.86	1,891.89	<100	450[x]	--	**510**[y]	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
TOC: 1,898.75 feet	09/10/09	7.68	1,891.07	<100	290[x]	--	360	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	09/10/09 (Duplicate)	--	--	<100	320[x]	--	470	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	12/10/09	7.39	1,891.36	<100	250[x]	--	280[y]	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/10/09 (Duplicate)	--	--	<100	330[x]	--	330[y]	--	<1	<1	<1	<3	<5	<1	<1	<1	<1
	03/09/10	7.08	1,891.67	<100	260[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/09/10 (Duplicate)	--		<100	310[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	06/08/10	6.77	1,891.98	<100	190[x]	--	260[x]	--	<1	<1	<1	<3	<5	--	--	--	--
	08/18/10	7.65	1,891.10	<100	270[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	08/18/10 (Duplicate)	--	--	<100	250[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	11/17/10	7.39	1,891.36	<100	240[x]	--	<250	--	<1	<1	<1	<3	<5[ca]	--	--	--	--
	11/17/10 (Duplicate)	--	--	<100	250[x]	--	<250	--	<1	<1	<1	<3	<5[ca]	--	--	--	--
	02/15/11	6.71	1,892.04	<100	250	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	02/15/11 (Duplicate)	--	--	<100	200[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	05/18/11	6.45	1,892.30	<100	270[x]	--	<250	--	<1	<1	<1	<3	<1	--	--	--	--
	05/18/11 (Duplicate)	--	--	<100	<50	--	<250	--	<1	<1	<1	<3	<1	--	--	--	--
MW30	06/09/09	5.82	1,891.31	**1,400**	**2,400**	**1,000**	460[y]	<250	<1	<1	110	13	<1	<0.01	<1	<1	<1
TOC: 1,897.13 feet	09/10/09	7.50	1,889.63	360	**1,300**[x]	--	440	--	<1	<1	4.5	<3	<1	<0.01	<1	<1	<1
	12/10/09	7.07	1,890.06	300	**1,000**[x]	--	340[y]	--	<1	<1	1.4	<3	<1	<1	<1	<1	<1
	03/09/10	6.52	1,890.61	410	**1,600**[x]	--	370[x]	--	<1	<1	5.8	<3	<1	<1	<1	<1	<1
	06/09/10	6.32	1,890.81	580	**1,800**[x]	--	**690**[x]	--	2.2	<1	6.5	<3	<5	--	--	--	--
	08/18/10	7.68	1,889.45	450	**1,200**[x]	--	280[x]	--	<1	<1	5.7	6.5	<5	--	--	--	--
	11/16/10	7.36	1,889.77	370	**730**[x]	--	<250	--	1.4	<1	2.5	3.4	<5[ca]	--	--	--	--
	02/15/11	5.86	1,891.27	550	**1,200**	--	<250	--	<1	<1	7.9	4.0	<5	--	--	--	--
	05/17/11	5.51	1,891.62	**1,100**	**1,300**[x]	--	310[x]	--	1.0	6.3	19	8.1	<1	--	--	--	--
MTCA Method A Cleanup Level for Groundwater[a]				**1,000/800**[b]	**500**		**500**		**5**	**1,000**	**700**	**1,000**	**20**	**0.01**	**5**	**15**	

SoundEarth Strategies

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)													
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7]	
																Dissolved	Total
MW31	06/10/09	5.85	1,890.59	<100	130[x]	--	280[y]	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
TOC: 1,896.44 feet	09/09/09	7.05	1,889.39	<100	230	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	12/09/09	6.52	1,889.92	<100	88[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/09/10	5.96	1,890.48	<100	70[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	06/09/10	5.80	1,890.64	<100	<50	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	08/17/10	7.15	1,889.29	<100	160[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	11/16/10	6.79	1,889.65	<100	<50	--	<250	--	<1	<1	<1	<3	<5[ca]	--	--	--	--
	02/15/11	5.31	1,891.13	<100	57	--	<250	--	<1	<1	<1	<3	<1	--	--	--	--
	05/17/11	4.98	1,891.46	<100	<50	--	<250	--	<1	<1	<1	<3	<1	--	--	--	--
MW32	06/11/09	6.28	1,892.22	<100	480[x]	<50	570[y]	<250	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
TOC: 1,898.50 feet	09/10/09	7.12	1,891.38	<100	380[x]	--	490	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	12/10/09	6.72	1,891.78	<100	330[x]	--	330[y]	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/09/10	6.56	1,891.94	<100	330[x]	--	310[x]	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	06/09/10	6.24	1,892.26	<100	410[x]	--	460[x]	--	<1	<1	<1	<3	<5	--	--	--	--
	08/18/10	7.18	1,891.32	<100	250[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	11/16/10	6.85	1,891.65	<100	300[x]	--	260[x]	--	<1	<1	<1	<3	<5[ca]	--	--	--	--
	02/15/11	6.22	1,892.28	<100	290	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	05/18/11	5.89	1,892.61	<100	380[x]	--	280[x]	--	<1	<1	<1	<3	<1	--	--	--	--
CMW01[a]	10/21/04	9.69	1,889.89	ND	--	--	--	--	**9.4**	ND	ND	ND	--	--	--	--	--
TOC: 1,899.58 feet	11/23/04	9.89	1,889.69	233	--	--	--	--	**71.5**	5.24	1.35	3.44	--	--	--	--	--
	12/13/04	9.05	1,890.53	685	--	--	--	--	**66.8**	5.71	1.67	23.7	--	--	--	--	--
	03/16/05	9.66	1,889.92	428	--	--	--	--	**110**	2.43	2.03	4.51	--	--	--	--	--
	06/23/05	9.50	1,890.08	316	--	--	--	--	**76.7**	ND	ND	2.39	--	--	--	--	--
	09/08/05	10.07	1,889.51	249	--	--	--	--	**53.8**	ND	1.69	5.48	--	--	--	--	--
	12/14/05	9.60	1,889.98	324	--	--	--	--	**59.2**	1.25	1.30	6.71	<1.00	--	--	--	--
	03/16/06	8.33	1,891.25	250	--	--	--	--	**16.0**	<2.00	<1.00	1.91	<2.00	--	--	--	--
	07/25/06	9.43	1,890.15	151	--	--	--	--	3.28	ND	ND	1.84	1.31	--	--	--	--
	09/26/06	9.99	1,889.59	ND	--	--	--	--	2.35	ND	ND	ND	ND	--	--	--	--
	01/24/07	Decommissioned															
CMW02[a]	10/21/04	10.11	1,887.86	ND	--	--	--	--	**5.16**	ND	ND	ND	--	--	--	--	--
TOC: 1,899.97 feet	11/23/04	10.29	1,887.68	ND	--	--	--	--	4.66	ND	ND	ND	--	--	--	--	--
	12/13/04	9.45	1,888.52	145	--	--	--	--	**22.3**	ND	ND	4.03	--	--	--	--	--
	03/16/05	10.10	1,887.87	ND	--	--	--	--	**12.3**	ND	ND	ND	--	--	--	--	--
	06/23/05	9.91	1,888.06	ND	--	--	--	--	**17.3**	ND	ND	ND	--	--	--	--	--
	09/08/05	10.45	1,887.52	ND	--	--	--	--	**12.6**	ND	ND	ND	--	--	--	--	--
	12/14/05	9.94	1,890.03	382	--	--	--	--	**115**	36.50	4.41	10.86	<1.00	--	--	--	--
	03/16/06	8.73	1,891.24	**1,130**	--	--	--	--	**432**	5.33	14.1	21.9	4.82	--	--	--	--
	07/25/06	9.82	1,890.15	159	--	--	--	--	**22**	2.07	2.13	8.67	ND	--	--	--	--
	09/26/06	10.33	1,889.64	122	--	--	--	--	**21.7**	ND	5.25	13.50	ND	--	--	--	--
	01/24/07	8.45	1,891.52	465	--	--	--	--	**151**	2.41	11.70	11.90	ND	--	--	--	--
	03/14/07	8.79	1,891.18	471	325	--	<500	--	**87.6**	<2	27.8	5.54	<10.0	<0.0100	<10	--	--
	06/27/07	9.88	1,890.09	<100	<250	--	<500	--	3.20	<2	<1	<1.50	<1	<0.0100	<1	--	--
	06/27/07 (Duplicate)	--	--	<100	220	--	<250	--	3.4	<1	<1	<3	<1	<1	<1	--	--
	09/25/07	9.45	1,890.52	111	<250	--	<500	--	**7.21**	<2	<1	<1.50	<1	<0.0100	<1	--	--
	12/19/07	9.45	1,890.52	<100	<250	--	<500	--	3.56	<2.00	<1	<1.50	<1	<0.0100	<1	--	--
	03/04/08	8.61	1,891.36	<100	180	--	<250	--	3.5	<1	<1	<3	<1	<1	<1	--	<1
	06/10/08	9.45	1,890.52	<100	130[x]	--	<250	--	**7.7**	<1	<1	<3	1.0[g]	<1	<1	--	--
	09/10/08	10.16	1,889.81	<100	140	--	<250	--	**10**	<1	<1	<3	<1	<1	<1	<1	<1
	12/09/08	9.67	1,890.30	<100	90	--	<250	--	1.4	<1	<1	<3	<1	<1	<1	<1	<1
	03/04/09	8.45	1,891.52	<100	77[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/10/09	8.93	1,891.04	<100	110[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	09/10/09	10.37	1,889.60	<100	110[x]	--	<250	--	<1	<1	<1	<3	<5	--	--	--	--
	12/07/09	10.10	1,889.87	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/10/10	9.49	1,890.48	<100	81[x]	--	<250	--	<1	<1	<1	<3	--	--	--	--	--
	06/07/10	9.20	1,890.77	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	10.59	1,889.38	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	10.40	1,889.57	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/14/11	8.84	1,891.13	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	8.68	1,891.29	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Level for Groundwater[a]				**1,000/800**[b]	**500**		**500**		**5**	**1,000**	**700**	**1,000**	**20**	**0.01**	**5**	**15**	

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)													
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7]	
																Dissolved	Total
CMW03[a]	10/21/04	8.62	1,891.56	ND	--	--	--	--	ND	ND	ND	ND	--	--	--	--	--
TOC: 1,900.18 feet	11/23/04	8.55	1,891.63	ND	--	--	--	--	ND	ND	ND	ND	--	--	--	--	--
	12/13/04	7.83	1,892.35	ND	--	--	--	--	ND	ND	ND	ND	--	--	--	--	--
	03/16/05	8.79	1,891.39	ND	--	--	--	--	ND	ND	ND	ND	--	--	--	--	--
	06/23/05	9.85	1,890.33	ND	--	--	--	--	ND	ND	ND	ND	--	--	--	--	--
	09/08/05	9.13	1,891.05	ND	--	--	--	--	ND	ND	ND	ND	--	--	--	--	--
	12/14/05	8.42	1,891.76	<100	--	--	--	--	1.14	<0.500	<1.00	<3.00	<1.00	--	--	--	--
	03/16/06	7.90	1,892.28	<100	--	--	--	--	<0.500	<2.00	<1.00	<1.50	<1.00	--	--	--	--
	07/25/06	8.85	1,891.33	ND	--	--	--	--	ND	ND	ND	ND	ND	--	--	--	--
	09/26/06	9.42	1,890.76	ND	--	--	--	--	ND	ND	2.12	7.60	ND	--	--	--	--
	01/24/07	7.88	1,892.30	ND	--	--	--	--	ND	ND	ND	ND	ND	--	--	--	--
	03/14/07	8.09	1,892.09	<100	<250	--	**507**	--	<0.500	<2.00	<1.00	<1.50	<1.00	<0.0100	<1.00	--	--
	06/27/07	8.95	1,891.23	<100	<250	--	<500	--	<0.500	<2.00	<1.00	<1.50	<1.00	<0.0100	<1.00	--	--
	09/25/07	9.83	1,890.35	<100	<250	--	<500	--	<0.500	<2.00	<1.00	<1.50	<1.00	<0.0100	<1.00	--	--
	12/19/07	8.42	1,891.76	<100	<250	--	<500	--	<0.500	<2.00	<1.00	<1.50	<1.00	<0.0100	<1.00	--	--
	03/04/08	8.02	1,892.16	<100	160[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	<1
	06/10/08	8.29	1,891.89	<100	92[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	09/10/08	9.21	1,890.97	<100	220	--	320	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/09/08	8.60	1,891.58	<100	140	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	03/04/09	7.50	1,892.68	<100	110[x]	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/10/09	8.10	1,892.08	<100	100[x]	--	<250	--	<1	<1	<1	<3	<1	<1	<1	--	--
	09/08/09	9.05	1,891.13	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/07/09	8.70	1,891.48	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/08/10	8.36	1,891.82	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/07/10	8.05	1,892.13	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	9.17	1,891.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	9.85	1,890.33	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/14/11	7.88	1,892.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	7.67	1,892.51	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CMW04[a]	12/13/04	7.01	1,891.21	**1,990**	--	--	--	--	**218**	118	79.8	164	--	--	--	--	--
TOC: 1,898.22 feet	03/16/05	8.31	1,889.91	464	--	--	--	--	**111**	22.8	24.4	30	--	--	--	--	--
	06/23/05	6.18	1,892.04	**1,680**	--	--	--	--	**196**	15.4	128	131	--	--	--	--	--
	09/08/05	8.74	1,889.48	**4,720**	--	--	--	--	**564**	34.7	292	311	--	--	--	--	--
	12/14/05	8.22	1,890.00	783	--	--	--	--	**236**	122	31.2	71.6	<10.0	--	--	--	--
	03/16/06	6.99	1,891.23	**1,630**	--	--	--	--	**159**	129	43.9	116	2.60	--	--	--	--
	03/16/06 (Duplicate)	--	--	**2,150**	--	--	--	--	**226**	199	58.8	170	<5.00	<0.500	<0.500	--	--
	07/25/06	8.13	1,890.09	**5,130**	--	--	--	--	**725**	80.50	367	574	ND	--	--	--	--
	09/26/06	8.46	1,889.76	**1,510**	--	--	--	--	**265**	20.70	110	124	ND	--	--	--	--
	09/26/06 (Duplicate)	--	--	**1,400**	**736**[D-06]	--	<472	--	**225**	16.3	95.6	104	<5.00	<0.500	<0.500	--	--
	01/24/07	6.74	1,891.48	160	--	--	--	--	**25.0**	2.80	4.67	11	ND	--	--	--	--
	03/14/07	7.05	1,891.17	168	298	--	<500	--	**29.2**	<2.00	3.72	4.05	2.10	<0.0100	<2.00	--	--
	06/27/07	8.17	1,890.05	116	<250	--	<500	--	**16.4**	<2.00	2.85	7.86	<1.00	<0.0100	<1.00	--	--
	09/25/07	9.02	1,889.20	<100	<250	--	<500	--	1.02	<2.00	<1.20	<1.89	<1.22	<0.0100	<1.00	--	--
	12/19/07	7.70	1,890.52	<100	<250	--	<500	--	**5.80**	<2.00	1.20	1.89	1.22	<0.0100	<1.00	--	--
	03/04/08	6.89	1,891.33	<100	150[x]	--	<250	--	3.8	<1	<1	<3	<1	<1	<1	--	<1
	06/10/08	7.61	1,890.61	<100	130[x]	--	<250	--	1.4	<1	<1	<3	1.1[J]	<1	<1	--	--
	09/10/08	8.45	1,889.77	<100	130	--	<250	--	<1	<1	<1	<3	<1	<1	<1	<1	<1
	12/09/08	7.96	1,890.26	<100	160	--	<250	--	2.4	<1	1.1	<3	1.1	<1	<1	<1	<1
	03/06/09	6.70	1,891.52	<100	140	--	<250	--	1.6	<1	<1	<3	1.3	<0.01	<1	<1	<1
	06/08/09	7.20	1,891.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/08/09	8.64	1,889.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/07/09	8.40	1,889.82	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/08/10	7.76	1,890.46	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/07/10	7.46	1,890.76	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	8.87	1,889.35	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/10	8.65	1,889.57	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/14/11	7.11	1,891.11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/11	6.92	1,891.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Level for Groundwater[8]				**1,000/800**[b]	**500**		**500**		**5**	**1,000**	**700**	**1,000**	**20**	**0.01**	**5**	**15**	

Table 2
Summary of Groundwater Analytical Results for TPH, BTEX, VOCs, and Lead
North Colfax Petroleum Contamination Site
Colfax, Washington

Well ID	Sample Date	Depth to Groundwater[1] (feet)	Groundwater Elevation (feet)	Analytical Results (µg/L)													
				GRPH[2]	DRPH[3]	DRPH with silica gel[4]	ORPH[3]	ORPH with silica gel[4]	Benzene[5]	Toluene[5]	Ethylbenzene[5]	Total Xylenes[5]	MTBE[5]	EDB[6]	EDC[5]	Lead[7] Dissolved	Lead[7] Total
CMW05[a]	12/13/04	7.74	1,890.51	**8,330**	--	--	--	--	**498**	184	324	583	--	--	--	--	--
TOC: 1,898.25 feet	03/16/05	8.33	1,889.92	**3,750**	--	--	--	--	**415**	6.74	486	304	--	--	--	--	--
	06/23/05	8.21	1,890.04	**12,400**	--	--	--	--	**1,970**	357	**767**	**1,560**	--	--	--	--	--
	09/08/05	8.77	1,889.48	**6,910**	--	--	--	--	**1,380**	27.4	315	243	--	--	--	--	--
	12/14/05	8.24	1,890.01	**6,310**	--	--	--	--	**1,190**	82.9	481	826	<100	--	--	--	--
	03/16/06	7.04	1,891.21	**6,970**	--	--	--	--	**585**	2.6	512	701	<20.0	--	--	--	--
	07/25/06	8.16	1,890.09	**9,220**	--	--	--	--	**1,550**	ND	502	328	ND	--	--	--	--
	09/26/06	8.65	1,889.60	**5,210**	--	--	--	--	**1,070**	ND	400	225	ND	--	--	--	--
	01/24/07	6.76	1,891.49	295	--	--	--	--	**53.0**	ND	3.88	11.7	ND	--	--	--	--
	03/14/07	7.07	1,891.18	220	270	--	<500	--	**34.7**	<2.00	1.31	<1.50	<2.00	<0.0100	<2.00	--	--
	03/14/07 (Duplicate)	--	--	240	190[D-06]	--	<250	--	**34**	<1.00	<1.00	<3.00	2.8	<1.00	<1.00	--	--
	06/27/07	8.20	1,890.05	143	<250	--	<500	--	**28.8**	<2.00	<1.00	<1.50	3.96	<0.0100	<1.00	--	--
	09/25/07	9.06	1,889.19	116	<250	--	<500	--	**8.34**	<2.00	<1.00	1.51	1.42	<0.0100	<1.00	--	--
	09/25/07 (Duplicate)	--	--	<100	<50	--	<250	--	2.6	<1	<1	<3	1.9	<1	<1	--	--
	12/19/07	7.73	1,890.52	<100	89	--	<250	--	1.9	<1	<1	<3	4.8	<1	<1	--	--
	12/19/07 (Duplicate)	--	--	<100	<250	--	<500	--	2.14	<2	<1	<1.50	5.04	<0.0100	<1.00	--	--
	03/04/08	6.91	1,891.34	<100	93[x]	--	<250	--	3.5	<1	<1	<3	7.1	<1	<1	--	<1
	03/04/08	--	--	<100	120[x]	--	<250	--	3.8	<1	<1	<3	7.9	<1	<1	--	<1
	06/10/08	7.67	1,890.58	<100	74[x]	--	<250	--	<1	<1	<1	<3	5.5[J]	<1	<1	--	--
	06/10/08 (Duplicate)	--	--	<100	<50	--	<250	--	<1	<1	<1	<3	4.5	<1	<1	--	--
	09/10/08	8.45	1,889.80	<100	64	--	<250	--	<1	<1	<1	<3	5.5	<1	<1	<1	<1
	12/09/08	7.97	1,890.28	<100	90	--	<250	--	<1	<1	<1	<3	4.9	<1	<1	<1	<1
	03/06/09	6.75	1,891.50	<100	85	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	03/06/09 (Duplicate)	--	--	<100	140	--	<250	--	<1	<1	<1	<3	<1	<0.01	<1	<1	<1
	06/08/09	7.25	1,891.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/08/09	8.71	1,889.54	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/07/09	8.42	1,889.83	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/08/10	7.79	1,890.46	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/07/10	7.50	1,890.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/16/10	8.90	1,889.35	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/17/10	8.71	1,889.54	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	02/14/11	7.15	1,891.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/11	6.96	1,891.29	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Level for Groundwater[8]				**1,000/800**[b]	**500**		**500**		**5**	**1,000**	**700**	**1,000**	**20**	**0.01**	**5**	**15**	

NOTES:

Red denotes concentration exceeds MTCA Method A cleanup level for groundwater.

Data collected from wells MW01 through MW12 prior to September 2005 as reported in GeoEngineers, Inc.'s February 2005 Groundwater Monitoring Report.

Sample analyses conducted by Friedman & Bruya, Inc. of Seattle, Washington.

[1]Measured below a fixed spot on the well casing rim.

[2]Analyzed by Method NWTPH-Gx.

[3]Analyzed by Method NWTPH-Dx.

[4]Analyzed by Method NWTPH-Dx following a silica gel cleanup sample preparation.

[5]Analyzed by EPA Method 8021B, 8260B, or 8260C.

[6]Analyzed by EPA Method 8260B, 8260C, or 8011 Modified.

[7]Analyzed by EPA Method 200.8.

[8]MTCA Method A Cleanup Levels, Table 720-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, revised November 2007.

[a]Wells are located on the Colfax Grange property. Results prior to 2008 as reported by Quantum Engineering.

[b]1,000 µg/L when benzene is not detected and 800 µg/L when benzene is detected.

Laboratory Notes:

[A-02]Sample had headspace due to multiple shots.

[ca]The calibration results for this range fell outside of acceptance criteria. The value reported is an estimate.

[D-06]The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

[d]Detection limits are raised due to sample dilution.

[dv]Laboratory reporting limits are raised due to insufficient sample.

[HT-1]Sample analysis performed past method-specific holding time.

[HT-3]Initial analysis within holding time. Reanalysis for the required dilution was past holding time.

[Q-40]This analyte had a low bias on the associated calibration verification standard.

[Q-41]This analyte had a high bias on the associated calibration verification standard.

[J]The analyte result in the laboratory control sample is out of control limits. Results should be considered an estimate.

[x]The pattern of peaks present is not indicative of diesel or the sample chromatographic pattern does not resemble the fuel standard used for quantitation.

[y]The pattern of peaks present is not indicative of motor oil.

-- = not analyzed, measured, or calculated
< = not detected at concentration exceeding the laboratory reporting limit
µg/L = micrograms per liter
BTEX = benzene, toluene, ethylbenzene, and total xylenes
DRPH = diesel-range petroleum hydrocarbons
EDB = ethylene dibromide (1,2-dibromoethane)
EDC = ethylene dichloride (1,2-dichloroethane)
EPA = U.S. Environmental Protection Agency
GRPH = gasoline-range petroleum hydrocarbons
MTBE = methyl tertiary-butyl ether
MTCA = Washington State Model Toxics Control Act
ND = not detected above the laboratory reporting limit as reported by Quantum Engineering
NWTPH = Northwest Total Petroleum Hydrocarbon
ORPH = oil-range petroleum hydrocarbons
TOC = top of casing elevation
TPH = total petroleum hydrocarbons
VOC = volatile organic compounds

Table 3
Time Oil Property Remedial Component Screening Matrix
North Colfax Petroleum Contamination Site
Colfax, Washington

Component Group	Component Options	Protects Human Health and the Environment	Complies with Cleanup Standards	Complies with Applicable Local, State and Federal Laws	Provides for Compliance Monitoring	Uses Permanent Solutions to the Maximum Extent Practicable	Provides Reasonable Restoration Time Frame	Considers Public Concerns[1]	Component Retained for Further Evaluation	Comments
		Threshold Criteria (WAC 173-340-360 [2][a])				**Modifying Criteria (WAC 173-340-360 [2][b])**				
Passive Remediation										
	No Further Action	X	X	X	X	X	X	NA	No	Excluded because component is not protective of human health and the environment.
	Monitored Natural Attenuation	√	√	√	√	√	√	NA	Yes	Retained in conjunction with cap maintenance and an institutional control.
	Institutional Control	√	√	√	√	√	√	NA	Yes	Retained in conjunction with cap maintenance and monitored natural attenuation.
	Passive Treatment Wall (Activated Carbon/PRB)	NA	NA	NA	NA	NA	NA	NA	No	Not retained because groundwater contamination no longer remains beneath the property.
In Situ Physical Treatment										
	VE	√	√	√	√	√	√	NA	Yes	Retained for treatment of soil contamination in the vadose zone.
	Air Sparge	√	√	√	√	√	√	NA	No	Not retained because groundwater contamination no longer remains beneath the property; however, groundwater samples will continue to be collected on a quarterly basis from MW26 (the only well to slightly exceed MTCA Method A) to observe groundwater trends. If future monitoring events reveal persistent ORPH concentrations that exceed the MTCA Method A cleanup levels, an active remedial technology such as this would be considered.
	Air Sparge with VE	√	√	√	√	√	√	NA	No	Not retained because groundwater contamination no longer remains beneath the property; however, groundwater samples will continue to be collected on a quarterly basis from MW26 (the only well to slightly exceed MTCA Method A) to observe groundwater trends. If future monitoring events reveal persistent ORPH concentrations that exceed MTCA Method A, an active remedial technology such as this would be considered.
	Bioslurping	NA	NA	NA	NA	NA	NA	NA	No	Not retained because groundwater contamination no longer remains beneath the property.
	Surfactant Washing	√	√	√	√	√	X	NA	No	Not retained because groundwater contamination no longer remains beneath the property. Although component may address vadose zone soil, technology specifically targets saturated zone contamination, and treatment of vadose zone would likely not meet cleanup standards within a reasonable time frame.
	Cosolvent Washing	X	X	√	√	X	X	NA	No	Not retained because component is not effective for remediation of vadose zone soil.
	Air Sparge with Ozone	√	√	√	√	√	√	NA	No	Not retained for further evaluation because groundwater contamination no longer remains beneath the property and because the presence of a strong oxidant in the vicinity of an active fueling system has the potential for an explosive environment.
	Pump and Treat	NA	NA	NA	NA	NA	NA	NA	No	
	Dual-Phase Extraction	NA	NA	NA	NA	NA	NA	NA	No	Not retained because groundwater contamination no longer remains beneath the property.
Thermal										
	Resistive Thermal with VE	√	√	√	√	√	√	NA	No	
	Conductive Thermal with VE	√	√	√	√	√	√	NA	No	
	Radio Frequency/Electromagnetic Thermal with VE	√	√	√	√	√	√	NA	No	
	Steam Injection with VE and Groundwater Extraction	√	√	√	√	√	√	NA	No	Although these in situ thermal components generally satisfy the MTCA threshold and modifying evaluation criteria, none are retained because they are difficult to implement and are not cost effective with other components when implemented on a small scale. Additionally, these thermal components present an increased short-term risk of injury during their installation and operation period.
	Hot Air Injection with VE	√	√	√	√	√	√	NA	No	
	Hot Water Injection with VE and Groundwater Extraction	√	√	√	√	√	√	NA	No	
Source Removal										
	Excavation without shoring	X	√	√	√	√	√	NA	No	Not feasible to implement as excavation of all existing contaminated soil would require the demolition of existing structures on the property.
	Excavation with shoring									
	Secant Pile Wall - Impervious wall	X	X	√	√	X	X	NA	No	Not retained due to difficulty in waterproofing joints and increased costs compared to sheet pile walls.
	Sheet Pile Wall (Sealed) - Impervious wall	X	X	√	√	X	X	NA	No	Not retained due to inability of shoring materials to penetrate shallow bedrock in vicinity of excavation.
	Soldier Pile Wall - Pervious wall	√	√	√	√	√	√	NA	Yes	Retained as shoring option due to the observed shallow bedrock in the vicinity of the excavation. Other shoring options will not be able to penetrate and maintain soil loads with shallower bedrock penetration.
	Groundwater Treatment with Shored Excavation									
	with permeable reactive barrier for groundwater	√	√	√	√	√	√	NA	No	Not retained because the excavation with shoring will require the excavation to be dewatered with above-ground treatment (if necessary) prior to discharging to the sewer. This component assumes groundwater treatment in place which would limit the depth of the excavation, leaving a residual amount of contamination in place.
	with sub-grade groundwater intrusion control system	√	√	√	√	√	√	NA	No	Not retained because a permanent groundwater intrusion control system is not necessary for the excavation.
	with groundwater discharge to sewer	√	√	√	√	√	√	NA	Yes	Retained for temporary dewatering of groundwater in the vicinity of the excavation.
Source Removal Treatment										
	Surfactant Washing	√	√	√	√	√	√	NA	No	
	Cosolvent Washing	√	√	√	√	√	√	NA	No	
	Chemical Oxidation	√	√	√	√	√	√	NA	No	Not retained as this treatment component is not the most permanent for destruction of chemicals.
	Thermal Desorption	√	√	√	√	√	√	NA	No	Evaluated as a source removal treatment component, but not retained due to cost of treatment of soil versus landfill disposal.
	Landfill Disposal	√	√	√	√	√	√	NA	Yes	Retained for further consideration in conjunction with excavation with shoring via soldier piles and pin piles.

Table 3
Time Oil Property Remedial Component Screening Matrix
North Colfax Petroleum Contamination Site
Colfax, Washington

Component Group	Component Options	Protects Human Health and the Environment	Complies with Cleanup Standards	Complies with Applicable Local, State and Federal Laws	Provides for Compliance Monitoring	Uses Permanent Solutions to the Maximum Extent Practicable	Provides Reasonable Restoration Time Frame	Considers Public Concerns[1]	Component Retained for Further Evaluation	Comments
		Threshold Criteria (WAC 173-340-360 [2][a])				Modifying Criteria (WAC 173-340-360 [2][b])				
In Situ Chemical Oxidation										
	Sodium Persulfate	X	X	√	√	X	X	NA	No	Not retained because these components are typically used to remediate saturated zone soil and groundwater, and groundwater contamination no longer remains beneath the property. In situ chemical oxidation is not effective for soil contamination in the vadose zone.
	Heated Sodium Persulfate	X	X	√	√	X	X	NA	No	Not retained because groundwater contamination no longer remains beneath the property; however, groundwater samples will continue to be collected on a quarterly basis from MW26 (the only well to slightly exceed MTCA Method A) to observe groundwater trends. If future monitoring events reveal persistent ORPH concentrations that exceed MTCA Method A, an active remedial technology such as this would be considered.
	pH-Activated Sodium Persulfate	X	X	√	√	X	X	NA	No	Not retained because groundwater contamination no longer remains beneath the property; however, groundwater samples will continue to be collected on a quarterly basis from MW26 (the only well to slightly exceed MTCA Method A) to observe groundwater trends. If future monitoring events reveal persistent ORPH concentrations that exceed MTCA Method A, an active remedial technology such as this would be considered.
	Hydrogen Peroxide	X	X	√	√	X	X	NA	No	Not retained because these components are typically used to remediate saturated zone soil and groundwater, and groundwater contamination no longer remains beneath the property. In situ chemical oxidation is not effective for soil contamination in the vadose zone.
	Hydrogen Peroxide-Activated Sodium Persulfate	X	X	√	√	X	X	NA	No	Not retained because groundwater contamination no longer remains beneath the property; however, groundwater samples will continue to be collected on a quarterly basis from MW26 the (only well to slightly exceed MTCA Method A) to observe groundwater trends. If future monitoring events reveal persistent ORPH concentrations that exceed MTCA Method A, an active remedial technology such as this would be considered.
	Permanganate	X	X	√	√	X	X	NA	No	
	RegenOx (Catalyzed Sodium Percarbonate)	X	X	√	√	X	X	NA	No	Not retained because these components are typically used to remediate saturated zone soil and groundwater, and groundwater contamination no longer remains beneath the property. In situ chemical oxidation is not effective for soil contamination in the vadose zone.
	Fenton's Reagent	X	X	√	√	X	X	NA	No	Not retained because groundwater contamination no longer remains beneath the property; however, groundwater samples will continue to be collected on a quarterly basis from MW26 (the only well to slightly exceed MTCA Method A) to observe groundwater trends. If future monitoring events reveal persistent ORPH concentrations that exceed MTCA Method A, an active remedial technology such as this would be considered.
	Activated Iron Wall	X	X	√	√	X	X	NA	No	Not retained because these components are typically used to remediate saturated zone soil and groundwater, and groundwater contamination no longer remains beneath the property. In situ chemical oxidation is not effective for soil contamination in the vadose zone.
Containment/Immobilization										
	Bituminization	√	X	√	√	X	X	NA	No	
	Emulsified Asphalt	√	X	√	√	X	X	NA	No	
	Modified Sulfur Cement	√	X	√	√	X	X	NA	No	Not retained because these components reduce the mobility of hazardous substances but not toxicity or volume.
	Polyethylene Extrusion	√	X	√	√	X	X	NA	No	Not retained because component is not well developed and is complex to implement.
	Pozzolan/Portland Cement	√	X	√	√	X	X	NA	No	
	Vitrification/Molten Glass	√	X	√	√	X	X	NA	No	
	Slurry Wall Containment	NA	NA	NA	NA	NA	NA	NA	No	
	Sheet Pile Wall Containment	NA	NA	NA	NA	NA	NA	NA	No	Not retained because these components reduce the mobility of hazardous substances but not toxicity or volume.
	Pump and Treat for Hydraulic Containment	NA	NA	NA	NA	NA	NA	NA	No	Not retained because groundwater contamination no longer remains beneath the property.
Phytoremediation										
	Hydraulic Control	√	√	√	√	√	X	NA	No	
	Phyto-Degradation	√	√	√	√	√	X	NA	No	
	Phyto-Volatilization	√	√	√	√	√	X	NA	No	
	Phyto-Accumulation	√	√	√	√	√	X	NA	No	
	Phyto-Stabilization	√	√	√	√	√	X	NA	No	
	Enhanced Rhizosphere Biodegradation	√	√	√	√	√	X	NA	No	Not retained because component is not compatible with future land use plans, nor do these components result in a reasonable restoration timeframe.
In Situ Bioremediation										
	Co-Metabolic Aerobic Bio-Augmentation	√	√	√	√	√	√	NA	No	Components could be implemented in conjunction with VE, but is not warranted due to the relatively low contaminant concentrations beneath the property.
	Co-Metabolic Aerobic Bio-Stimulation	√	√	√	√	√	√	NA	No	
	Anaerobic Bio-Augmentation	X	X	√	√	X	X	NA	No	
	Anaerobic Bio-Stimulation	X	X	√	√	X	X	NA	No	
	Nitrate-Enhanced Bioremediation	X	X	√	√	X	X	NA	No	
	Sulfate-Enhanced Bioremediation	X	X	√	√	X	X	NA	No	Not retained as components will not address residual contamination via anaerobic means.
Capping										
	Containment Cap	√	√	√	√	√	√	NA	Yes	Retained in conjunction with institutional control and monitored natural attenuation

NOTES:

[1]The public comment process has not been initiated for this document; therefore, public concerns have not been evaluated for these alternatives.

In order for the option to pass the screening, all of the threshold criteria must be met.

X = Does not meet criterion

√ = Does meet criterion

MTCA = Washington State Model Toxics Control Act

NA = not applicable

ORPH = oil-range petroleum hydrocarbons

PRB = permeable reactive barrier

VE = vapor extraction

WAC = Washington Administrative Code

Table 4
Cenex Property Remedial Component Screening Matrix
North Colfax Petroleum Contamination Site
Colfax, Washington

Component Group	Component Options	Protects Human Health and the Environment	Complies with Cleanup Standards	Complies with Applicable Local, State and Federal Laws	Provides for Compliance Monitoring	Uses Permanent Solutions to the Maximum Extent Practicable	Provides Reasonable Restoration Time Frame	Considers Public Concerns[1]	Component Retained for Further Evaluation	Comments
		Threshold Criteria (WAC 173-340-360 [2][a])				Modifying Criteria (WAC 173-340-360 [2][b])				
Passive Remediation										
	No Further Action	X	X	X	X	X	X	NA	No	Excluded because component is not protective of human health and the environment.
	Monitored Natural Attenuation	√	√	√	√	√	√	NA	Yes	Retained in conjunction with cap maintenance and an institutional control.
	Institutional Control	√	√	√	√	√	√	NA	Yes	Retained in conjunction with cap maintenance and monitored natural attenuation.
	Passive Treatment Wall (Activated Carbon/PRB)	NA	NA	NA	NA	NA	NA	NA	No	Not retained because groundwater contamination no longer remains beneath the property.
In Situ Physical Treatment										
	VE	√	√	√	√	√	√	NA	Yes	Retained for treatment of soil contamination in the vadose zone.
	Air Sparge	NA	NA	NA	NA	NA	NA	NA	No	
	Air Sparge with VE	NA	NA	NA	NA	NA	NA	NA	No	
	Bioslurping	NA	NA	NA	NA	NA	NA	NA	No	Not retained because groundwater contamination no longer remains beneath the property.
	Surfactant Washing	√	√	√	√	√	X	NA	No	Not retained because groundwater contamination no longer remains beneath the property. Although component may address vadose zone soils, technology specifically targets saturated zone contamination, and treatment of vadose zone would likely not meet cleanup standards within a reasonable time frame.
	Cosolvent Washing	X	X	√	√	X	X	NA	No	Not retained because component is not effective for remediation of vadose zone soil.
	Air Sparge with Ozone	√	√	√	√	√	√	NA	No	Not retained for further evaluation because groundwater contamination no longer remains beneath the property and because the presence of a strong oxidant in the vicinity of an active fueling system has the potential for an explosive environment.
	Pump and Treat	NA	NA	NA	NA	NA	NA	NA	No	
	Dual-Phase Extraction	NA	NA	NA	NA	NA	NA	NA	No	Not retained because groundwater contamination no longer remains beneath the property.
Thermal										
	Resistive Thermal with VE	√	√	√	√	√	√	NA	No	Although these in situ thermal components generally satisfy the MTCA threshold and modifying evaluation criteria, none are retained because they are difficult to implement and are not cost effective with other components when implemented on a small scale. Additionally, these thermal components present an increased short-term risk of injury during their installation and operation period.
	Conductive Thermal with VE	√	√	√	√	√	√	NA	No	
	Radio Frequency/Electromagnetic Thermal with VE	√	√	√	√	√	√	NA	No	
	Steam Injection with VE and Groundwater Extraction	√	√	√	√	√	√	NA	No	
	Hot Air Injection with VE	√	√	√	√	√	√	NA	No	
	Hot Water Injection with VE and Groundwater Extraction	√	√	√	√	√	√	NA	No	
Source Removal										
	Excavation without shoring	X	√	√	√	√	√	NA	No	Not feasible to implement as excavation of all existing contaminated soil would require the demolition of existing structures on the property.
	Excavation with shoring									
	Secant Pile Wall - Impervious wall	X	X	√	√	X	X	NA	No	Not retained due to difficulty in waterproofing joints and increased costs compared to sheet pile walls.
	Sheet Pile Wall (Sealed) - Impervious wall	X	X	√	√	X	X	NA	No	Not retained due to inability of shoring materials to penetrate shallow bedrock in vicinity of excavation.
	Soldier Pile Wall - Pervious wall	√	√	√	√	√	√	NA	Yes	Retained as shoring option due to the observed shallow bedrock in the vicinity of the excavation. Other shoring options will not be able to penetrate and maintain soil loads with shallower bedrock penetration.
	Groundwater Treatment with Shored Excavation									
	with permeable reactive barrier for groundwater	√	√	√	√	√	√	NA	No	Not retained because the excavation with shoring will require the excavation to be dewatered with above-ground treatment (if necessary) prior to discharging to the sewer. This component assumes groundwater treatment in place which would limit the depth of the excavation, leaving a residual amount of contamination in place.
	with sub-grade groundwater intrusion control system	√	√	√	√	√	√	NA	No	Not retained because a permanent groundwater intrusion control system is not necessary for the excavation.
	with groundwater discharge to sewer	√	√	√	√	√	√	NA	Yes	Retained for temporary dewatering of groundwater in the vicinity of the excavation.
Source Removal Treatment										
	Surfactant Washing	√	√	√	√	√	√	NA	No	
	Cosolvent Washing	√	√	√	√	√	√	NA	No	
	Chemical Oxidation	√	√	√	√	√	√	NA	No	Not retained as this treatment component is not the most permanent for destruction of chemicals.
	Thermal Desorption	√	√	√	√	√	√	NA	No	Evaluated as a source removal treatment component, but not retained due to cost of treatment of soil versus landfill disposal.
	Landfill Disposal	√	√	√	√	√	√	NA	Yes	Retained for further consideration in conjunction with excavation with shoring via soldier piles and pin piles.

Table 4
Cenex Property Remedial Component Screening Matrix
North Colfax Petroleum Contamination Site
Colfax, Washington

Component Group	Component Options	Protects Human Health and the Environment	Complies with Cleanup Standards	Complies with Applicable Local, State and Federal Laws	Provides for Compliance Monitoring	Uses Permanent Solutions to the Maximum Extent Practicable	Provides Reasonable Restoration Time Frame	Considers Public Concerns[1]	Component Retained for Further Evaluation	Comments
		Threshold Criteria (WAC 173-340-360 [2][a])				Modifying Criteria (WAC 173-340-360 [2][b])				
In Situ Chemical Oxidation										
	Sodium Persulfate	X	X	√	√	X	X	NA	No	
	Heated Sodium Persulfate	X	X	√	√	X	X	NA	No	
	pH-Activated Sodium Persulfate	X	X	√	√	X	X	NA	No	
	Hydrogen Peroxide	X	X	√	√	X	X	NA	No	
	Hydrogen Peroxide-Activated Sodium Persulfate	X	X	√	√	X	X	NA	No	
	Permanganate	X	X	√	√	X	X	NA	No	
	RegenOx (Catalyzed Sodium Percarbonate)	X	X	√	√	X	X	NA	No	Not retained because these components are typically used to remediate saturated zone soil and groundwater, and groundwater contamination no longer remains beneath the property. In situ chemical oxidation is not effective for soil contamination in the vadose zone.
	Fenton's Reagent	X	X	√	√	X	X	NA	No	
	Activated Iron Wall	X	X	√	√	X	X	NA	No	
Containment/Immobilization										
	Bituminization	√	X	√	√	X	X	NA	No	
	Emulsified Asphalt	√	X	√	√	X	X	NA	No	
	Modified Sulfur Cement	√	X	√	√	X	X	NA	No	Not retained because these components reduce the mobility of hazardous substances but not toxicity or volume.
	Polyethylene Extrusion	√	X	√	√	X	X	NA	No	Not retained because component is not well developed and is complex to implement.
	Pozzolan/Portland Cement	√	X	√	√	X	X	NA	No	
	Vitrification/Molten Glass	√	X	√	√	X	X	NA	No	
	Slurry Wall Containment	NA	NA	NA	NA	NA	NA	NA	No	
	Sheet Pile Wall Containment	NA	NA	NA	NA	NA	NA	NA	No	Not retained because these components reduce the mobility of hazardous substances but not toxicity or volume.
	Pump and Treat for Hydraulic Containment	NA	NA	NA	NA	NA	NA	NA	No	Not retained because groundwater contamination no longer remains beneath the property.
Phytoremediation										
	Hydraulic Control	√	√	√	√	√	X	NA	No	
	Phyto-Degradation	√	√	√	√	√	X	NA	No	
	Phyto-Volatilization	√	√	√	√	√	X	NA	No	
	Phyto-Accumulation	√	√	√	√	√	X	NA	No	
	Phyto-Stabilization	√	√	√	√	√	X	NA	No	Not retained because component is not compatible with future land use plans, nor do these components result in a reasonable restoration time frame.
	Enhanced Rhizosphere Biodegradation	√	√	√	√	√	X	NA	No	
In Situ Bioremediation										
	Co-Metabolic Aerobic Bio-Augmentation	√	√	√	√	√	√	NA	No	Components could be implemented in conjunction with VE, but is not warranted due to the relatively low contaminant concentrations beneath the property.
	Co-Metabolic Aerobic Bio-Stimulation	√	√	√	√	√	√	NA	No	
	Anaerobic Bio-Augmentation	X	X	√	√	X	X	NA	No	
	Anaerobic Bio-Stimulation	X	X	√	√	X	X	NA	No	
	Nitrate-Enhanced Bioremediation	X	X	√	√	X	X	NA	No	
	Sulfate-Enhanced Bioremediation	X	X	√	√	X	X	NA	No	Not retained as components will not address residual contamination via anaerobic means.
Capping										
	Containment Cap	√	√	√	√	√	√	NA	Yes	Retained in conjunction with institutional control and monitored natural attenuation.

NOTES:

[1]The public comment process has not been initiated for this document; therefore, public concerns have not been evaluated for these alternatives.

In order for the option to pass the screening, all of the threshold criteria must be met.

X = Does not meet criterion

√ = Does meet criterion

MTCA = Washington State Model Toxics Control Act

NA = not applicable

PRB = permeable reactive barrier

VE = vapor extraction

WAC = Washington Administrative Code

Table 5
Colfax Grange Property Remedial Component Screening Matrix
North Colfax Petroleum Contamination Site
Colfax, Washington

Component Group	Component Options	Protects Human Health and the Environment	Complies with Cleanup Standards	Complies with Applicable Local, State and Federal Laws	Provides for Compliance Monitoring	Uses Permanent Solutions to the Maximum Extent Practicable	Provides Reasonable Restoration Time Frame	Considers Public Concerns[1]	Component Retained for Further Evaluation	Comments
		Threshold Criteria (WAC 173-340-360 [2][a])				Modifying Criteria (WAC 173-340-360 [2][b])				
Passive Remediation										
	No Further Action	X	X	X	X	X	X	NA	No	Excluded because component is not protective of human health and the environment.
	Monitored Natural Attenuation	√	√	√	√	√	√	NA	Yes	Retained in conjunction with cap maintenance and an institutional control.
	Institutional Control	√	√	√	√	√	√	NA	Yes	Retained in conjunction with cap maintenance and monitored natural attenuation.
	Passive Treatment Wall (Activated Carbon/PRB)	NA	NA	NA	NA	NA	NA	NA	No	Not retained because groundwater contamination no longer remains beneath the property.
In Situ Physical Treatment										
	VE	X	X	√	√	X	X	NA	No	Not retained because component is a proven technology for the remediation of light end hydrocarbons only, and property contamination consists of heavy end hydrocarbons.
	Air Sparge	NA	NA	NA	NA	NA	NA	NA	No	
	Air Sparge with VE	NA	NA	NA	NA	NA	NA	NA	No	
	Bioslurping	NA	NA	NA	NA	NA	NA	NA	No	Not retained because groundwater contamination no longer remains beneath the property.
	Surfactant Washing	√	√	√	√	√	X	NA	No	Not retained because groundwater contamination no longer remains beneath the property. Although component may address vadose zone soil, technology specifically targets saturated zone contamination, and treatment of vadose zone would likely not meet cleanup standards within a reasonable time frame.
	Cosolvent Washing	X	X	√	√	X	X	NA	No	Not retained because component is not effective for remediation of vadose zone soil.
	Air Sparge with Ozone	√	√	√	√	√	X	NA	No	
	Pump and Treat	NA	NA	NA	NA	NA	NA	NA	No	
	Dual-Phase Extraction	NA	NA	NA	NA	NA	NA	NA	No	Not retained because groundwater contamination no longer remains beneath the property.
Thermal										
	Resistive Thermal with VE	√	√	√	√	√	√	NA	No	
	Conductive Thermal with VE	√	√	√	√	√	√	NA	No	
	Radio Frequency/Electromagnetic Thermal with VE	√	√	√	√	√	√	NA	No	
	Steam Injection with VE and Groundwater Extraction	√	√	√	√	√	√	NA	No	Although these in situ thermal components generally satisfy the MTCA threshold and modifying evaluation criteria, none are retained because they are difficult to implement and are not cost effective with other components when implemented on a small scale. Additionally, these thermal components present an increased short-term risk of injury during their installation and operation period.
	Hot Air Injection with VE	√	√	√	√	√	√	NA	No	
	Hot Water Injection with VE and Groundwater Extraction	√	√	√	√	√	√	NA	No	
Source Removal										
	Excavation without shoring	X	X	√	√	X	X	NA	No	Not retained for further evaluation as the location of residual contamination would require shoring to excavate beneath the existing structure on the property - a significant volume of soil would be inaccessible without the use of shoring.
	Excavation with shoring									
	Secant Wall - Impervious wall	X	X	√	√	X	X	NA	No	Not retained for further evaluation as the method of shoring would not provide sufficient stability to allow for excavation beneath the existing structure.
	Sheet Pile Wall (Sealed) - Impervious wall	X	X	√	√	X	X	NA	No	Not retained for further evaluation as the method of shoring would not provide sufficient stability to allow for excavation beneath the existing structure.
	Soldier Pile Wall - Pervious wall, with pin piles	√	√	√	√	√	√	NA	Yes	Retained for further consideration in conjunction with pin piles to provide support for the existing structure on the property. Additionally, this shoring alternative has the ability to penetrate shallow bedrock in the vicinity of the excavation.
	Groundwater Treatment with Shored Excavation									
	with permeable reactive barrier for groundwater	√	√	√	√	√	√	NA	No	Not retained because the excavation with shoring will require the excavation to be dewatered with above-ground treatment (if necessary) prior to discharging to the sewer. This component assumes groundwater treatment in place which would limit the depth of the excavation, leaving a residual amount of contamination in place.
	with sub-grade groundwater intrusion control system	√	√	√	√	√	√	NA	No	Not retained because a permanent groundwater intrusion control system is not necessary for the excavation.
	with groundwater discharge to sewer	√	√	√	√	√	√	NA	Yes	Retained for temporary dewatering of groundwater in the vicinity of the excavation.
Source Removal Treatment										
	Surfactant Washing	√	√	√	√	√	X	NA	No	Component can address heavy range hydrocarbons, but is not the most effective and will not meet regulatory cleanup concentrations within a reasonable restoration time frame.
	Cosolvent Washing	X	X	√	√	X	X	NA	No	Not retained as source removal treatment because component is not compatible with treatment of heavy range hydrocarbons.
	Chemical Oxidation	X	X	√	√	X	X	NA	No	
	Thermal Desorption	√	√	√	√	√	√	NA	No	Evaluated as a source removal treatment component, but not retained due to cost of treatment of soil versus landfill disposal.
	Landfill Disposal	√	√	√	√	√	√	NA	Yes	Retained for further consideration in conjunction with excavation with shoring via soldier piles and pin piles.

Table 5
Colfax Grange Property Remedial Component Screening Matrix
North Colfax Petroleum Contamination Site
Colfax, Washington

Component Group	Component Options	Protects Human Health and the Environment	Complies with Cleanup Standards	Complies with Applicable Local, State and Federal Laws	Provides for Compliance Monitoring	Uses Permanent Solutions to the Maximum Extent Practicable	Provides Reasonable Restoration Time Frame	Considers Public Concerns[1]	Component Retained for Further Evaluation	Comments
		Threshold Criteria (WAC 173-340-360 [2][a])				Modifying Criteria (WAC 173-340-360 [2][b])				
In Situ Chemical Oxidation										
	Sodium Persulfate	X	X	√	√	X	X	NA	No	
	Heated Sodium Persulfate	X	X	√	√	X	X	NA	No	
	pH-Activated Sodium Persulfate	√	√	√	√	√	√	NA	Yes	
	Hydrogen Peroxide	X	X	X	X	X	X	NA	No	
	Hydrogen Peroxide-Activated Sodium Persulfate	X	X	X	X	X	X	NA	No	
	Permanganate	X	X	X	X	X	X	NA	No	
	RegenOx (Catalyzed Sodium Percarbonate)	X	X	X	X	X	X	NA	No	Not retained because these components are typically used to remediate saturated zone soil and groundwater, and groundwater contamination no longer remains beneath the property. In situ chemical oxidation is not effective for soil contamination in the vadose zone.
	Fenton's Reagent	X	X	X	X	X	X	NA	No	
	Activated Iron Wall	X	X	X	X	X	X	NA	No	
Containment/Immobilization										
	Bituminization	√	X	√	√	X	X	NA	No	
	Emulsified Asphalt	√	X	√	√	X	X	NA	No	Not retained because these components reduce the mobility of hazardous substances but not toxicity or volume.
	Modified Sulfur Cement	√	X	√	√	X	X	NA	No	
	Polyethylene Extrusion	√	X	√	√	X	X	NA	No	Not retained because component is not well developed and is complex to implement.
	Pozzolan/Portland Cement	√	X	√	√	X	X	NA	No	
	Vitrification/Molten Glass	√	X	√	√	X	X	NA	No	
	Slurry Wall Containment	NA	NA	NA	NA	NA	NA	NA	No	Not retained because these components reduce the mobility of hazardous substances but not toxicity or volume.
	Sheet Pile Wall Containment	NA	NA	NA	NA	NA	NA	NA	No	
	Pump and Treat for Hydraulic Containment	NA	NA	NA	NA	NA	NA	NA	No	Not retained because groundwater contamination no longer remains beneath the property.
Phytoremediation										
	Hydraulic Control	√	√	√	√	√	X	NA	No	
	Phyto-Degradation	√	√	√	√	√	X	NA	No	
	Phyto-Volatilization	√	√	√	√	√	X	NA	No	
	Phyto-Accumulation	√	√	√	√	√	X	NA	No	
	Phyto-Stabilization	√	√	√	√	√	X	NA	No	Not retained because component is not compatible with future land use plans, nor do these components result in a reasonable restoration timeframe.
	Enhanced Rhizosphere Biodegradation	√	√	√	√	√	X	NA	No	
In Situ Bioremediation										
	Co-Metabolic Aerobic Bio-Augmentation	√	√	√	√	√	√	NA	No	Components could be implemented in conjunction with VE, but is not warranted due to the relatively low contaminant concentrations beneath the property.
	Co-Metabolic Aerobic Bio-Stimulation	√	√	√	√	√	√	NA	No	
	Anaerobic Bio-Augmentation	X	X	√	√	X	X	NA	No	
	Anaerobic Bio-Stimulation	X	X	√	√	X	X	NA	No	
	Nitrate-Enhanced Bioremediation	X	X	√	√	X	X	NA	No	
	Sulfate-Enhanced Bioremediation	X	X	√	√	X	X	NA	No	Not retained as components will not address residual contamination via anaerobic means.
Capping										
	Containment Cap	√	√	√	√	√	√	NA	Yes	Retained in conjunction with institutional control and monitored natural attenuation.

NOTES:

[1]The public comment process has not been initiated for this document; therefore, public concerns have not been evaluated for these alternatives.

In order for the option to pass the screening, all of the threshold criteria must be met.

X Does not meet criterion

√ Does meet criterion

MTCA = Washington State Model Toxics Control Act

NA = not applicable

PRB = permeable reactive barrier

VE = vapor extraction

WAC = Washington Administrative Code

Table 6-1
Feasibility Level Cost Estimate
Time Oil Property Cleanup Alternative 1
Monitored Natural Attenuation with Institutional Control
North Colfax Petroleum Contamination Site
Colfax, Washington

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Institutional Control					
Negotiate with Ecology and Implement Institutional Control	1	ea	$ 40,000	$ 40,000	
Subtotal				*$ 40,000*	
Contingency					
Scope (20% of construction subtotal)				$ 8,000	
Subtotal				*$ 8,000*	
CONSTRUCTION TOTAL					$ 48,000
Indirect Capital Costs					
Project Management & Administration (18% of construction total)				$ 8,640	
Subtotal				*$ 8,640*	
TOTAL CAPITAL COST					**$ 56,640**

O&M COST ITEM	ANNUAL COST [1]	Present Worth Cost of Annual O&M 10-Year Real Discount Rate = 2.2%	TOTALS
Quarterly Groundwater Monitoring and Reporting (1 year)	$ 40,500	$ 40,500	
Annual Maintenance and Monitoring (10 years)	$ 1,800	$ 16,001	
Annual MNA Sampling (10 years)	$ 10,125	$ 90,004	
Confirmation Sampling, Analysis, Well Decommissioning and Reporting (Year 10)		$ 35,000	
TOTAL PRESENT WORTH OF O&M COST			**$ 181,505**
TOTAL PRESENT WORTH COST OF ALTERNATIVE 1 (SUM OF CAPITAL AND PRESENT WORTH OF O&M)			**$238,145**

NOTES:

[1] Annual Cost is 2009 year cost.

ea = each
MNA = monitored natural attenuation
O&M = operation and maintenance
QTY = quantity

SoundEarth Strategies

Table 6-2
Feasibility Level Cost Estimate
Time Oil Property Cleanup Alternative 2
In Situ Bioremediation via Soil Vapor Extraction
North Colfax Petroleum Contamination Site
Colfax, Washington

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Site Work					
Site controls (fencing)	400	lf	$ 7.55	$ 3,020	
Site controls (signage)	30	sf	$ 29.50	$ 885	
Additional above-ground pipe installation and manifold construction	1	ls	$ 4,560	$ 4,560	
Site restoration	1	ls	$ 2,000	$ 2,000	
Subtotal				*$ 10,465*	
Remediation Compound					
Remedial skid with one vapor extraction blower, knockout tank, instrumentation, telemetry (includes cover over system)	1	ls	$ 65,000	$ 65,000	
Electrical work - system master panel; breaker panel, wiring, lighting and controls	1	ls	$ 20,000	$ 20,000	
Subtotal				*$ 85,000*	
CONSTRUCTION SUBTOTAL					$ 95,465
Mobilization, Contingencies and Demobilization					
Mobilization (3% of construction subtotal)				$ 2,864	
Bid (10% of construction subtotal)				$ 9,547	
Scope (15% of construction subtotal)				$ 14,320	
Cleanup and demobilization (3% of construction subtotal)				$ 2,864	
Subtotal				*$ 29,594*	
CONSTRUCTION TOTAL					$ 125,059
Indirect Capital Costs					
Engineering design & permitting (15% of construction total)				$ 18,759	
Engineering construction services (20% of construction total)				$ 25,012	
Subtotal				*$ 43,771*	
TOTAL CAPITAL COST					**$ 168,830**

O&M COST ITEM	ANNUAL COST[1]	Present Worth Cost of Annual O&M Real Discount Rate = 0.9%	
		n = 3 years	
Monthly Operation and Maintenance (2 years)	$ 32,839	$	64,803
Quarterly Groundwater Monitoring and Reporting (3 years)	$ 40,500	$	119,345
Well Decomissioning (Year 4)		$	10,000
TOTAL PRESENT WORTH O&M COST		**$**	**194,148**
TOTAL PRESENT WORTH COST OF ALTERNATIVE 2		**$**	**362,978**

NOTES:

[1]Annual cost is 2009 year cost.

lf = linear feet
ls = lump sum
n = number of years of operation and maintenance
O&M = operation and maintenance
PVC = polyvinyl chloride
QTY = quantity
sf = square feet

SoundEarth Strategies

Table 6-3
Feasibility Level Cost Estimate
Time Oil Property Cleanup Alternative 3
Bulk Excavation with Shoring
North Colfax Petroleum Contamination Site
Colfax, Washington

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Permitting					
Right of Way permit fees					
Sidewalk and lane closure fees	1	per permit	$ 3,500	$ 3,500	
Grading permit fees	1	per permit	$ 5,000	$ 5,000	
Shoring permit fees	1	per permit	$ 5,000	$ 5,000	
Geotechnical Engineering Support Services					
Preliminary geotechnical engineering report	1	ls	$ 10,000	$ 10,000	
Structural Engineer Support Services					
Shoring design	2,596	foot of shored facing	$ 1.50	$ 3,893	
Site Work					
Geotechnical Engineering Services					
Field oversight - shoring installation	10	day	$ 1,200	$ 12,000	
Field oversight - excavation and backfill	10	day	$ 1,200	$ 12,000	
Shoring Contractor					
Install H-pile & lagging shoring	2,596	foot of shored facing	$ 75	$ 194,670	
Survey - baseline, weekly, conclusion of field work	1	ls	$ 50,000	$ 50,000	
Well abandonment within proposed excavation	3	ea	$ 2,000	$ 6,000	
Excavation Contractor					
Mob/demob, erosion control, temporary site controls	1	ls	$ 10,000	$ 10,000	
Asphalt demoliton and removal	264	sy	$ 8.50	$ 2,244	
Concrete curb demolition and removal	50	sy	$ 13.95	$ 698	
Asphalt and concrete disposal	1	ls	$ 1,438	$ 1,438	
Temporary dewatering equipment/labor/disposal fees	1	ls	$ 50,000	$ 50,000	
Decommission existing pump island equipment and subsurface gasoline conveyance piping	1	ls	$ 50,000	$ 50,000	
Excavate and stockpile overburden	1,145	ton	$ 20	$ 22,900	
Excavate, haul and dispose PCS at Subtitle D landfill	1,604	ton	$ 70	$ 112,280	
Replace subsurface gasoline conveyance piping	1	ls	$ 4,130	$ 4,130	
Place and compact overburden	673	lcy	$ 34	$ 22,896	
Import, place and compact structural backfill	1,604	ton	$ 23	$ 36,892	
Replace pump island equipment	1	ls	$ 50,000	$ 50,000	
Traffic Control					
Signage rental	45	day	$ 50	$ 2,250	
Flaggers	45	day	$ 415	$ 18,675	
Confirmation analytical (24-hour TAT)	40	sample	$ 170	$ 6,800	
Well replacement/installation for quarterly groundwater monitoring	3	ea	$ 2,000	$ 6,000	
Site Restoration					
Reconnect utilities	1	ls	$ 10,000	$ 10,000	
Grade and repave right-of-way (includes sidewalk)	1	ls	$ 15,700	$ 15,700	
Grade and repave property	1	ls	$ 30,100	$ 30,100	
Subtotal				*$ 755,065*	
CONSTRUCTION SUBTOTAL					$ 755,065
Mobilization, Contingencies and Demobilization					
Mobilization (1% of construction subtotal)				$ 7,551	
Bid (2% of construction subtotal)				$ 15,101	
Scope (15% of construction subtotal)				$ 113,260	
Cleanup and demobilization (1% of construction subtotal)				$ 7,551	
Subtotal				*$ 143,462*	
CONSTRUCTION TOTAL					$ 898,527
Indirect Capital Costs					
Engineering construction services (8% of construction total)				$ 71,882	
Subtotal				*$ 71,882*	
TOTAL CAPITAL COST					**$ 970,410**

O&M COST ITEM	ANNUAL COST[1]	Present Worth Cost of Annual O&M Real Discount Rate = 0.9%	
		n = 1 years	
Quarterly Groundwater Monitoring and Reporting (Year 1)	$ 40,500	$ 40,500	
Well Decommissioning (Year 2)		$ 10,000	
TOTAL PRESENT WORTH O&M COST			**$ 50,500**
TOTAL PRESENT WORTH COST OF ALTERNATIVE 3			**$ 1,020,910**

NOTES:
[1] Annual cost is 2009 year cost.

ea = each
lcy = loose cubic yards
ls = lump sum
n = number of years of operation and maintenance
O&M = operation and maintenance
PCS = petroleum-contaminated soil
QTY = quantity
sy = square yards
TAT = turnaround time

Table 7-1
Feasibility Level Cost Estimate
Cenex Property Cleanup Alternative 1
Monitored Natural Attenuation with Institutional Control
North Colfax Petroleum Contamination Site
Colfax, Washington

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Institutional Control					
Negotiate with Ecology and Implement Institutional Control	1	ea	$ 40,000	$ 40,000	
Subtotal				*$ 40,000*	
Contingency					
Scope (20% of construction subtotal)				$ 8,000	
Subtotal				*$ 8,000*	
CONSTRUCTION TOTAL					$ 48,000
Indirect Capital Costs					
Project Management & Administration (18% of construction total)				$ 8,640	
Subtotal				$ 8,640	
TOTAL CAPITAL COST					**$ 56,640**

O&M COST ITEM	ANNUAL COST [1]	Present Worth Cost of Annual O&M 10-Year Real Discount Rate = 2.2%	
Quarterly Groundwater Monitoring and Reporting (1 year)	$ 40,500	$ 40,500	
Annual Maintenance and Monitoring (10 years)	$ 1,800	$ 16,001	
Annual MNA Sampling (10 years)	$ 10,125	$ 90,004	
Confirmation Sampling, Analysis, Well Decommissioning and Reporting (Year 10)		$ 35,000	
TOTAL PRESENT WORTH OF O&M COST			**$ 181,505**
TOTAL PRESENT WORTH COST OF ALTERNATIVE 1 (SUM OF CAPITAL AND PRESENT WORTH OF O&M)			**$238,145**

NOTES:

[1] Annual Cost is 2009 year cost.

ea = each
MNA = monitored natural attenuation
O&M = operation and maintenance
QTY = quantity

Table 7-2
Feasibility Level Cost Estimate
Cenex Property Cleanup Alternative 2
In Situ Bioremediation via Soil Vapor Extraction
North Colfax Petroleum Contamination Site
Colfax, Washington

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Site Work					
Site controls (fencing)	500	lf	$ 7.55	$ 3,775	
Site controls (signage)	30	sf	$ 29.50	$ 885	
Asphalt saw cutting	700	lf	$ 1.80	$ 1,260	
Asphalt removal	116	sy	$ 5.15	$ 597	
Well installation	7	ea	$ 2,000	$ 14,000	
Excavate trenches and install pipe	1	ls	$ 25,000	$ 25,000	
Hauling and disposal of unsuitable fill (uncontaminated)	200	ton	$ 39	$ 7,800	
PVC pipe, 3-inch diameter, installed	1,000	lf	$ 23	$ 23,000	
Well vaults, installed	8	ea	$ 1,000	$ 8,000	
Import backfill and compaction	200	ton	$ 37	$ 7,400	
Site restoration (asphalt repaving and patch, curb repair, general cleanup)	1	ls	$ 8,050	$ 8,050	
Subtotal				*$ 99,767*	
Remediation Compound					
Remedial skid with one soil vapor extraction blower, knockout tank, instrumentation, telemetry (includes cover over system)	1	ls	$ 65,000	$ 65,000	
Electrical work - system master panel; breaker panel, wiring, lighting and controls	1	ls	$ 20,000	$ 20,000	
Subtotal				*$ 85,000*	
CONSTRUCTION SUBTOTAL					$ 184,767
Mobilization, Contingencies and Demobilization					
Mobilization (3% of construction subtotal)				$ 5,543	
Bid (10% of construction subtotal)				$ 18,477	
Scope (15% of construction subtotal)				$ 27,715	
Cleanup and demobilization (3% of construction subtotal)				$ 5,543	
Subtotal				*$ 57,278*	
CONSTRUCTION TOTAL					$ 242,045
Indirect Capital Costs					
Engineering design & permitting (15% of construction total)				$ 36,307	
Engineering construction services (20% of construction total)				$ 48,409	
Subtotal				*$ 84,716*	
TOTAL CAPITAL COST					**$ 326,761**

O&M COST ITEM	ANNUAL COST[1]	Present Worth Cost of Annual O&M Real Discount Rate = 0.9%	
		n = 3 years	
Monthly Operation and Maintenance (2 years)	$ 32,839	$ 64,802	
Quarterly Groundwater Monitoring and Reporting (3 years)	$ 40,500	$ 119,345	
Well Decommissioning (Year 4)		$ 10,000	
TOTAL PRESENT WORTH O&M COST			**$ 194,147**
TOTAL PRESENT WORTH COST OF ALTERNATIVE 2			**$ 520,908**

NOTES:

[1]Annual cost is 2009 year cost.

ea = each
lf = linear feet
ls = lump sum
n = number of years of operation and maintenance
O&M = operation and maintenance
PVC = polyvinyl chloride
QTY = quantity
sf = square foot
sy = square yard

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Table 7-3
Feasibility Level Cost Estimate
Cenex Property Cleanup Alternative 3
Bulk Excavation with Shoring
North Colfax Petroleum Contamination Site
Colfax, Washington

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Permitting					
Right of Way permit fees					
Sidewalk and lane closure fees	1	per permit	$ 3,500	$ 3,500	
Grading permit fees	1	per permit	$ 5,000	$ 5,000	
Shoring permit fees	1	per permit	$ 5,000	$ 5,000	
Geotechnical Engineering Support Services					
Preliminary geotechnical engineering report	1	ls	$ 10,000	$ 10,000	
Structural Engineer Support Services					
Shoring design	3,400	foot of shored facing	$ 1.50	$ 5,099	
Site Work					
Geotechnical Engineering Services					
Field oversight - shoring installation	12	day	$ 1,200	$ 14,400	
Field oversight - excavation and backfill	31	day	$ 1,200	$ 37,200	
Shoring Contractor					
Install H-pile & lagging shoring	3,400	foot of shored facing	$ 75	$ 254,963	
Survey - baseline, weekly, conclusion of field work	1	ls	$ 50,000	$ 50,000	
Well abandonment within proposed excavation	3	ea	$ 2,000	$ 6,000	
Excavation Contractor					
Mob/demob, erosion control, temporary site controls	1	ls	$ 10,000	$ 10,000	
Asphalt demoliton and removal	800	sy	$ 8.50	$ 6,800	
Asphalt disposal	1	ls	$ 4,025	$ 4,025	
Temporary dewatering equipment/labor/disposal fees	1	ls	$ 50,000	$ 50,000	
Decommission existing pump island equipment (gasoline and diesel) and subsurface conveyance piping	1	ls	$ 50,000	$ 50,000	
Decommission and remove three existing USTs	1	ls	$ 50,400	$ 50,400	
Excavate and stockpile overburden	4,641	ton	$ 20	$ 92,820	
Excavate, haul and dispose PCS at Subtitle D landfill	3,978	ton	$ 70	$ 278,460	
Install new subsurface gasoline conveyance piping	1	ls	$ 20,000	$ 20,000	
Install new gasoline underground storage tanks (USTs)	1	ls	$ 36,000	$ 36,000	
Place and compact overburden	2,730	lcy	$ 34	$ 92,820	
Import, place and compact structural backfill	3,978	ton	$ 23	$ 91,494	
Replace pump island equipment	1	ls	$ 50,000	$ 50,000	
Traffic Control					
Signage rental	60	day	$ 50	$ 3,000	
Flaggers	60	day	$ 415	$ 24,900	
Confirmation analytical (24-hour TAT)	40	sample	$ 170	$ 6,800	
Well replacement/installation for quarterly groundwater monitoring	3	ea	$ 2,000	$ 6,000	
Site Restoration					
Reconnect utilities	1	ls	$ 10,000	$ 10,000	
Grade and repave right-of-way (includes sidewalk)	1	ls	$ 15,700	$ 15,700	
Grade and repave property	1	ls	$ 35,800	$ 35,800	
Subtotal				*$ 1,326,181*	
CONSTRUCTION SUBTOTAL					$ 1,326,181
Mobilization, Contingencies and Demobilization					
Mobilization (1% of construction subtotal)				$ 13,262	
Bid (2% of construction subtotal)				$ 26,524	
Scope (15% of construction subtotal)				$ 198,927	
Cleanup and demobilization (1% of construction subtotal)				$ 13,262	
Subtotal				*$ 251,974*	
CONSTRUCTION TOTAL					$ 1,578,155
Indirect Capital Costs					
Engineering construction services (8% of construction total)				$ 126,252	
Subtotal				*$ 126,252*	
TOTAL CAPITAL COST					**$ 1,704,407**

O&M COST ITEM	ANNUAL COST[1]	Present Worth Cost of Annual O&M Real Discount Rate = 0.9% n = 1 years	
Quarterly Groundwater Monitoring and Reporting (Year 1)	$ 40,500	$ 40,500	
Well Decommissioning (Year 2)		$ 10,000	
TOTAL PRESENT WORTH O&M COST			**$ 50,500**
TOTAL PRESENT WORTH COST OF ALTERNATIVE 3			**$ 1,754,907**

NOTES:
[1]Annual cost is 2009 year cost.
ea = each
lcy = loose cubic yards
ls = lump sum
PCS = petroleum-contaminated soil
QTY = quantity
sy = square yards
n = number of years of operation and maintenance
O&M = operation and maintenance
TAT = turnaround time
UST = underground storage tank

Table 8-1
Feasibility Level Cost Estimate
Colfax Grange Property Cleanup Alternative 1
Monitored Natural Attenuation with Institutional Control
North Colfax Petroleum Contamination Site
Colfax, Washington

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Institutional Controls					
Negotiate with Ecology and Implement Institutional Control	1	ea	$ 40,000	$ 40,000	
Subtotal				*$ 40,000*	
Site Work					
Installation of an asphalt/concrete cap	1	ls	$ 10,000	$ 10,000	
Subtotal				*$ 10,000*	
Contingency					
Scope (20% of construction subtotal)				$ 8,000	
Subtotal				*$ 8,000*	
CONSTRUCTION TOTAL					$ 58,000
Indirect Capital Costs					
Project Management & Administration (18% of construction total)				$ 10,440	
Subtotal				*$ 10,440*	
TOTAL CAPITAL COST					**$ 68,440**

O&M COST ITEM	ANNUAL COST [1]	Present Worth Cost of Annual O&M 10-Year Real Discount Rate = 2.2%
Quarterly Groundwater Monitoring and Reporting (1 year)	$ 40,500	$ 40,500
Annual Maintenance and Monitoring (10 years)	$ 1,800	$ 16,001
Annual MNA Sampling (10 years)	$ 10,125	$ 90,004
Confirmation Sampling, Analysis, Well Decommissioning and Reporting (Year 10)		$ 35,000
TOTAL PRESENT WORTH OF O&M COST		**$ 181,505**
TOTAL PRESENT WORTH COST OF ALTERNATIVE 1 (SUM OF CAPITAL AND PRESENT WORTH OF O&M)		**$249,945**

NOTES:

[1] Annual Costs are 2009 year costs

ea = each
ls = lump sum
MNA = monitored natural attenuation
O&M = operation and maintenance
QTY = quantity

Table 8-2
Feasibility Level Cost Estimate
Colfax Grange Property Cleanup Alternative 2
In Situ Remediation via Chemical Oxidation
North Colfax Petroleum Contamination Site
Colfax, Washington

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Site Work					
Site controls (fencing)	300	lf	$ 7.55	$ 2,265	
Site controls (signage)	30	sf	$ 29.50	$ 885	
Well point installation and injection equipment, 6 points per day, mobilization	6	day	$ 2,500	$ 15,000	
Total number of well points	37	points	Included		
Well screens	37	ea	$ 100	$ 3,700	
Start card/removal card	37	ea	$ 100	$ 3,700	
pH-activated sodium persulfate	4,070	lb	$ 6.00	$ 24,420	
Handling cost	1	ls	$ 4,000	$ 4,000	
Water charges	1	ls	$ 5,550	$ 5,550	
Labor and equipment	7	day	$ 7,000	$ 49,000	
Site restoration (impervious surface patching/repair, general cleanup)	1	ls	$ 2,000	$ 2,000	
Subtotal				*$ 110,520*	
CONSTRUCTION SUBTOTAL					$ 110,520
Mobilization, Contingencies and Demobilization					
Mobilization (5% of construction subtotal)				$5,526	
Bid (10% of construction subtotal)				$11,052	
Scope (20% of construction subtotal)				$22,104	
Cleanup and demobilization (3% of construction subtotal)				$3,316	
Subtotal				*$41,998*	
CONSTRUCTION TOTAL					$152,518
Indirect Capital Costs					
Engineering design & permitting (15% of construction total)				$22,878	
Engineering construction services (20% of construction total)				$30,504	
Subtotal				*$53,381*	
TOTAL CAPITAL COST					**$205,899**

O&M COST ITEM	ANNUAL COST[1]	Present Worth Cost of Annual O&M Real Discount Rate = 0.9%	
		n = 3 years	
Quarterly Groundwater Monitoring and Reporting (1 year)	$40,500	$40,500	
Annual Maintenance and Monitoring (3 years)	$1,800	$5,304	
Annual MNA Sampling (2 years)	$ 10,125	$ 19,980	
Well Decommissioning (Year 4)		$ 10,000	
TOTAL PRESENT WORTH O&M COST			**$75,784**
TOTAL PRESENT WORTH COST OF ALTERNATIVE 2			**$281,683**

NOTES:

[1]Annual cost is 2009 year cost.

ea = each
lb = pounds
lf = linear feet
ls = lump sum
MNA = monitored natural attenuation
n = number of years of operation and maintenance
O&M = operation and maintenance
QTY = quantity
sf = square foot

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Table 8-3
Feasibility Level Cost Estimate
Colfax Grange Property Cleanup Alternative 3
Bulk Excavation with Shoring
North Colfax Petroleum Contamination Site
Colfax, Washington

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Permitting					
Right of Way permit fees					
Sidewalk and lane closure fees	1	per permit	$ 3,500	$ 3,500	
Grading permit fees	1	per permit	$ 5,000	$ 5,000	
Shoring permit fees	1	per permit	$ 5,000	$ 5,000	
Geotechnical Engineering Support Services					
Preliminary geotechnical engineering report	1	ls	$ 10,000	$ 10,000	
Structural Engineer Support Services					
Shoring design	1,885	foot of shored facing	$ 1.50	$ 2,828	
Site Work					
Geotechnical Engineering Services					
Field oversight - shoring installation	14	day	$ 1,200	$ 16,800	
Field oversight - excavation and backfill	20	day	$ 1,200	$ 24,000	
Shoring Contractor					
Install H-pile & lagging shoring	1,885	foot of shored facing	$ 75	$ 141,375	
Install pin pile shoring around building perimeter	55	per pin pile	$ 1,000	$ 55,000	
Survey - baseline, weekly, conclusion of field work	1	ls	$ 50,000	$ 50,000	
Well abandonment within proposed excavation	3	ea	$ 2,000	$ 6,000	
Excavation Contractor					
Mob/demob, erosion control, temporary site controls	1	ls	$ 10,000	$ 10,000	
Asphalt demolition and removal	400	sy	$ 8.50	$ 3,400	
Asphalt and concrete disposal	1	ls	$ 2,013	$ 2,013	
Temporary dewatering equipment/labor/disposal fees	1	ls	$ 50,000	$ 50,000	
Excavate and stockpile overburden	1,602	ton	$ 20	$ 32,045	
Excavate, haul and dispose PCS at Subtitle D landfill	1,370	ton	$ 70	$ 95,914	
Place and compact overburden	806	lcy	$ 34	$ 27,404	
Import, place and compact structural backfill	1,370	ton	$ 23	$ 31,510	
Traffic Control					
Signage rental	34	day	$ 50	$ 1,700	
Flaggers	34	day	$ 415	$ 14,110	
Confirmation analytical (24-hour TAT)	40	sample	$ 170	$ 6,800	
Well replacement/installation for quarterly groundwater monitoring	3	ea	$ 2,000	$ 6,000	
Site restoration (grading/repaving, reconnect utilities (if any), general cleanup)	1	ls	$ 18,900	$ 18,900	
Subtotal				*$ 619,298*	
CONSTRUCTION SUBTOTAL					$ 619,298
Mobilization, Contingencies and Demobilization					
Mobilization (1% of construction subtotal)				$ 6,193	
Bid (2% of construction subtotal)				$ 12,386	
Scope (15% of construction subtotal)				$ 92,895	
Cleanup and demobilization (1% of construction subtotal)				$ 6,193	
Subtotal				*$ 117,667*	
CONSTRUCTION TOTAL					$ 736,965
Indirect Capital Costs					
Engineering construction services (8% of construction total)				$ 58,957	
Subtotal				*$ 58,957*	
TOTAL CAPITAL COST					**$ 795,922**

O&M COST ITEM	ANNUAL COST[1]	Present Worth Cost of Annual O&M Real Discount Rate = 0.9%	
		n = 1 years	
Quarterly Groundwater Monitoring and Reporting (Year 1)	$ 40,500	$ 40,500	
Well Decommissioning (Year 2)		$ 10,000	
TOTAL PRESENT WORTH O&M COST			**$ 50,500**
TOTAL PRESENT WORTH COST OF ALTERNATIVE 3			**$ 846,422**

NOTES:

[1]Annual cost is 2009 year cost.

ea = each

lcy = loose cubic yards

ls = lump sum

n = number of years of operation and maintenance

O&M = operation and maintenance

PCS = petroleum-contaminated soil

QTY = quantity

TAT = turnaround time

Table 9
Time Oil Property Remedial Alternatives Screening Summary
North Colfax Petroleum Contamination Site
Colfax, Washington

Remedial Alternatives	Remedial Details	Washington State Department of Ecology Evaluation Criteria/Relative Ranking (1 = Low 10 = High)						Ranking Score[2]	Cost ($1,000)
		Protectiveness	Permanence	Effectiveness over the Long Term	Management of Short-Term Risks	Technical and Administrative Implementability	Consideration of Public Concerns[1]		
1 - Monitored Natural Attenuation with Institutional Control	Maintenance of the containment cap with monitored natural attenuation and implementation of an institutional control.	9	7	7	9	8	N/A	**8.0**	**$238**
2 - In Situ Bioremediation via Soil Vapor Extraction	In situ bioremediation of soil through installation of a soil vapor extraction system with maintenance of the containment cap.	9	8	7	7	6	N/A	**7.4**	**$363**
3 - Bulk Excavation With Shoring	Excavation using shoring in proximity to adjacent rights-of-way. Due to excavation below the water table, dewatering of the excavation will be necessary to facilitate removal of the contaminated soil.	10	10	10	6	3	N/A	**7.8**	**$1,021**

NOTES:

[1]The public comment process has not been initiated for this document; therefore, public concerns have not been evaluated for these alternatives.

[2]The ranking scores for each alternative are equivalent to the average of the five evaluation criteria.

High (10) = Remedial components are proven under most field conditions and the alternative exhibits a high degree of compliance with the evaluation criterion.

Medium (5) = Remedial components are proven under certain conditions and the alternative exhibits a moderate degree of compliance with the evaluation criterion.

Low (1) = Remedial components are not reliable or proven and the alternative exhibits a low degree of compliance with the evaluation criterion.

N/A = not applicable

Table 10
Cenex Property Remedial Alternatives Screening Summary
North Colfax Petroleum Contamination Site
Colfax, Washington

Remedial Alternatives	Remedial Details	Washington State Department of Ecology Evaluation Criteria/Relative Ranking (1 = Low 10 = High)						Ranking Score[2]	Cost ($1,000)
		Protectiveness	Permanence	Effectiveness over the Long Term	Management of Short-Term Risks	Technical and Administrative Implementability	Consideration of Public Concerns[1]		
1 - Monitored Natural Attenuation with Institutional Control	Maintenance of the containment cap with monitored natural attenuation and implementation of an institutional control.	9	7	7	9	8	N/A	**8.0**	**$238**
2 - In Situ Bioremediation via Soil Vapor Extraction	In situ bioremediation of soil through installation of a soil vapor extraction system with maintenance of the containment cap.	9	8	7	7	6	N/A	**7.4**	**$521**
3 - Bulk Excavation With Shoring	Excavation using shoring in proximity to adjacent rights-of-way. Due to excavation below the water table, dewatering of the excavation will be necessary to facilitate removal of the contaminated soil.	10	10	10	6	3	N/A	**7.8**	**$1,755**

NOTES:

[1]The public comment process has not been initiated for this document; therefore, public concerns have not been evaluated for these alternatives.

[2]The ranking scores for each alternative are equivalent to the average of the five evaluation criteria.

High (10) = Remedial components are proven under most field conditions and the alternative exhibits a high degree of compliance with the evaluation criterion.

Medium (5) = Remedial components are proven under certain conditions and the alternative exhibits a moderate degree of compliance with the evaluation criterion.

Low (1) = Remedial components are not reliable or proven and the alternative exhibits a low degree of compliance with the evaluation criterion.

N/A = not applicable

Table 11
Colfax Grange Property Remedial Alternatives Screening Summary
North Colfax Petroleum Contamination Site
Colfax, Washington

Remedial Alternatives	Remedial Details	Washington State Department of Ecology Evaluation Criteria/Relative Ranking (1 = Low 10 = High)						Ranking Score[2]	Cost ($1,000)
		Protectiveness	Permanence	Effectiveness over the Long Term	Management of Short-Term Risks	Technical and Administrative Implementability	Consideration of Public Concerns[1]		
1 - Monitored Natural Attenuation with Institutional Control	Maintenance of the containment cap with monitored natural attenuation and implementation of an institutional control.	9	7	7	9	8	N/A	**8.0**	**$250**
2 - In Situ Remediation via Chemical Oxidation	Maintenance of paved surface to minimize infiltration and leachate generation and injection of pH-activated sodium persulfate to address residual groundwater contamination.	9	7	7	7	5	N/A	**7.0**	**$282**
3 - Bulk Excavation With Shoring	[illegible] proximity to adjacent rights-of-way and the existing Colfax Grange Building. Due to excavation below the water table, dewatering of the excavation will be necessary to facilitate removal of the contaminated soil.	10	10	10	6	3	N/A	**7.8**	**$846**

NOTES:

[1]The public comment process has not been initiated for this document; therefore, public concerns have not been evaluated for these alternatives.

[2]The ranking scores for each alternative are equivalent to the average of the five evaluation criteria.

High (10) = Remedial components are proven under most field conditions and the alternative exhibits a high degree of compliance with the evaluation criterion.

Medium (5) = Remedial components are proven under certain conditions and the alternative exhibits a moderate degree of compliance with the evaluation criterion.

Low (1) = Remedial components are not reliable or proven and the alternative exhibits a low degree of compliance with the evaluation criterion.

N/A = not applicable

CHARTS

Chart 1-1
Time Oil Property Cost and Relative Ranking of Cleanup Alternatives
North Colfax Petroleum Contamination Site
Colfax, Washington

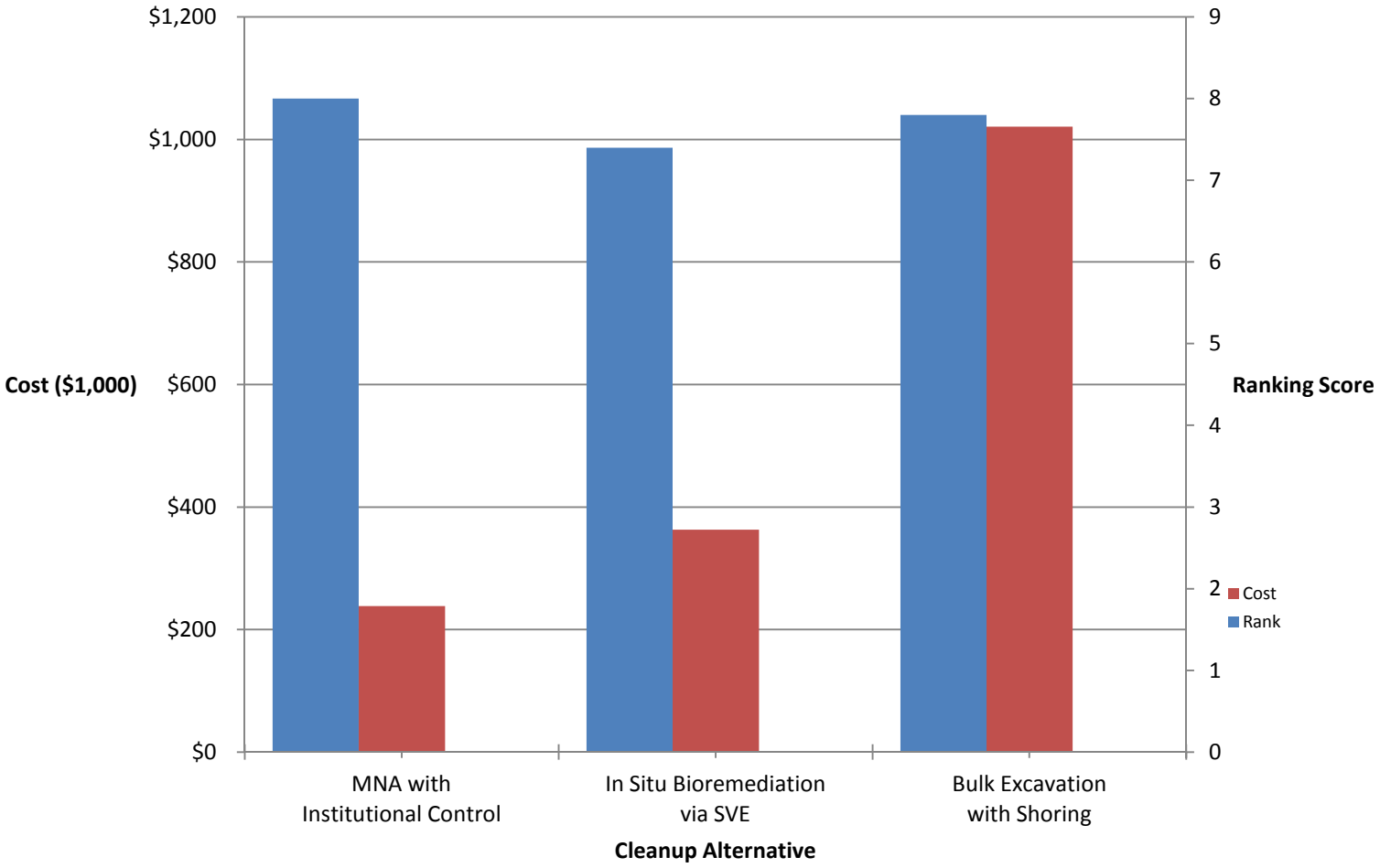
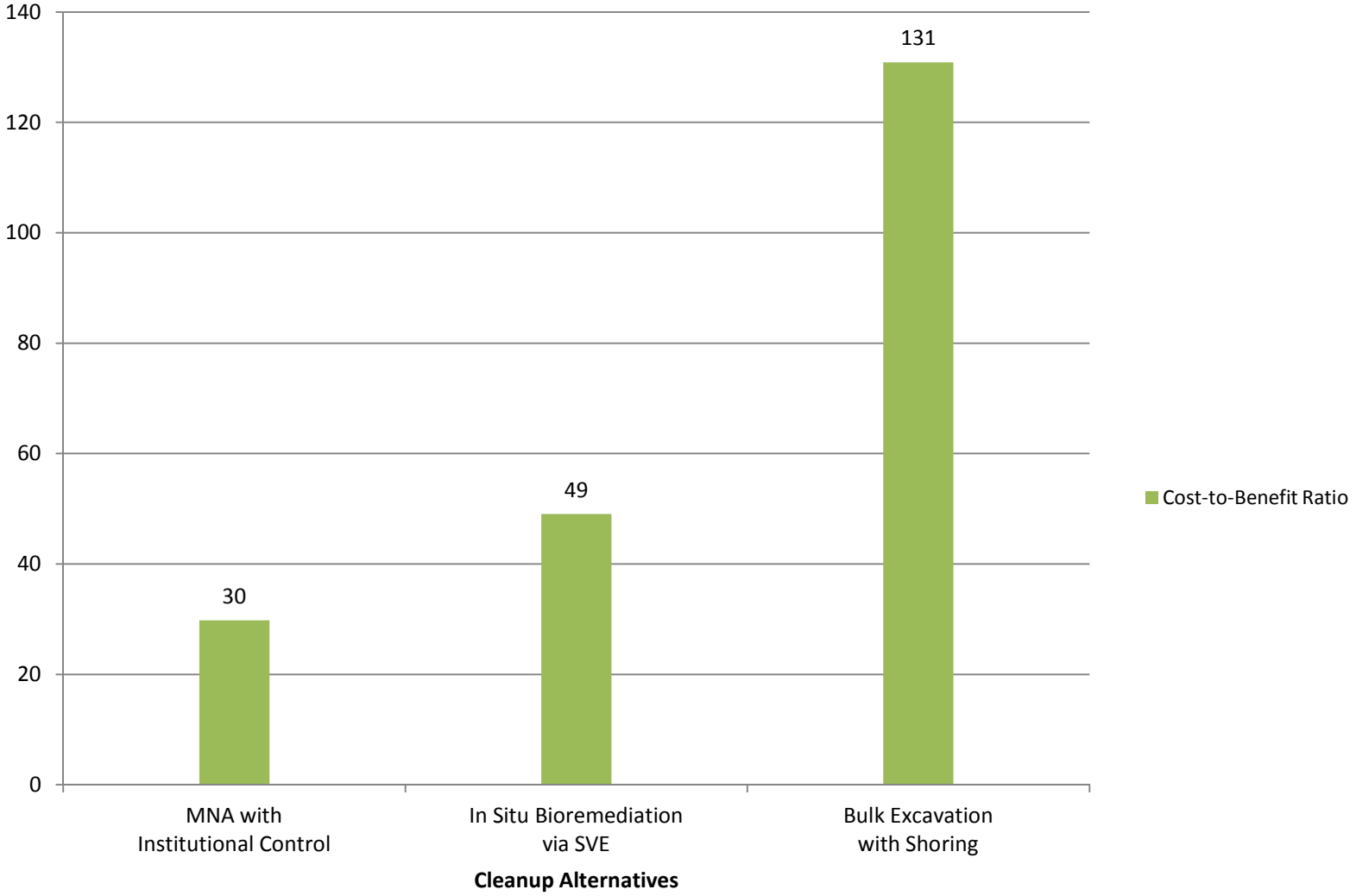


Chart 1-2
Time Oil Property Cost-to-Benefit Ratios for Cleanup Alternatives
North Colfax Petroleum Contamination Site
Colfax, Washington



Cost-to-Benefit Ratio = Present Worth Cost/Ranking Score

Chart 2-1
Cenex Property Cost and Relative Ranking of Cleanup Alternatives
North Colfax Petroleum Contamination Site
Colfax, Washington

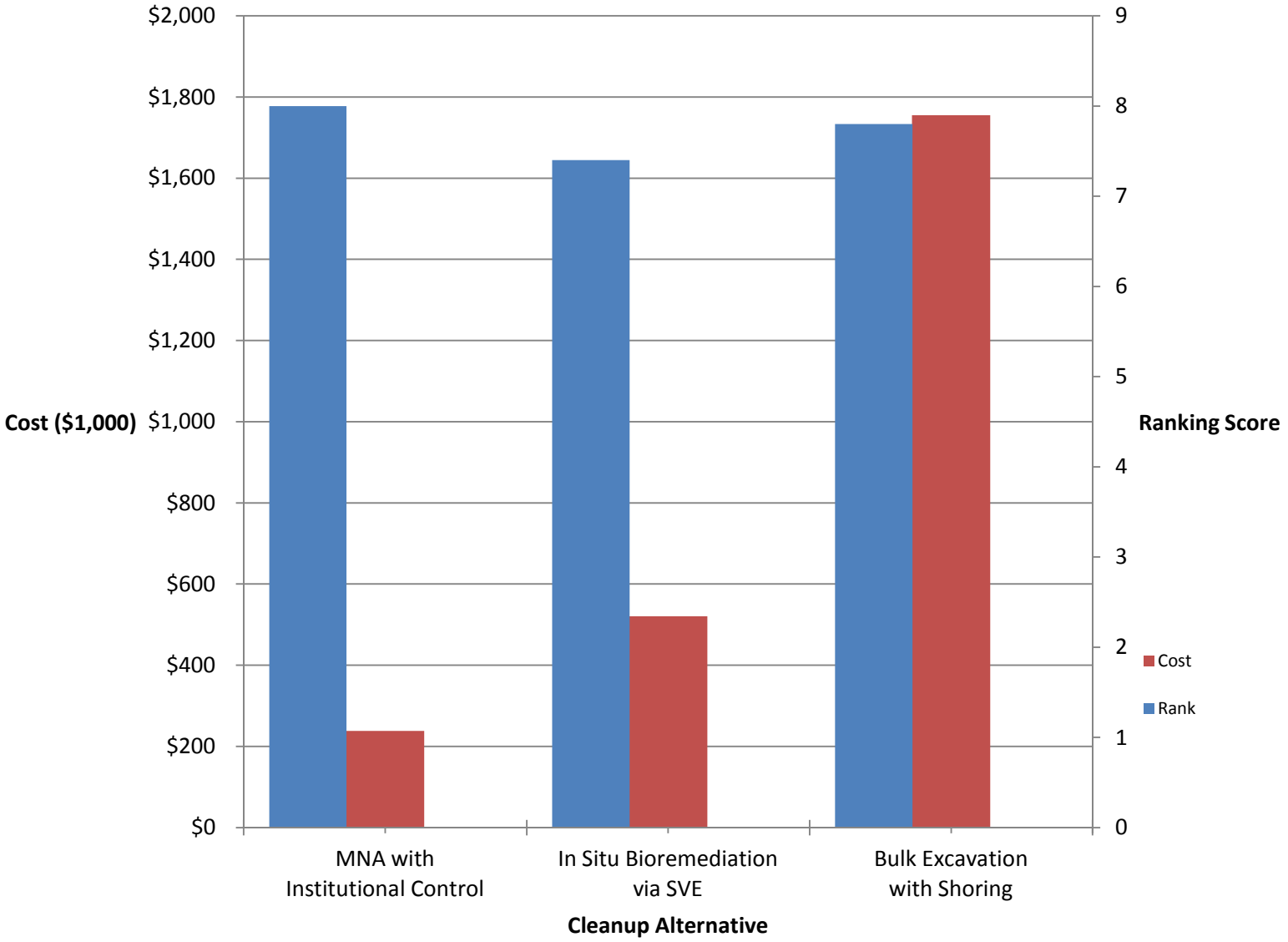
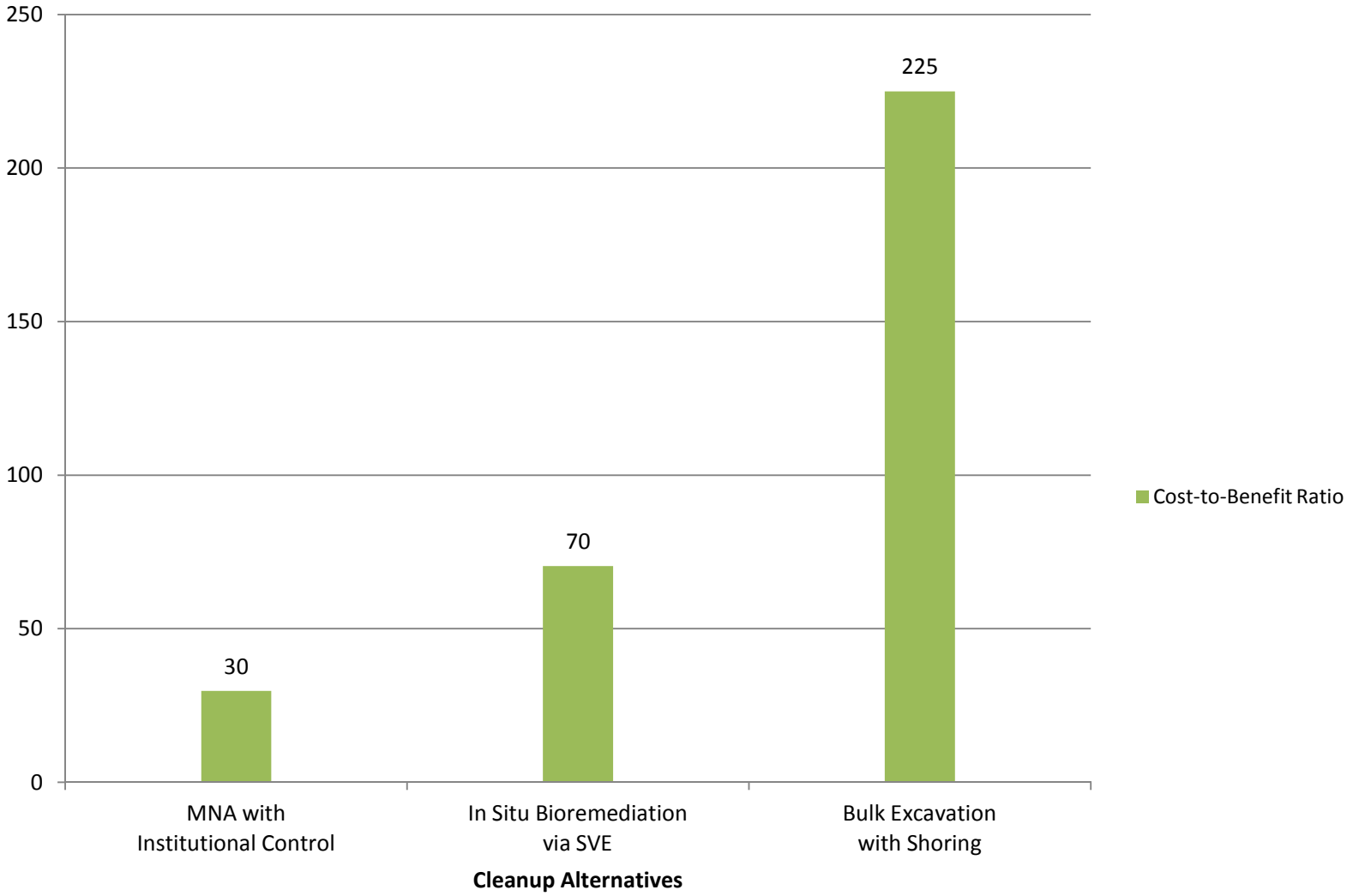


Chart 2-2
Cenex Property Cost-to-Benefit Ratios for Cleanup Alternatives
North Colfax Petroleum Contamination Site
Colfax, Washington



Cost-to-Benefit Ratio = Present Worth Cost/Ranking Score

Chart 3-1
Colfax Grange Property Cost and Relative Ranking of Cleanup Alternatives
North Colfax Petroleum Contamination Site
Colfax, Washington

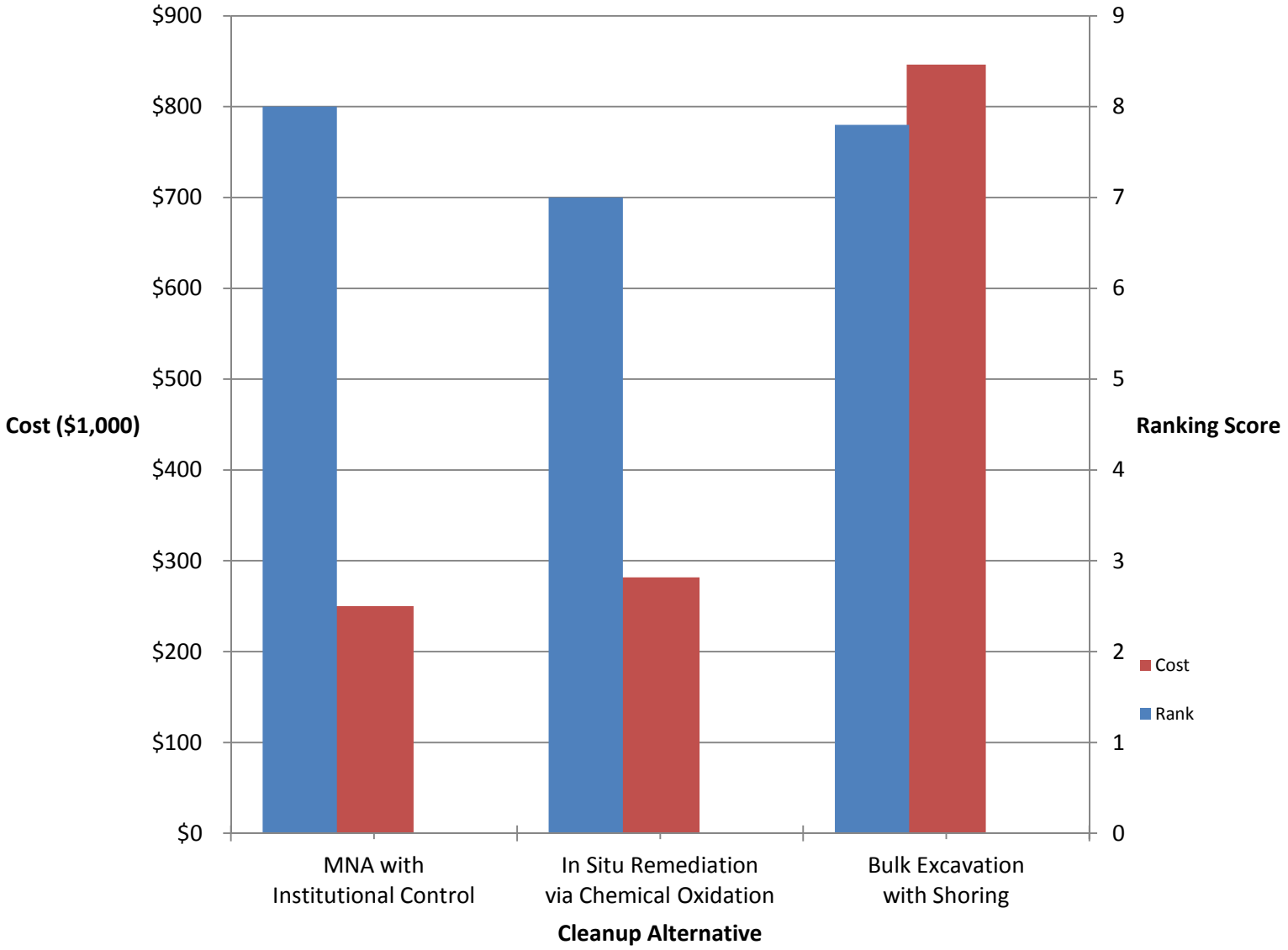
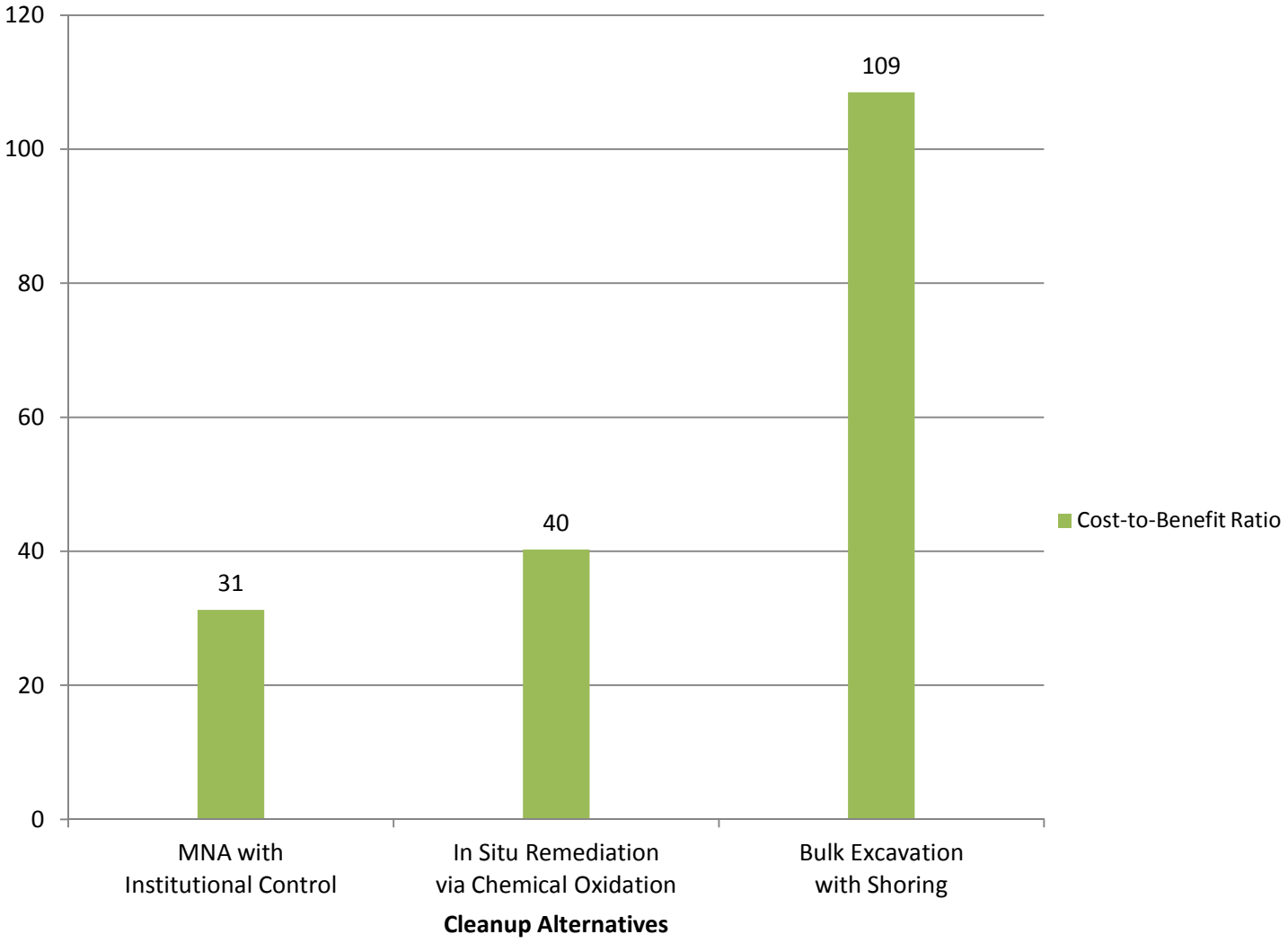


Chart 3-2
Colfax Grange Property Cost-to-Benefit Ratios for Cleanup Alternatives
North Colfax Petroleum Contamination Site
Colfax, Washington



Cost-to-Benefit Ratio = Present Worth Cost/Ranking Score

APPENDIX A

MODELING BENZENE PERSISTENCE IN THE UNSATURATED (VADOSE) ZONE

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APPENDIX A
MODELING BENZENE PERSISTENCE IN THE UNSATURATED (VADOSE) ZONE

MODELING OBJECTIVE

The modeling objective is to estimate the duration of benzene persistence in the unsaturated (vadose) zone beneath the Time Oil and Cenex properties at the North Colfax Petroleum Contamination Site (the Site) in Colfax, Washington.

MODELING CODE DESCRIPTION

The fate of benzene in the unsaturated (vadose) zone under the Time Oil property and Cenex property subareas was examined using the one-dimensional, vertical transport computer code Seasonal Soil (SESOIL). According to the Oak Ridge National Laboratory (1996), SESOIL can be used to simulate one dimensional, simultaneous movement of soil water and the transport and fate of chemical pollutants in the unsaturated (vadose) zone. SESOIL was originally developed in 1981 by Arthur D. Little Corporation under contract with the U.S. Environmental Protection Agency and has undergone subsequent modification by others to correct a mass balance calculation error in 1997, and extend code run time in 2005 (Schneiker 2006). For this project, SESOIL (version 6.0) was run as a component inside the graphical user interface SEVIEW: Integrated Contaminant Transport and Fate Modeling System (SEVIEW), version 6.3.12 dated January 2006 (Schneiker 2006).

The SESOIL code is written to calculate a mass balance and equilibrium partitioning of one pollutant at a time between the dissolved, sorbed, and vapor phases. Up to four soil layers in the unsaturated zone (referred to as compartments) can be represented in SESOIL. Compartments extend from the ground surface through the unsaturated zone to the groundwater table. Layers can be divided into sublayers, allowing pollutant-loading depth to be more precisely specified within a layer. Typically, SESOIL is used to estimate the pollutant rate of movement through the unsaturated zone. A SESOIL simulation of pollutant persistence can include environmental mobility, pollutant volatility, and biological degradation.

APPROACH SUMMARY

The New Jersey Department of Environmental Protection (NJDEP) guidance for the use of SESOIL (NJDEP 2008) was the principle reference for conducting the fate and transport modeling of benzene in the vadose zone.

The following step-wise approach was used for the simulations:

- Develop conceptualization of unsaturated zone subsurface condition based on Site-specific investigation reports, soil borings lithologic descriptions, and water level monitoring data. Site-specific data were used wherever possible and, where not available, default protective values recommended in NJDEP 2008 were used.
- Match the hydrologic portion of the SESOIL model simulation with the documented groundwater recharge rate from USGS (Bauer and Vaccaro 1990), at the Site (i.e., calibration of model).

- Adjust the vertical permeability in the uppermost layer profile to simulate the presence of pavement, and rerun SESOIL code to predict partitioning of benzene. Concentrations of benzene used for sublayer loading were the highest concentrations documented from soil sampling in each subarea.

SESOIL LIMITATIONS

The following model limitations are specified in the SESOIL guidance documentation (Schneiker 2006):

1. One-dimensional vertical soil moisture and pollutant transport.
2. Designed for simulation of unsaturated soil zone only.
3. Maximum of one pollutant fate and transport simulation at a time.
4. Isotropic and homogeneous subsurface unsaturated soil zone conditions.
5. Designed for long-term, e.g., months-to-years event duration, unsaturated soil zone simulations (i.e., not a single-storm event code).

In addition to the SESOIL limitations, the following key inputs were also considered:

1. Are climate data reasonably representatives of Site conditions?
2. Are input benzene concentration data representative of unsaturated soil zone conditions beneath the Time Oil property and Cenex property subareas?

The above SESOIL and project-specific limitations were carefully reviewed and compared with the Time Oil property and Cenex property settings and data inputs. Based on the reviews and comparisons, the application of SESOIL to the Time Oil property and Cenex property subareas was determined to be reasonable.

MODEL INPUTS

Model parameterization was required in three topical areas (1) subsurface soil properties, (2) benzene chemical properties, and (3) climate data. Site-specific parameters describing subsurface unsaturated zone soil properties were selected from existing technical reports or, where Site-specific data were unavailable, from the NJDEP SESOIL guidance document (NJDEP 2008).

Table 1 lists soil properties input parameters with corresponding information source used for both the Time Oil property and Cenex property subareas simulations. Chemical properties for benzene, such as water solubility, Henry's Law constant, molecular weight, and so on, were obtained from a database of chemical properties included with SEVIEW.

Table 2 lists the chemical properties of benzene used in the simulations for both the Time Oil property and Cenex property subareas. Climate data inputs used for both the Time Oil property and Cenex property subarea simulations were obtained from a database contained in SEVIEW of 6,674 climate recording stations located across the United States. SESOIL imports monthly 30-year average climate data and uses these data for the full simulation length. The "Colfax 1 NW" weather recording station

operated by the National Oceanic and Atmospheric Administration was selected; the Colfax 1 NW weather recording station is located approximately 0.9 miles southwest of the Site.

Table 3 lists the monthly 30-year average climate data inputs used for both the Time Oil property and Cenex property subareas.

Vertical discretization of each subarea model was performed using a total of four layers and included the use of sublayers to further refine each of the four primary layers. For both subareas, the depth of the bottom Layer 4 (i.e., the deepest layer) was established based on water-level records for nearby groundwater monitoring wells. This was done to ensure model layers were placed above the depth of the water table (to represent the unsaturated zone). Layers were assigned for both the Time Oil property and Cenex property subareas using the following approach:

1. Layer 1 (the uppermost layer) was specified to be relatively thin (as compared to the other three layers) for later use as a low permeability layer to simulate the presence and effect of overlying pavement surface.
2. Layers 2, 3, and 4, and their associated sublayers, were specified to be a relatively uniform thickness down to the total depth of each subarea model (i.e., the bottom of Layer 4). Some variation in layer thickness was done to facilitate sublayer depth matching to soil sample collection depths and entry of associated laboratory soil analysis for benzene data.

Tables 4 and 5 provide details on the vertical discretization and the vertical distribution of benzene concentration for the Time Oil property and Cenex property subareas, respectively.

SIMULATION RESULTS

For each subarea, a SESOIL simulation was run to create a 10-year projection of benzene concentration degradation. Tables 6, 7, and 8 list the predicted benzene concentration by layer over the 10-year simulation period. For both the Time Oil property and Cenex property subareas, results of the SESOIL simulation indicate benzene concentrations in the vadose zone in 2008 (year of soil sample collection) will attenuate to below the MTCA Method A cleanup level of 0.03 milligrams per kilogram within 5 years. Since SESOIL calculates pollutant concentrations partitioned among sorbed (soil), dissolved (soil moisture), and vapor (soil air) phases, these output were summed using the equation of Hetrick et al. (1994; equation 9; Figure 1) modified to express bulk concentration in terms of mass. Figures 2, 3, 4, and 5 illustrate the decline in calculated (bulk) benzene concentration versus time.

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SUPPORTING DOCUMENTATION:

SoundEarth Strategies, Inc.
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APPENDIX A
SUPPORTING DOCUMENTATION
FOR SESOIL ASSESSMENT OF BENZENE FATE IN THE VADOSE ZONE

GENERAL INPUT PARAMETERS (APPLIED TO BOTH THE TIME OIL AND CENEX PROPERTIES)

TABLE A-1, SUBSURFACE SOIL PROPERTIES

Soil Parameters[1]			Source
Bulk Density	1.5	g/cm^3	NJDEP SESOIL Guidance
Intrinsic permeability	discretized by layer	cm^2	Adjusted to match regional average recharge rate[2]; the default values recommended by the NJDEP Guidance are 3.5^{-10} for silt loam, and 10^{-11} for silt
Soil pore disconnectedness index	10	dimensionless	Adjusted to match regional average recharge rate[2] and maintain a reasonable soil water balance; the default values recommended by the NJDEP Guidance are 5.5 for silt loam, and 12 for silt
Effective porosity	0.35	fraction	Default value for silt loam; consistent with NJ Guidance
Organic carbon content	0.2	percent	NJDEP SESOIL Guidance
Cation exchange capacity	0 (not used)	meq/100 g dry soil	
Freundlich exponent	1	dimensionless	NJDEP SESOIL Guidance (assumes linear sorption)

NOTES:

[1]The boring logs for SP02 and SP11 describe the soil in the interval of interest as silt with trace or some sand.

[2]Based on an average annual recharge rate of 2-5 in, computed by Bauer and Vaccaro (1990) using a soil moisture balance model specific to an area within a few miles of Colfax.

Site latitude: 46.883 degrees.

TABLE A-2, CHEMICAL PROPERTIES FOR BENZENE

Chemical Properties for Benzene					
Water solubility	1780	mg/L	Air diffusion coefficient	0.077	cm^2/sec
Henry's Law constant	0.00555	m^3-atm/mol	Molecular weight	78.11	g/mole
Koc	31	(µg/g)/(µg/ml)	Neutral hydrolysis rate constant	0 (not used)	1/day
Kd	calculated	(µg/g)/(µg/ml)	Acid hydrolysis rate constant	0 (not used)	1/day
Chemical Valence	0 (not used)	g/mole	Ligand dissociation constant	0 (not used)	dimensionless
Base hydrolysis rate constant	0 (not used)	1/day	Moles ligand/mole chemical	0 (not used)	dimensionless
Liquid phase biodegradation rate	0 (not used)	1/day	Molecular weight ligand	0 (not used)	g/mol
Solid phase biodegradation rate	0 (not used)	1/day			
Water diffusion coefficient	9.80E-06	cm/sec			

NOTES:
Source: SESOIL database

TABLE A-3, CLIMATE DATA

Climate									
Month	Temp (C)	Cloud Cover (fraction)	Relative Humidity (fraction)	Short Wave Albedo (fraction)	Evapotranspiration [1] (cm/day)	Precipitation (cm/month)	Average Storm Length (days)	Average Number of Storms per month	Rainy Season [2] (days)
Oct	9	0.6	0.645	0.2	calculated	2.921	0.36	3.12	30.4
Nov	3.556	0.8	0.755	0.25	calculated	5.766	0.45	3.8	30.4
Dec	-0.389	0.85	0.775	0.5	calculated	7.087	0.47	3.8	30.4
Jan	-0.944	0.8	0.755	0.5	calculated	6.096	0.54	3.63	30.4
Feb	2.111	0.8	0.705	0.25	calculated	4.877	0.39	3.26	30.4
Mar	4.944	0.8	0.63	0.2	calculated	5.055	0.35	3.54	30.4
Apr	8.333	0.7	0.585	0.2	calculated	3.937	0.32	3.68	30.4
May	12.17	0.7	0.575	0.2	calculated	3.835	0.4	3.71	30.4
Jun	16.17	0.7	0.545	0.2	calculated	3.175	0.41	3.22	30.4
Jul	19.39	0.4	0.43	0.25	calculated	1.702	0.24	1.53	30.4
Aug	19.17	0.4	0.42	0.25	calculated	1.956	0.24	2.06	30.4
Sep	14.56	0.45	0.495	0.2	calculated	2.337	0.35	2.46	30.4

NOTES:
Source: NOAA, Colfax 1 NW station.

[1]Calculated from Temp, Cloud Cover, Relative Humidity, and Short Wave Albedo.
[2]Value of 30.4 assumes that rain can occur on any day of the given month.

TABLE A-4, INPUT PARAMETERS USED IN THE CENEX PROPERTY SIMULATION

Model Discretization							
Layer	Layer Top Elevation (ft)	Layer Bottom Elevation (ft)	Layer Top Elevation (cm)	Layer Bottom Elevation (cm)	Layer Thickness (cm)	Sublayer Thickness (cm)	Number of Sublayers
1	0.00	0.33	0.0	10.2	10.2	5.1	2
2	0.33	3.00	10.2	91.4	81.3	8.1	10
3	3.00	5.00	91.4	152.4	61.0	6.1	10
4	5.00	6.75	152.4	205.7	53.3	5.3	10

NOTES:

Model bottom elevation is based on the shallowest depth to water recorded in MW04, located near SP02.

Layer Inputs			Soil Samples				
Layer	Initial sorbed phase benzene concentration[1] (ug/g)	Intrinsic permeability[2] (cm^2)	Sample	Date	Sample Collection Depth (ft)	Sample Collection Depth (cm)	Sorbed phase concentration[3] (mg/kg)
1	0.00	2.50E-10					
2	0.00	2.50E-10					
3	0.37	2.50E-10	SP11-03-04	04/09/08	3-4	91.44-121.92	0.37
4	0.29	2.50E-10	SP11-05-06	04/09/08	5-6	152.4-182.88	0.29

TABLE A-5, INPUT PARAMETERS USED IN THE TIME OIL PROPERTY SIMULATION

Model Discretization							
Layer	**Layer top elevation (ft)**	**Layer bottom elevation (ft)**	**Layer top elevation (cm)**	**Layer bottom elevation (cm)**	**Layer Thickness (cm)**	**Sublayer thickness (cm)**	**Number of Sublayers**
1	0.00	0.33	0.0	10.2	10.2	5.1	2
2	0.33	3.00	10.2	91.4	81.3	8.1	10
3	3.00	4.00	91.4	121.9	30.5	5.1	6
4	4.00	5.33	121.9	162.6	40.6	4.1	10

Notes:

Model bottom elevation is based on the shallowest depth to water recorded in MW04, located near SP02

Layer Inputs			Soil Samples				
Layer	**Initial sorbed phase benzene concentration[1] (ug/g)**	**Intrinsic permeability[2] (cm^2)**	**Sample**	**Date**	**Sample Collection Depth (ft)**	**Sample Collection Depth (cm)**	**Sorbed phase concentration[3] (mg/kg)**
1	0	2.50E-10					
2	0	2.50E-10					
3	1.6	2.50E-10	SP02-03-04	04/09/08	3-4	91.44-121.92	1.6
4	1.6	2.50E-10					

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Table A-6
Simulated Benzene Concentrations
for the Time Oil Property, Unpaved Case

	Layer 4, Sublayer 10			Layer 2, Sublayer 10			Layer 3, Sublayer 6			Layer 1, Sublayer 1			All Layers
Time (yrs)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Moisture Content (%)
0.08	3.52E-01	5.68E+00	1.36E+00	1.89E-01	3.04E+00	7.26E-01	2.88E-01	4.64E+00	1.11E+00	3.31E-03	5.34E-02	1.27E-02	21.79
0.17	3.14E-01	5.06E+00	1.23E+00	1.73E-01	2.79E+00	6.79E-01	2.56E-01	4.13E+00	1.01E+00	4.40E-03	7.09E-02	1.73E-02	25.95
0.25	2.89E-01	4.66E+00	1.15E+00	1.57E-01	2.53E+00	6.25E-01	2.33E-01	3.76E+00	9.28E-01	4.08E-03	6.57E-02	1.62E-02	26.72
0.33	2.68E-01	4.33E+00	1.07E+00	1.44E-01	2.32E+00	5.70E-01	2.14E-01	3.45E+00	8.50E-01	3.73E-03	6.02E-02	1.48E-02	26.86
0.42	2.49E-01	4.01E+00	9.79E-01	1.40E-01	2.26E+00	5.53E-01	2.04E-01	3.28E+00	8.02E-01	4.50E-03	7.26E-02	1.77E-02	25.25
0.50	2.23E-01	3.60E+00	8.74E-01	1.40E-01	2.26E+00	5.48E-01	1.91E-01	3.08E+00	7.49E-01	5.58E-03	9.00E-02	2.18E-02	23.19
0.58	1.97E-01	3.18E+00	7.60E-01	1.35E-01	2.17E+00	5.19E-01	1.74E-01	2.81E+00	6.72E-01	6.35E-03	1.02E-01	2.45E-02	22.03
0.67	1.76E-01	2.84E+00	6.70E-01	1.25E-01	2.02E+00	4.75E-01	1.58E-01	2.54E+00	6.00E-01	6.29E-03	1.01E-01	2.39E-02	21.86
0.75	1.57E-01	2.53E+00	5.89E-01	1.14E-01	1.84E+00	4.27E-01	1.42E-01	2.29E+00	5.31E-01	6.07E-03	9.79E-02	2.28E-02	21.40
0.83	1.34E-01	2.15E+00	4.92E-01	1.00E-01	1.61E+00	3.69E-01	1.22E-01	1.97E+00	4.49E-01	5.93E-03	9.56E-02	2.18E-02	20.00
0.92	1.12E-01	1.81E+00	4.15E-01	8.52E-02	1.38E+00	3.14E-01	1.03E-01	1.66E+00	3.80E-01	5.14E-03	8.29E-02	1.90E-02	19.79
1.00	9.65E-02	1.56E+00	3.61E-01	7.32E-02	1.18E+00	2.74E-01	8.84E-02	1.43E+00	3.31E-01	4.37E-03	7.04E-02	1.63E-02	20.35
1.08	8.52E-02	1.37E+00	3.28E-01	6.42E-02	1.04E+00	2.47E-01	7.78E-02	1.26E+00	3.00E-01	3.71E-03	5.98E-02	1.43E-02	21.37
1.17	7.65E-02	1.23E+00	3.00E-01	5.68E-02	9.16E-01	2.23E-01	6.96E-02	1.12E+00	2.73E-01	2.81E-03	4.52E-02	1.10E-02	25.88
1.25	7.30E-02	1.18E+00	2.91E-01	5.18E-02	8.36E-01	2.06E-01	6.51E-02	1.05E+00	2.59E-01	2.15E-03	3.47E-02	8.56E-03	26.72
1.33	7.01E-02	1.13E+00	2.79E-01	4.75E-02	7.67E-01	1.89E-01	6.14E-02	9.90E-01	2.44E-01	1.76E-03	2.84E-02	6.99E-03	26.86
1.42	6.80E-02	1.10E+00	2.68E-01	4.53E-02	7.31E-01	1.79E-01	5.93E-02	9.56E-01	2.34E-01	1.86E-03	3.00E-02	7.32E-03	25.25
1.50	6.39E-02	1.03E+00	2.50E-01	4.35E-02	7.01E-01	1.70E-01	5.63E-02	9.08E-01	2.21E-01	1.99E-03	3.20E-02	7.78E-03	23.19
1.58	5.78E-02	9.32E-01	2.23E-01	4.08E-02	6.57E-01	1.57E-01	5.16E-02	8.33E-01	1.99E-01	2.04E-03	3.29E-02	7.88E-03	22.03
1.67	5.22E-02	8.41E-01	1.98E-01	3.75E-02	6.04E-01	1.43E-01	4.69E-02	7.56E-01	1.78E-01	1.93E-03	3.11E-02	7.34E-03	21.86
1.75	4.67E-02	7.53E-01	1.75E-01	3.40E-02	5.49E-01	1.28E-01	4.22E-02	6.81E-01	1.58E-01	1.83E-03	2.95E-02	6.86E-03	21.40
1.83	3.97E-02	6.41E-01	1.47E-01	2.98E-02	4.81E-01	1.10E-01	3.63E-02	5.85E-01	1.34E-01	1.77E-03	2.86E-02	6.53E-03	20.00
1.92	3.35E-02	5.40E-01	1.24E-01	2.54E-02	4.10E-01	9.37E-02	3.07E-02	4.95E-01	1.13E-01	1.53E-03	2.47E-02	5.65E-03	19.79
2.00	2.88E-02	4.64E-01	1.08E-01	2.18E-02	3.52E-01	8.15E-02	2.63E-02	4.25E-01	9.85E-02	1.30E-03	2.10E-02	4.86E-03	20.35
2.08	2.54E-02	4.09E-01	9.76E-02	1.91E-02	3.08E-01	7.36E-02	2.32E-02	3.74E-01	8.92E-02	1.11E-03	1.78E-02	4.25E-03	21.37
2.17	2.28E-02	3.67E-01	8.94E-02	1.69E-02	2.73E-01	6.64E-02	2.07E-02	3.35E-01	8.14E-02	8.36E-04	1.35E-02	3.28E-03	25.88
2.25	2.18E-02	3.51E-01	8.66E-02	1.54E-02	2.49E-01	6.15E-02	1.94E-02	3.13E-01	7.73E-02	6.41E-04	1.03E-02	2.55E-03	26.72
2.33	2.09E-02	3.37E-01	8.30E-02	1.42E-02	2.29E-01	5.62E-02	1.83E-02	2.95E-01	7.26E-02	5.25E-04	8.46E-03	2.08E-03	26.86
2.42	2.03E-02	3.27E-01	7.99E-02	1.35E-02	2.18E-01	5.32E-02	1.77E-02	2.85E-01	6.96E-02	5.54E-04	8.93E-03	2.18E-03	25.25
2.50	1.91E-02	3.07E-01	7.46E-02	1.30E-02	2.09E-01	5.07E-02	1.68E-02	2.71E-01	6.57E-02	5.92E-04	9.54E-03	2.32E-03	23.19
2.58	1.72E-02	2.78E-01	6.64E-02	1.21E-02	1.96E-01	4.68E-02	1.54E-02	2.48E-01	5.93E-02	6.08E-04	9.81E-03	2.35E-03	22.03
2.67	1.55E-02	2.51E-01	5.91E-02	1.12E-02	1.80E-01	4.25E-02	1.40E-02	2.25E-01	5.31E-02	5.75E-04	9.28E-03	2.19E-03	21.86
2.75	1.39E-02	2.24E-01	5.22E-02	1.01E-02	1.64E-01	3.80E-02	1.26E-02	2.03E-01	4.71E-02	5.45E-04	8.79E-03	2.04E-03	21.40
2.83	1.18E-02	1.91E-01	4.36E-02	8.89E-03	1.43E-01	3.28E-02	1.08E-02	1.74E-01	3.99E-02	5.28E-04	8.51E-03	1.94E-03	20.00
2.92	9.98E-03	1.61E-01	3.68E-02	7.57E-03	1.22E-01	2.79E-02	9.14E-03	1.48E-01	3.37E-02	4.57E-04	7.36E-03	1.68E-03	19.79
3.00	8.57E-03	1.38E-01	3.20E-02	6.49E-03	1.05E-01	2.43E-02	7.85E-03	1.27E-01	2.93E-02	3.88E-04	6.25E-03	1.45E-03	20.35
3.08	7.56E-03	1.22E-01	2.91E-02	5.69E-03	9.18E-02	2.19E-02	6.91E-03	1.11E-01	2.66E-02	3.29E-04	5.31E-03	1.27E-03	21.37
3.17	6.79E-03	1.10E-01	2.66E-02	5.04E-03	8.13E-02	1.98E-02	6.18E-03	9.97E-02	2.43E-02	2.49E-04	4.02E-03	9.77E-04	25.88
3.25	6.48E-03	1.05E-01	2.58E-02	4.60E-03	7.42E-02	1.83E-02	5.78E-03	9.32E-02	2.30E-02	1.91E-04	3.08E-03	7.60E-04	26.72
3.33	6.23E-03	1.00E-01	2.47E-02	4.22E-03	6.81E-02	1.68E-02	5.45E-03	8.79E-02	2.16E-02	1.56E-04	2.52E-03	6.21E-04	26.86
3.42	6.04E-03	9.74E-02	2.38E-02	4.02E-03	6.49E-02	1.59E-02	5.26E-03	8.49E-02	2.08E-02	1.65E-04	2.66E-03	6.50E-04	25.25
3.50	5.68E-03	9.15E-02	2.22E-02	3.86E-03	6.22E-02	1.51E-02	5.00E-03	8.06E-02	1.96E-02	1.76E-04	2.84E-03	6.90E-04	23.19
3.58	5.13E-03	8.27E-02	1.98E-02	3.62E-03	5.84E-02	1.40E-02	4.58E-03	7.39E-02	1.77E-02	1.81E-04	2.92E-03	6.99E-04	22.03
3.67	4.63E-03	7.47E-02	1.76E-02	3.33E-03	5.37E-02	1.27E-02	4.16E-03	6.71E-02	1.58E-02	1.71E-04	2.76E-03	6.52E-04	21.86
3.75	4.15E-03	6.69E-02	1.55E-02	3.02E-03	4.87E-02	1.13E-02	3.75E-03	6.04E-02	1.40E-02	1.62E-04	2.62E-03	6.09E-04	21.40
3.83	3.53E-03	5.69E-02	1.30E-02	2.65E-03	4.27E-02	9.76E-03	3.22E-03	5.20E-02	1.19E-02	1.57E-04	2.54E-03	5.79E-04	20.00
3.92	2.97E-03	4.80E-02	1.10E-02	2.25E-03	3.64E-02	8.31E-03	2.72E-03	4.39E-02	1.01E-02	1.36E-04	2.19E-03	5.02E-04	19.79
4.00	2.55E-03	4.12E-02	9.54E-03	1.94E-03	3.12E-02	7.23E-03	2.34E-03	3.77E-02	8.74E-03	1.16E-04	1.86E-03	4.32E-04	20.35
4.08	2.25E-03	3.63E-02	8.67E-03	1.70E-03	2.74E-02	6.53E-03	2.06E-03	3.32E-02	7.92E-03	9.81E-05	1.58E-03	3.78E-04	21.37
4.17	2.02E-03	3.26E-02	7.94E-03	1.50E-03	2.42E-02	5.90E-03	1.84E-03	2.97E-02	7.23E-03	7.42E-05	1.20E-03	2.91E-04	25.88
4.25	1.93E-03	3.11E-02	7.69E-03	1.37E-03	2.21E-02	5.46E-03	1.72E-03	2.78E-02	6.86E-03	5.69E-05	9.17E-04	2.27E-04	26.72
4.33	1.86E-03	2.99E-02	7.37E-03	1.26E-03	2.03E-02	4.99E-03	1.62E-03	2.62E-02	6.45E-03	4.66E-05	7.51E-04	1.85E-04	26.86
4.42	1.80E-03	2.90E-02	7.09E-03	1.20E-03	1.93E-02	4.72E-03	1.57E-03	2.53E-02	6.18E-03	4.92E-05	7.93E-04	1.94E-04	25.25
4.50	1.69E-03	2.73E-02	6.62E-03	1.15E-03	1.86E-02	4.50E-03	1.49E-03	2.40E-02	5.83E-03	5.25E-05	8.47E-04	2.06E-04	23.19
4.58	1.53E-03	2.47E-02	5.90E-03	1.08E-03	1.74E-02	4.16E-03	1.37E-03	2.20E-02	5.27E-03	5.40E-05	8.71E-04	2.08E-04	22.03
4.67	1.38E-03	2.23E-02	5.25E-03	9.91E-04	1.60E-02	3.77E-03	1.24E-03	2.00E-02	4.72E-03	5.11E-05	8.24E-04	1.94E-04	21.86
4.75	1.24E-03	1.99E-02	4.63E-03	9.00E-04	1.45E-02	3.38E-03	1.12E-03	1.80E-02	4.18E-03	4.84E-05	7.81E-04	1.81E-04	21.40
4.83	1.05E-03	1.70E-02	3.87E-03	7.89E-04	1.27E-02	2.91E-03	9.60E-04	1.55E-02	3.54E-03	4.68E-05	7.55E-04	1.73E-04	20.00
4.92	8.86E-04	1.43E-02	3.27E-03	6.72E-04	1.08E-02	2.48E-03	8.12E-04	1.31E-02	2.99E-03	4.05E-05	6.54E-04	1.50E-04	19.79
5.00	7.61E-04	1.23E-02	2.84E-03	5.77E-04	9.30E-03	2.16E-03	6.97E-04	1.12E-02	2.60E-03	3.44E-05	5.55E-04	1.29E-04	20.35

SoundEarth Strategies

Table A-6
Simulated Benzene Concentrations
for the Time Oil Property, Unpaved Case

	Layer 4, Sublayer 10			Layer 2, Sublayer 10			Layer 3, Sublayer 6			Layer 1, Sublayer 1			All Layers
Time (yrs)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Moisture Content (%)
5.08	6.71E-04	1.08E-02	2.58E-03	5.06E-04	8.15E-03	1.95E-03	6.13E-04	9.89E-03	2.36E-03	2.92E-05	4.72E-04	1.13E-04	21.37
5.17	6.03E-04	9.72E-03	2.37E-03	4.48E-04	7.22E-03	1.76E-03	5.49E-04	8.85E-03	2.15E-03	2.21E-05	3.57E-04	8.68E-05	25.88
5.25	5.75E-04	9.28E-03	2.29E-03	4.08E-04	6.59E-03	1.63E-03	5.13E-04	8.28E-03	2.04E-03	1.69E-05	2.73E-04	6.75E-05	26.72
5.33	5.53E-04	8.92E-03	2.20E-03	3.75E-04	6.04E-03	1.49E-03	4.84E-04	7.80E-03	1.92E-03	1.39E-05	2.24E-04	5.51E-05	26.86
5.42	5.36E-04	8.64E-03	2.11E-03	3.57E-04	5.76E-03	1.41E-03	4.67E-04	7.54E-03	1.84E-03	1.46E-05	2.36E-04	5.77E-05	25.25
5.50	5.04E-04	8.13E-03	1.97E-03	3.43E-04	5.53E-03	1.34E-03	4.44E-04	7.16E-03	1.74E-03	1.57E-05	2.52E-04	6.13E-05	23.19
5.58	4.55E-04	7.35E-03	1.76E-03	3.21E-04	5.18E-03	1.24E-03	4.07E-04	6.56E-03	1.57E-03	1.61E-05	2.60E-04	6.21E-05	22.03
5.67	4.11E-04	6.63E-03	1.56E-03	2.95E-04	4.76E-03	1.12E-03	3.70E-04	5.96E-03	1.41E-03	1.52E-05	2.45E-04	5.79E-05	21.86
5.75	3.68E-04	5.94E-03	1.38E-03	2.68E-04	4.33E-03	1.01E-03	3.33E-04	5.36E-03	1.25E-03	1.44E-05	2.33E-04	5.40E-05	21.40
5.83	3.13E-04	5.05E-03	1.15E-03	2.35E-04	3.79E-03	8.67E-04	2.86E-04	4.61E-03	1.05E-03	1.40E-05	2.25E-04	5.14E-05	20.00
5.92	2.64E-04	4.26E-03	9.73E-04	2.00E-04	3.23E-03	7.38E-04	2.42E-04	3.90E-03	8.92E-04	1.21E-05	1.95E-04	4.45E-05	19.79
6.00	2.27E-04	3.66E-03	8.47E-04	1.72E-04	2.77E-03	6.42E-04	2.08E-04	3.35E-03	7.76E-04	1.03E-05	1.65E-04	3.83E-05	20.35
6.08	2.00E-04	3.23E-03	7.69E-04	1.51E-04	2.43E-03	5.80E-04	1.83E-04	2.95E-03	7.03E-04	8.71E-06	1.41E-04	3.35E-05	21.37
6.17	1.80E-04	2.90E-03	7.05E-04	1.33E-04	2.15E-03	5.23E-04	1.63E-04	2.64E-03	6.42E-04	6.59E-06	1.06E-04	2.59E-05	25.88
6.25	1.71E-04	2.76E-03	6.83E-04	1.22E-04	1.96E-03	4.85E-04	1.53E-04	2.47E-03	6.09E-04	5.05E-06	8.14E-05	2.01E-05	26.72
6.33	1.65E-04	2.66E-03	6.54E-04	1.12E-04	1.80E-03	4.43E-04	1.44E-04	2.33E-03	5.72E-04	4.13E-06	6.67E-05	1.64E-05	26.86
6.42	1.60E-04	2.58E-03	6.29E-04	1.06E-04	1.72E-03	4.19E-04	1.39E-04	2.25E-03	5.49E-04	4.36E-06	7.04E-05	1.72E-05	25.25
6.50	1.50E-04	2.42E-03	5.88E-04	1.02E-04	1.65E-03	4.00E-04	1.32E-04	2.13E-03	5.18E-04	4.66E-06	7.52E-05	1.83E-05	23.19
6.58	1.36E-04	2.19E-03	5.23E-04	9.57E-05	1.54E-03	3.69E-04	1.21E-04	1.95E-03	4.67E-04	4.79E-06	7.73E-05	1.85E-05	22.03
6.67	1.22E-04	1.98E-03	4.66E-04	8.80E-05	1.42E-03	3.35E-04	1.10E-04	1.78E-03	4.19E-04	4.53E-06	7.31E-05	1.72E-05	21.86
6.75	1.10E-04	1.77E-03	4.11E-04	7.99E-05	1.29E-03	3.00E-04	9.91E-05	1.60E-03	3.71E-04	4.29E-06	6.93E-05	1.61E-05	21.40
6.83	9.33E-05	1.51E-03	3.44E-04	7.00E-05	1.13E-03	2.58E-04	8.52E-05	1.37E-03	3.14E-04	4.16E-06	6.70E-05	1.53E-05	20.00
6.92	7.86E-05	1.27E-03	2.90E-04	5.96E-05	9.61E-04	2.20E-04	7.20E-05	1.16E-03	2.66E-04	3.60E-06	5.80E-05	1.33E-05	19.79
7.00	6.75E-05	1.09E-03	2.52E-04	5.12E-05	8.25E-04	1.91E-04	6.18E-05	9.97E-04	2.31E-04	3.05E-06	4.93E-05	1.14E-05	20.35
7.08	5.96E-05	9.61E-04	2.29E-04	4.49E-05	7.24E-04	1.73E-04	5.44E-05	8.78E-04	2.09E-04	2.59E-06	4.18E-05	9.98E-06	21.37
7.17	5.35E-05	8.62E-04	2.10E-04	3.97E-05	6.41E-04	1.56E-04	4.87E-05	7.85E-04	1.91E-04	1.96E-06	3.16E-05	7.70E-06	25.88
7.25	5.10E-05	8.23E-04	2.03E-04	3.62E-05	5.84E-04	1.44E-04	4.55E-05	7.34E-04	1.81E-04	1.50E-06	2.42E-05	5.98E-06	26.72
7.33	4.90E-05	7.91E-04	1.95E-04	3.32E-05	5.36E-04	1.32E-04	4.29E-05	6.92E-04	1.70E-04	1.23E-06	1.98E-05	4.88E-06	26.86
7.42	4.75E-05	7.67E-04	1.87E-04	3.17E-05	5.11E-04	1.25E-04	4.15E-05	6.69E-04	1.63E-04	1.30E-06	2.09E-05	5.12E-06	25.25
7.50	4.47E-05	7.21E-04	1.75E-04	3.04E-05	4.90E-04	1.19E-04	3.94E-05	6.35E-04	1.54E-04	1.39E-06	2.24E-05	5.43E-06	23.19
7.58	4.04E-05	6.51E-04	1.56E-04	2.85E-05	4.59E-04	1.10E-04	3.61E-05	5.82E-04	1.39E-04	1.43E-06	2.30E-05	5.50E-06	22.03
7.67	3.64E-05	5.88E-04	1.39E-04	2.62E-05	4.22E-04	9.96E-05	3.28E-05	5.29E-04	1.25E-04	1.35E-06	2.18E-05	5.13E-06	21.86
7.75	3.26E-05	5.26E-04	1.22E-04	2.38E-05	3.84E-04	8.92E-05	2.95E-05	4.76E-04	1.11E-04	1.28E-06	2.06E-05	4.79E-06	21.40
7.83	2.78E-05	4.48E-04	1.02E-04	2.08E-05	3.36E-04	7.68E-05	2.54E-05	4.09E-04	9.35E-05	1.24E-06	2.00E-05	4.56E-06	20.00
7.92	2.34E-05	3.77E-04	8.63E-05	1.77E-05	2.86E-04	6.54E-05	2.14E-05	3.46E-04	7.91E-05	1.07E-06	1.73E-05	3.95E-06	19.79
8.00	2.01E-05	3.24E-04	7.51E-05	1.52E-05	2.46E-04	5.69E-05	1.84E-05	2.97E-04	6.88E-05	9.08E-07	1.47E-05	3.40E-06	20.35
8.08	1.77E-05	2.86E-04	6.82E-05	1.33E-05	2.15E-04	5.14E-05	1.62E-05	2.61E-04	6.23E-05	7.71E-07	1.24E-05	2.97E-06	21.37
8.17	1.59E-05	2.56E-04	6.24E-05	1.18E-05	1.91E-04	4.64E-05	1.45E-05	2.34E-04	5.68E-05	5.83E-07	9.40E-06	2.29E-06	25.88
8.25	1.52E-05	2.45E-04	6.05E-05	1.08E-05	1.74E-04	4.29E-05	1.35E-05	2.18E-04	5.39E-05	4.46E-07	7.20E-06	1.78E-06	26.72
8.33	1.46E-05	2.35E-04	5.79E-05	9.89E-06	1.59E-04	3.92E-05	1.28E-05	2.06E-04	5.07E-05	3.65E-07	5.89E-06	1.45E-06	26.86
8.42	1.41E-05	2.28E-04	5.57E-05	9.42E-06	1.52E-04	3.71E-05	1.23E-05	1.99E-04	4.86E-05	3.86E-07	6.22E-06	1.52E-06	25.25
8.50	1.33E-05	2.14E-04	5.20E-05	9.03E-06	1.46E-04	3.54E-05	1.17E-05	1.89E-04	4.58E-05	4.12E-07	6.65E-06	1.61E-06	23.19
8.58	1.20E-05	1.94E-04	4.63E-05	8.46E-06	1.37E-04	3.27E-05	1.07E-05	1.73E-04	4.14E-05	4.24E-07	6.83E-06	1.63E-06	22.03
8.67	1.08E-05	1.75E-04	4.12E-05	7.78E-06	1.26E-04	2.96E-05	9.73E-06	1.57E-04	3.70E-05	4.01E-07	6.46E-06	1.52E-06	21.86
8.75	9.69E-06	1.56E-04	3.63E-05	7.06E-06	1.14E-04	2.65E-05	8.75E-06	1.41E-04	3.28E-05	3.79E-07	6.12E-06	1.42E-06	21.40
8.83	8.24E-06	1.33E-04	3.04E-05	6.19E-06	9.98E-05	2.28E-05	7.52E-06	1.21E-04	2.77E-05	3.67E-07	5.92E-06	1.35E-06	20.00
8.92	6.94E-06	1.12E-04	2.56E-05	5.26E-06	8.49E-05	1.94E-05	6.36E-06	1.03E-04	2.35E-05	3.17E-07	5.12E-06	1.17E-06	19.79
9.00	5.95E-06	9.60E-05	2.22E-05	4.51E-06	7.28E-05	1.69E-05	5.45E-06	8.79E-05	2.04E-05	2.69E-07	4.34E-06	1.01E-06	20.35
9.08	5.25E-06	8.46E-05	2.02E-05	3.95E-06	6.37E-05	1.52E-05	4.80E-06	7.73E-05	1.85E-05	2.28E-07	3.68E-06	8.79E-07	21.37
9.17	4.71E-06	7.59E-05	1.85E-05	3.50E-06	5.64E-05	1.37E-05	4.29E-06	6.91E-05	1.68E-05	1.72E-07	2.78E-06	6.77E-07	25.88
9.25	4.49E-06	7.25E-05	1.79E-05	3.19E-06	5.14E-05	1.27E-05	4.01E-06	6.46E-05	1.60E-05	1.32E-07	2.12E-06	5.24E-07	26.72
9.33	4.31E-06	6.96E-05	1.71E-05	2.93E-06	4.72E-05	1.16E-05	3.78E-06	6.09E-05	1.50E-05	1.09E-07	1.75E-06	4.31E-07	26.86
9.42	4.18E-06	6.74E-05	1.65E-05	2.79E-06	4.49E-05	1.10E-05	3.64E-06	5.88E-05	1.44E-05	1.14E-07	1.83E-06	4.48E-07	25.25
9.50	3.92E-06	6.33E-05	1.54E-05	2.67E-06	4.30E-05	1.04E-05	3.46E-06	5.58E-05	1.35E-05	1.22E-07	1.96E-06	4.76E-07	23.19
9.58	3.54E-06	5.71E-05	1.37E-05	2.50E-06	4.03E-05	9.63E-06	3.16E-06	5.10E-05	1.22E-05	1.25E-07	2.02E-06	4.82E-07	22.03
9.67	3.19E-06	5.15E-05	1.21E-05	2.29E-06	3.70E-05	8.72E-06	2.87E-06	4.63E-05	1.09E-05	1.18E-07	1.90E-06	4.48E-07	21.86
9.75	2.85E-06	4.60E-05	1.07E-05	2.08E-06	3.35E-05	7.79E-06	2.58E-06	4.16E-05	9.66E-06	1.12E-07	1.80E-06	4.18E-07	21.40
9.83	2.42E-06	3.91E-05	8.92E-06	1.82E-06	2.93E-05	6.70E-06	2.21E-06	3.57E-05	8.15E-06	1.08E-07	1.74E-06	3.97E-07	20.00
9.92	2.04E-06	3.28E-05	7.51E-06	1.54E-06	2.49E-05	5.69E-06	1.87E-06	3.01E-05	6.88E-06	9.30E-08	1.50E-06	3.43E-07	19.79
10.00	1.74E-06	2.81E-05	6.51E-06	1.32E-06	2.13E-05	4.94E-06	1.60E-06	2.58E-05	5.97E-06	7.87E-08	1.27E-06	2.94E-07	20.35

SoundEarth Strategies

Table A-7
Simulated Benzene Concentrations
for the Time Oil Property, Paved Case

	Layer 4, Sublayer 10			Layer 2, Sublayer 10			Layer 3, Sublayer 6			Layer 1, Sublayer 1			All Layers
Time (yrs)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Moisture Content (%)
0.08	3.63E-01	5.86E+00	1.40E+00	1.87E-01	3.01E+00	7.19E-01	2.95E-01	4.76E+00	1.14E+00	2.23E-03	3.59E-02	8.57E-03	22.64
0.17	3.57E-01	5.75E+00	1.40E+00	1.78E-01	2.88E+00	7.00E-01	2.69E-01	4.34E+00	1.06E+00	3.84E-03	6.20E-02	1.51E-02	27.40
0.25	3.35E-01	5.40E+00	1.33E+00	1.69E-01	2.73E+00	6.75E-01	2.54E-01	4.09E+00	1.01E+00	4.13E-03	6.66E-02	1.64E-02	28.49
0.33	3.20E-01	5.16E+00	1.27E+00	1.63E-01	2.62E+00	6.45E-01	2.42E-01	3.91E+00	9.62E-01	4.21E-03	6.79E-02	1.67E-02	28.80
0.42	3.10E-01	5.00E+00	1.22E+00	1.65E-01	2.66E+00	6.50E-01	2.44E-01	3.93E+00	9.61E-01	5.02E-03	8.10E-02	1.98E-02	26.88
0.50	2.86E-01	4.61E+00	1.12E+00	1.71E-01	2.76E+00	6.69E-01	2.39E-01	3.86E+00	9.37E-01	6.84E-03	1.10E-01	2.68E-02	24.04
0.58	2.56E-01	4.13E+00	9.87E-01	1.69E-01	2.73E+00	6.52E-01	2.23E-01	3.59E+00	8.59E-01	8.07E-03	1.30E-01	3.11E-02	22.92
0.67	2.33E-01	3.75E+00	8.85E-01	1.61E-01	2.60E+00	6.14E-01	2.06E-01	3.32E+00	7.82E-01	8.38E-03	1.35E-01	3.19E-02	22.85
0.75	2.13E-01	3.43E+00	7.97E-01	1.52E-01	2.45E+00	5.69E-01	1.90E-01	3.06E+00	7.12E-01	8.31E-03	1.34E-01	3.11E-02	22.57
0.83	1.90E-01	3.06E+00	6.99E-01	1.40E-01	2.25E+00	5.15E-01	1.72E-01	2.77E+00	6.33E-01	8.18E-03	1.32E-01	3.02E-02	21.56
0.92	1.68E-01	2.71E+00	6.18E-01	1.25E-01	2.02E+00	4.62E-01	1.53E-01	2.46E+00	5.63E-01	7.52E-03	1.21E-01	2.77E-02	21.28
1.00	1.50E-01	2.41E+00	5.59E-01	1.12E-01	1.81E+00	4.19E-01	1.36E-01	2.20E+00	5.09E-01	6.75E-03	1.09E-01	2.52E-02	21.70
1.08	1.35E-01	2.18E+00	5.21E-01	1.01E-01	1.63E+00	3.89E-01	1.23E-01	1.99E+00	4.74E-01	6.04E-03	9.74E-02	2.33E-02	22.29
1.17	1.22E-01	1.97E+00	4.80E-01	9.18E-02	1.48E+00	3.60E-01	1.11E-01	1.79E+00	4.36E-01	5.70E-03	9.20E-02	2.24E-02	27.30
1.25	1.19E-01	1.92E+00	4.73E-01	8.73E-02	1.41E+00	3.48E-01	1.06E-01	1.70E+00	4.21E-01	5.08E-03	8.20E-02	2.02E-02	28.45
1.33	1.17E-01	1.88E+00	4.63E-01	8.41E-02	1.36E+00	3.34E-01	1.02E-01	1.65E+00	4.05E-01	4.61E-03	7.43E-02	1.83E-02	28.80
1.42	1.18E-01	1.90E+00	4.64E-01	8.44E-02	1.36E+00	3.33E-01	1.04E-01	1.67E+00	4.09E-01	4.50E-03	7.26E-02	1.78E-02	26.88
1.50	1.16E-01	1.88E+00	4.56E-01	8.32E-02	1.34E+00	3.26E-01	1.04E-01	1.68E+00	4.07E-01	4.56E-03	7.36E-02	1.79E-02	24.04
1.58	1.09E-01	1.76E+00	4.21E-01	7.87E-02	1.27E+00	3.04E-01	9.79E-02	1.58E+00	3.78E-01	4.40E-03	7.09E-02	1.70E-02	22.92
1.67	1.01E-01	1.64E+00	3.86E-01	7.35E-02	1.19E+00	2.80E-01	9.11E-02	1.47E+00	3.47E-01	4.12E-03	6.65E-02	1.57E-02	22.85
1.75	9.38E-02	1.51E+00	3.52E-01	6.83E-02	1.10E+00	2.56E-01	8.44E-02	1.36E+00	3.17E-01	3.88E-03	6.26E-02	1.46E-02	22.57
1.83	8.42E-02	1.36E+00	3.10E-01	6.26E-02	1.01E+00	2.31E-01	7.65E-02	1.23E+00	2.82E-01	3.72E-03	5.99E-02	1.37E-02	21.56
1.92	7.47E-02	1.20E+00	2.75E-01	5.60E-02	9.03E-01	2.06E-01	6.80E-02	1.10E+00	2.51E-01	3.38E-03	5.45E-02	1.25E-02	21.28
2.00	6.67E-02	1.08E+00	2.49E-01	5.00E-02	8.07E-01	1.87E-01	6.07E-02	9.80E-01	2.27E-01	3.02E-03	4.87E-02	1.13E-02	21.70
2.08	6.04E-02	9.73E-01	2.32E-01	4.51E-02	7.28E-01	1.74E-01	5.49E-02	8.85E-01	2.11E-01	2.70E-03	4.35E-02	1.04E-02	22.29
2.17	5.46E-02	8.80E-01	2.14E-01	4.09E-02	6.60E-01	1.61E-01	4.95E-02	7.99E-01	1.94E-01	2.55E-03	4.11E-02	9.99E-03	27.30
2.25	5.29E-02	8.54E-01	2.11E-01	3.89E-02	6.28E-01	1.55E-01	4.71E-02	7.60E-01	1.88E-01	2.27E-03	3.66E-02	9.04E-03	28.45
2.33	5.20E-02	8.39E-01	2.07E-01	3.75E-02	6.05E-01	1.49E-01	4.55E-02	7.34E-01	1.81E-01	2.06E-03	3.32E-02	8.16E-03	28.80
2.42	5.25E-02	8.47E-01	2.07E-01	3.77E-02	6.07E-01	1.48E-01	4.63E-02	7.46E-01	1.82E-01	2.01E-03	3.24E-02	7.92E-03	26.88
2.50	5.19E-02	8.37E-01	2.03E-01	3.71E-02	5.99E-01	1.45E-01	4.63E-02	7.47E-01	1.81E-01	2.03E-03	3.28E-02	7.97E-03	24.04
2.58	4.87E-02	7.86E-01	1.88E-01	3.51E-02	5.66E-01	1.36E-01	4.37E-02	7.04E-01	1.69E-01	1.96E-03	3.16E-02	7.57E-03	22.92
2.67	4.52E-02	7.30E-01	1.72E-01	3.28E-02	5.29E-01	1.25E-01	4.06E-02	6.55E-01	1.55E-01	1.84E-03	2.97E-02	7.00E-03	22.85
2.75	4.18E-02	6.75E-01	1.57E-01	3.05E-02	4.92E-01	1.14E-01	3.77E-02	6.07E-01	1.41E-01	1.73E-03	2.79E-02	6.49E-03	22.57
2.83	3.76E-02	6.06E-01	1.38E-01	2.79E-02	4.50E-01	1.03E-01	3.41E-02	5.50E-01	1.26E-01	1.66E-03	2.67E-02	6.11E-03	21.56
2.92	3.33E-02	5.37E-01	1.23E-01	2.50E-02	4.03E-01	9.20E-02	3.03E-02	4.89E-01	1.12E-01	1.51E-03	2.43E-02	5.55E-03	21.28
3.00	2.97E-02	4.80E-01	1.11E-01	2.23E-02	3.60E-01	8.34E-02	2.71E-02	4.37E-01	1.01E-01	1.35E-03	2.17E-02	5.03E-03	21.70
3.08	2.69E-02	4.34E-01	1.04E-01	2.01E-02	3.25E-01	7.75E-02	2.45E-02	3.95E-01	9.42E-02	1.20E-03	1.94E-02	4.63E-03	22.29
3.17	2.43E-02	3.92E-01	9.55E-02	1.83E-02	2.95E-01	7.17E-02	2.21E-02	3.56E-01	8.67E-02	1.14E-03	1.83E-02	4.46E-03	27.30
3.25	2.36E-02	3.81E-01	9.40E-02	1.74E-02	2.80E-01	6.92E-02	2.10E-02	3.39E-01	8.37E-02	1.01E-03	1.63E-02	4.03E-03	28.45
3.33	2.32E-02	3.74E-01	9.21E-02	1.67E-02	2.70E-01	6.64E-02	2.03E-02	3.27E-01	8.05E-02	9.17E-04	1.48E-02	3.64E-03	28.80
3.42	2.34E-02	3.78E-01	9.24E-02	1.68E-02	2.71E-01	6.62E-02	2.06E-02	3.33E-01	8.13E-02	8.96E-04	1.45E-02	3.53E-03	26.88
3.50	2.31E-02	3.73E-01	9.06E-02	1.66E-02	2.67E-01	6.48E-02	2.07E-02	3.33E-01	8.09E-02	9.07E-04	1.46E-02	3.55E-03	24.04
3.58	2.17E-02	3.50E-01	8.38E-02	1.57E-02	2.53E-01	6.04E-02	1.95E-02	3.14E-01	7.51E-02	8.75E-04	1.41E-02	3.37E-03	22.92
3.67	2.02E-02	3.25E-01	7.67E-02	1.46E-02	2.36E-01	5.56E-02	1.81E-02	2.92E-01	6.89E-02	8.20E-04	1.32E-02	3.12E-03	22.85
3.75	1.87E-02	3.01E-01	6.99E-02	1.36E-02	2.19E-01	5.09E-02	1.68E-02	2.71E-01	6.30E-02	7.72E-04	1.25E-02	2.89E-03	22.57
3.83	1.68E-02	2.70E-01	6.17E-02	1.24E-02	2.01E-01	4.59E-02	1.52E-02	2.45E-01	5.61E-02	7.39E-04	1.19E-02	2.72E-03	21.56
3.92	1.49E-02	2.40E-01	5.48E-02	1.11E-02	1.80E-01	4.11E-02	1.35E-02	2.18E-01	4.99E-02	6.72E-04	1.08E-02	2.48E-03	21.28
4.00	1.33E-02	2.14E-01	4.96E-02	9.95E-03	1.61E-01	3.72E-02	1.21E-02	1.95E-01	4.52E-02	6.00E-04	9.68E-03	2.24E-03	21.70
4.08	1.20E-02	1.94E-01	4.62E-02	8.98E-03	1.45E-01	3.46E-02	1.09E-02	1.76E-01	4.20E-02	5.36E-04	8.65E-03	2.06E-03	22.29
4.17	1.09E-02	1.75E-01	4.26E-02	8.14E-03	1.31E-01	3.20E-02	9.85E-03	1.59E-01	3.87E-02	5.06E-04	8.17E-03	1.99E-03	27.30
4.25	1.05E-02	1.70E-01	4.19E-02	7.75E-03	1.25E-01	3.09E-02	9.37E-03	1.51E-01	3.73E-02	4.51E-04	7.28E-03	1.80E-03	28.45
4.33	1.04E-02	1.67E-01	4.11E-02	7.46E-03	1.20E-01	2.96E-02	9.05E-03	1.46E-01	3.59E-02	4.09E-04	6.59E-03	1.62E-03	28.80
4.42	1.05E-02	1.69E-01	4.12E-02	7.49E-03	1.21E-01	2.95E-02	9.20E-03	1.48E-01	3.63E-02	4.00E-04	6.45E-03	1.58E-03	26.88
4.50	1.03E-02	1.67E-01	4.04E-02	7.38E-03	1.19E-01	2.89E-02	9.21E-03	1.49E-01	3.61E-02	4.05E-04	6.53E-03	1.58E-03	24.04
4.58	9.69E-03	1.56E-01	3.74E-02	6.98E-03	1.13E-01	2.69E-02	8.69E-03	1.40E-01	3.35E-02	3.90E-04	6.29E-03	1.51E-03	22.92
4.67	9.00E-03	1.45E-01	3.42E-02	6.52E-03	1.05E-01	2.48E-02	8.08E-03	1.30E-01	3.07E-02	3.66E-04	5.90E-03	1.39E-03	22.85
4.75	8.32E-03	1.34E-01	3.12E-02	6.06E-03	9.78E-02	2.27E-02	7.49E-03	1.21E-01	2.81E-02	3.44E-04	5.55E-03	1.29E-03	22.57
4.83	7.47E-03	1.21E-01	2.75E-02	5.55E-03	8.95E-02	2.05E-02	6.78E-03	1.09E-01	2.50E-02	3.30E-04	5.32E-03	1.22E-03	21.56
4.92	6.62E-03	1.07E-01	2.44E-02	4.96E-03	8.01E-02	1.83E-02	6.03E-03	9.73E-02	2.23E-02	3.00E-04	4.83E-03	1.11E-03	21.28
5.00	5.91E-03	9.54E-02	2.21E-02	4.44E-03	7.16E-02	1.66E-02	5.39E-03	8.69E-02	2.01E-02	2.68E-04	4.32E-03	1.00E-03	21.70

SoundEarth Strategies

Table A-7
Simulated Benzene Concentrations
for the Time Oil Property, Paved Case

	Layer 4, Sublayer 10			Layer 2, Sublayer 10			Layer 3, Sublayer 6			Layer 1, Sublayer 1			All Layers
Time (yrs)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Moisture Content (%)
5.08	5.35E-03	8.63E-02	2.06E-02	4.00E-03	6.46E-02	1.54E-02	4.87E-03	7.85E-02	1.87E-02	2.39E-04	3.86E-03	9.20E-04	22.29
5.17	4.84E-03	7.80E-02	1.90E-02	3.63E-03	5.86E-02	1.43E-02	4.39E-03	7.08E-02	1.72E-02	2.26E-04	3.64E-03	8.86E-04	27.30
5.25	4.70E-03	7.57E-02	1.87E-02	3.45E-03	5.57E-02	1.38E-02	4.18E-03	6.74E-02	1.66E-02	2.01E-04	3.25E-03	8.01E-04	28.45
5.33	4.62E-03	7.44E-02	1.83E-02	3.33E-03	5.37E-02	1.32E-02	4.03E-03	6.51E-02	1.60E-02	1.82E-04	2.94E-03	7.24E-04	28.80
5.42	4.66E-03	7.52E-02	1.84E-02	3.34E-03	5.39E-02	1.32E-02	4.10E-03	6.62E-02	1.62E-02	1.78E-04	2.87E-03	7.02E-04	26.88
5.50	4.60E-03	7.42E-02	1.80E-02	3.29E-03	5.31E-02	1.29E-02	4.11E-03	6.62E-02	1.61E-02	1.80E-04	2.91E-03	7.06E-04	24.04
5.58	4.32E-03	6.97E-02	1.67E-02	3.11E-03	5.02E-02	1.20E-02	3.87E-03	6.25E-02	1.49E-02	1.74E-04	2.81E-03	6.71E-04	22.92
5.67	4.01E-03	6.47E-02	1.53E-02	2.91E-03	4.69E-02	1.11E-02	3.60E-03	5.81E-02	1.37E-02	1.63E-04	2.63E-03	6.20E-04	22.85
5.75	3.71E-03	5.99E-02	1.39E-02	2.70E-03	4.36E-02	1.01E-02	3.34E-03	5.39E-02	1.25E-02	1.54E-04	2.48E-03	5.76E-04	22.57
5.83	3.33E-03	5.37E-02	1.23E-02	2.47E-03	3.99E-02	9.12E-03	3.03E-03	4.88E-02	1.12E-02	1.47E-04	2.37E-03	5.42E-04	21.56
5.92	2.95E-03	4.76E-02	1.09E-02	2.21E-03	3.57E-02	8.16E-03	2.69E-03	4.34E-02	9.92E-03	1.34E-04	2.15E-03	4.93E-04	21.28
6.00	2.64E-03	4.26E-02	9.86E-03	1.98E-03	3.19E-02	7.40E-03	2.40E-03	3.88E-02	8.98E-03	1.19E-04	1.93E-03	4.46E-04	21.70
6.08	2.39E-03	3.85E-02	9.19E-03	1.79E-03	2.88E-02	6.87E-03	2.17E-03	3.50E-02	8.35E-03	1.07E-04	1.72E-03	4.11E-04	22.29
6.17	2.16E-03	3.48E-02	8.47E-03	1.62E-03	2.61E-02	6.36E-03	1.96E-03	3.16E-02	7.69E-03	1.01E-04	1.62E-03	3.95E-04	27.30
6.25	2.09E-03	3.38E-02	8.34E-03	1.54E-03	2.48E-02	6.14E-03	1.86E-03	3.01E-02	7.42E-03	8.97E-05	1.45E-03	3.57E-04	28.45
6.33	2.06E-03	3.32E-02	8.17E-03	1.48E-03	2.39E-02	5.89E-03	1.80E-03	2.90E-02	7.14E-03	8.13E-05	1.31E-03	3.23E-04	28.80
6.42	2.08E-03	3.35E-02	8.19E-03	1.49E-03	2.40E-02	5.87E-03	1.83E-03	2.95E-02	7.21E-03	7.95E-05	1.28E-03	3.13E-04	26.88
6.50	2.05E-03	3.31E-02	8.04E-03	1.47E-03	2.37E-02	5.75E-03	1.83E-03	2.95E-02	7.17E-03	8.05E-05	1.30E-03	3.15E-04	24.04
6.58	1.93E-03	3.11E-02	7.43E-03	1.39E-03	2.24E-02	5.36E-03	1.73E-03	2.79E-02	6.66E-03	7.76E-05	1.25E-03	2.99E-04	22.92
6.67	1.79E-03	2.89E-02	6.81E-03	1.30E-03	2.09E-02	4.93E-03	1.61E-03	2.59E-02	6.11E-03	7.28E-05	1.17E-03	2.77E-04	22.85
6.75	1.66E-03	2.67E-02	6.20E-03	1.21E-03	1.94E-02	4.52E-03	1.49E-03	2.40E-02	5.58E-03	6.85E-05	1.11E-03	2.57E-04	22.57
6.83	1.49E-03	2.40E-02	5.48E-03	1.10E-03	1.78E-02	4.07E-03	1.35E-03	2.18E-02	4.97E-03	6.56E-05	1.06E-03	2.42E-04	21.56
6.92	1.32E-03	2.13E-02	4.86E-03	9.87E-04	1.59E-02	3.64E-03	1.20E-03	1.94E-02	4.43E-03	5.96E-05	9.61E-04	2.20E-04	21.28
7.00	1.18E-03	1.90E-02	4.40E-03	8.83E-04	1.42E-02	3.30E-03	1.07E-03	1.73E-02	4.01E-03	5.32E-05	8.59E-04	1.99E-04	21.70
7.08	1.07E-03	1.72E-02	4.10E-03	7.96E-04	1.28E-02	3.06E-03	9.68E-04	1.56E-02	3.73E-03	4.76E-05	7.67E-04	1.83E-04	22.29
7.17	9.62E-04	1.55E-02	3.78E-03	7.22E-04	1.17E-02	2.84E-03	8.74E-04	1.41E-02	3.43E-03	4.49E-05	7.24E-04	1.76E-04	27.30
7.25	9.34E-04	1.51E-02	3.72E-03	6.87E-04	1.11E-02	2.74E-03	8.31E-04	1.34E-02	3.31E-03	4.00E-05	6.45E-04	1.59E-04	28.45
7.33	9.18E-04	1.48E-02	3.64E-03	6.62E-04	1.07E-02	2.63E-03	8.02E-04	1.29E-02	3.19E-03	3.63E-05	5.85E-04	1.44E-04	28.80
7.42	9.27E-04	1.50E-02	3.65E-03	6.64E-04	1.07E-02	2.62E-03	8.16E-04	1.32E-02	3.22E-03	3.54E-05	5.72E-04	1.40E-04	26.88
7.50	9.15E-04	1.48E-02	3.58E-03	6.55E-04	1.06E-02	2.56E-03	8.17E-04	1.32E-02	3.20E-03	3.59E-05	5.79E-04	1.41E-04	24.04
7.58	8.59E-04	1.39E-02	3.31E-03	6.19E-04	9.99E-03	2.39E-03	7.70E-04	1.24E-02	2.97E-03	3.46E-05	5.58E-04	1.34E-04	22.92
7.67	7.98E-04	1.29E-02	3.04E-03	5.78E-04	9.32E-03	2.20E-03	7.17E-04	1.16E-02	2.73E-03	3.24E-05	5.23E-04	1.23E-04	22.85
7.75	7.38E-04	1.19E-02	2.77E-03	5.38E-04	8.67E-03	2.02E-03	6.64E-04	1.07E-02	2.49E-03	3.05E-05	4.93E-04	1.15E-04	22.57
7.83	6.63E-04	1.07E-02	2.44E-03	4.92E-04	7.94E-03	1.81E-03	6.02E-04	9.71E-03	2.22E-03	2.92E-05	4.72E-04	1.08E-04	21.56
7.92	5.88E-04	9.48E-03	2.17E-03	4.40E-04	7.10E-03	1.62E-03	5.35E-04	8.63E-03	1.97E-03	2.66E-05	4.29E-04	9.80E-05	21.28
8.00	5.25E-04	8.46E-03	1.96E-03	3.94E-04	6.35E-03	1.47E-03	4.78E-04	7.71E-03	1.79E-03	2.37E-05	3.83E-04	8.88E-05	21.70
8.08	4.75E-04	7.66E-03	1.83E-03	3.55E-04	5.73E-03	1.37E-03	4.32E-04	6.96E-03	1.66E-03	2.12E-05	3.42E-04	8.17E-05	22.29
8.17	4.29E-04	6.92E-03	1.69E-03	3.22E-04	5.20E-03	1.26E-03	3.90E-04	6.28E-03	1.53E-03	2.00E-05	3.23E-04	7.86E-05	27.30
8.25	4.17E-04	6.72E-03	1.66E-03	3.06E-04	4.94E-03	1.22E-03	3.71E-04	5.98E-03	1.48E-03	1.78E-05	2.88E-04	7.11E-05	28.45
8.33	4.09E-04	6.60E-03	1.63E-03	2.95E-04	4.76E-03	1.17E-03	3.58E-04	5.77E-03	1.42E-03	1.62E-05	2.61E-04	6.42E-05	28.80
8.42	4.13E-04	6.67E-03	1.63E-03	2.96E-04	4.78E-03	1.17E-03	3.64E-04	5.87E-03	1.43E-03	1.58E-05	2.55E-04	6.23E-05	26.88
8.50	4.08E-04	6.59E-03	1.60E-03	2.92E-04	4.71E-03	1.14E-03	3.64E-04	5.88E-03	1.43E-03	1.60E-05	2.58E-04	6.27E-05	24.04
8.58	3.83E-04	6.18E-03	1.48E-03	2.76E-04	4.46E-03	1.07E-03	3.44E-04	5.54E-03	1.33E-03	1.54E-05	2.49E-04	5.95E-05	22.92
8.67	3.56E-04	5.74E-03	1.35E-03	2.58E-04	4.16E-03	9.81E-04	3.20E-04	5.16E-03	1.22E-03	1.45E-05	2.33E-04	5.50E-05	22.85
8.75	3.29E-04	5.31E-03	1.23E-03	2.40E-04	3.87E-03	8.99E-04	2.96E-04	4.78E-03	1.11E-03	1.36E-05	2.20E-04	5.11E-05	22.57
8.83	2.96E-04	4.77E-03	1.09E-03	2.20E-04	3.54E-03	8.09E-04	2.68E-04	4.33E-03	9.89E-04	1.30E-05	2.10E-04	4.81E-05	21.56
8.92	2.62E-04	4.23E-03	9.66E-04	1.96E-04	3.17E-03	7.24E-04	2.39E-04	3.85E-03	8.80E-04	1.19E-05	1.91E-04	4.37E-05	21.28
9.00	2.34E-04	3.77E-03	8.75E-04	1.76E-04	2.83E-03	6.56E-04	2.13E-04	3.44E-03	7.97E-04	1.06E-05	1.71E-04	3.96E-05	21.70
9.08	2.12E-04	3.42E-03	8.15E-04	1.58E-04	2.55E-03	6.09E-04	1.93E-04	3.11E-03	7.41E-04	9.46E-06	1.53E-04	3.64E-05	22.29
9.17	1.91E-04	3.09E-03	7.51E-04	1.44E-04	2.32E-03	5.64E-04	1.74E-04	2.80E-03	6.82E-04	8.93E-06	1.44E-04	3.51E-05	27.30
9.25	1.86E-04	3.00E-03	7.40E-04	1.37E-04	2.20E-03	5.44E-04	1.65E-04	2.67E-03	6.58E-04	7.96E-06	1.28E-04	3.17E-05	28.45
9.33	1.83E-04	2.94E-03	7.25E-04	1.32E-04	2.12E-03	5.23E-04	1.60E-04	2.57E-03	6.34E-04	7.21E-06	1.16E-04	2.86E-05	28.80
9.42	1.84E-04	2.97E-03	7.27E-04	1.32E-04	2.13E-03	5.21E-04	1.62E-04	2.62E-03	6.40E-04	7.05E-06	1.14E-04	2.78E-05	26.88
9.50	1.82E-04	2.94E-03	7.13E-04	1.30E-04	2.10E-03	5.10E-04	1.62E-04	2.62E-03	6.36E-04	7.14E-06	1.15E-04	2.79E-05	24.04
9.58	1.71E-04	2.76E-03	6.59E-04	1.23E-04	1.99E-03	4.75E-04	1.53E-04	2.47E-03	5.91E-04	6.88E-06	1.11E-04	2.65E-05	22.92
9.67	1.59E-04	2.56E-03	6.04E-04	1.15E-04	1.85E-03	4.37E-04	1.43E-04	2.30E-03	5.42E-04	6.45E-06	1.04E-04	2.45E-05	22.85
9.75	1.47E-04	2.37E-03	5.50E-04	1.07E-04	1.72E-03	4.01E-04	1.32E-04	2.13E-03	4.95E-04	6.07E-06	9.80E-05	2.28E-05	22.57
9.83	1.32E-04	2.13E-03	4.86E-04	9.79E-05	1.58E-03	3.61E-04	1.20E-04	1.93E-03	4.41E-04	5.81E-06	9.38E-05	2.14E-05	21.56
9.92	1.17E-04	1.88E-03	4.31E-04	8.75E-05	1.41E-03	3.23E-04	1.06E-04	1.72E-03	3.92E-04	5.28E-06	8.52E-05	1.95E-05	21.28
10.00	1.04E-04	1.68E-03	3.90E-04	7.83E-05	1.26E-03	2.93E-04	9.50E-05	1.53E-03	3.55E-04	4.72E-06	7.61E-05	1.77E-05	21.70

SoundEarth Strategies

Table A-8
Simulated Benzene Concentrations
for the Cenex Property, Unpaved Case

	Layer 4, Sublayer 10			Layer 2, Sublayer 10			Layer 3, Sublayer 6			Layer 1, Sublayer 1			All Layers
Time (yrs)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Moisture Content (%)
0.08	8.23E-02	1.33E+00	3.17E-01	4.26E-02	6.87E-01	1.64E-01	7.56E-02	1.22E+00	2.91E-01	7.93E-04	1.28E-02	3.05E-03	21.68
0.17	7.67E-02	1.24E+00	3.01E-01	3.84E-02	6.19E-01	1.51E-01	6.74E-02	1.09E+00	2.65E-01	1.05E-03	1.70E-02	4.13E-03	25.71
0.25	7.33E-02	1.18E+00	2.92E-01	3.46E-02	5.58E-01	1.38E-01	6.31E-02	1.02E+00	2.52E-01	9.58E-04	1.55E-02	3.82E-03	26.62
0.33	7.09E-02	1.14E+00	2.82E-01	3.16E-02	5.09E-01	1.25E-01	5.97E-02	9.62E-01	2.37E-01	8.64E-04	1.39E-02	3.43E-03	26.79
0.42	6.96E-02	1.12E+00	2.74E-01	3.07E-02	4.95E-01	1.21E-01	5.81E-02	9.37E-01	2.29E-01	1.01E-03	1.63E-02	3.99E-03	25.22
0.50	6.69E-02	1.08E+00	2.62E-01	3.10E-02	4.99E-01	1.21E-01	5.64E-02	9.10E-01	2.21E-01	1.21E-03	1.95E-02	4.74E-03	23.22
0.58	6.21E-02	1.00E+00	2.39E-01	3.12E-02	5.03E-01	1.20E-01	5.35E-02	8.62E-01	2.06E-01	1.38E-03	2.23E-02	5.33E-03	22.00
0.67	5.74E-02	9.26E-01	2.18E-01	3.05E-02	4.92E-01	1.16E-01	5.02E-02	8.09E-01	1.91E-01	1.42E-03	2.28E-02	5.39E-03	21.79
0.75	5.30E-02	8.56E-01	1.99E-01	2.94E-02	4.74E-01	1.10E-01	4.68E-02	7.55E-01	1.76E-01	1.45E-03	2.33E-02	5.42E-03	21.30
0.83	4.75E-02	7.66E-01	1.75E-01	2.80E-02	4.52E-01	1.03E-01	4.26E-02	6.87E-01	1.57E-01	1.54E-03	2.48E-02	5.66E-03	19.83
0.92	4.21E-02	6.79E-01	1.55E-01	2.56E-02	4.14E-01	9.46E-02	3.81E-02	6.14E-01	1.40E-01	1.45E-03	2.33E-02	5.33E-03	19.55
1.00	3.77E-02	6.08E-01	1.41E-01	2.32E-02	3.74E-01	8.67E-02	3.42E-02	5.51E-01	1.28E-01	1.30E-03	2.10E-02	4.87E-03	20.11
1.08	3.44E-02	5.54E-01	1.32E-01	2.11E-02	3.40E-01	8.10E-02	3.11E-02	5.02E-01	1.20E-01	1.16E-03	1.86E-02	4.44E-03	21.12
1.17	3.10E-02	5.00E-01	1.22E-01	1.88E-02	3.03E-01	7.38E-02	2.81E-02	4.53E-01	1.10E-01	8.91E-04	1.44E-02	3.50E-03	25.60
1.25	2.99E-02	4.82E-01	1.19E-01	1.71E-02	2.76E-01	6.83E-02	2.66E-02	4.28E-01	1.06E-01	6.89E-04	1.11E-02	2.75E-03	26.58
1.33	2.91E-02	4.69E-01	1.15E-01	1.57E-02	2.54E-01	6.24E-02	2.54E-02	4.10E-01	1.01E-01	5.63E-04	9.09E-03	2.24E-03	26.79
1.42	2.89E-02	4.66E-01	1.14E-01	1.51E-02	2.43E-01	5.93E-02	2.51E-02	4.04E-01	9.88E-02	5.95E-04	9.59E-03	2.34E-03	25.22
1.50	2.84E-02	4.57E-01	1.11E-01	1.47E-02	2.37E-01	5.75E-02	2.46E-02	3.97E-01	9.63E-02	6.37E-04	1.03E-02	2.50E-03	23.22
1.58	2.68E-02	4.32E-01	1.03E-01	1.43E-02	2.31E-01	5.52E-02	2.34E-02	3.78E-01	9.04E-02	6.72E-04	1.08E-02	2.59E-03	22.00
1.67	2.50E-02	4.03E-01	9.51E-02	1.37E-02	2.22E-01	5.23E-02	2.20E-02	3.55E-01	8.38E-02	6.58E-04	1.06E-02	2.50E-03	21.79
1.75	2.32E-02	3.75E-01	8.71E-02	1.31E-02	2.11E-01	4.91E-02	2.06E-02	3.32E-01	7.73E-02	6.55E-04	1.06E-02	2.46E-03	21.30
1.83	2.09E-02	3.37E-01	7.70E-02	1.24E-02	2.00E-01	4.57E-02	1.88E-02	3.03E-01	6.92E-02	6.84E-04	1.10E-02	2.52E-03	19.83
1.92	1.85E-02	2.99E-01	6.84E-02	1.13E-02	1.83E-01	4.18E-02	1.68E-02	2.70E-01	6.18E-02	6.40E-04	1.03E-02	2.36E-03	19.55
2.00	1.66E-02	2.68E-01	6.21E-02	1.02E-02	1.65E-01	3.82E-02	1.51E-02	2.43E-01	5.63E-02	5.75E-04	9.28E-03	2.15E-03	20.11
2.08	1.51E-02	2.44E-01	5.83E-02	9.28E-03	1.50E-01	3.57E-02	1.37E-02	2.21E-01	5.28E-02	5.09E-04	8.21E-03	1.96E-03	21.12
2.17	1.37E-02	2.20E-01	5.36E-02	8.28E-03	1.34E-01	3.25E-02	1.24E-02	1.99E-01	4.85E-02	3.93E-04	6.34E-03	1.54E-03	25.60
2.25	1.32E-02	2.12E-01	5.24E-02	7.56E-03	1.22E-01	3.01E-02	1.17E-02	1.89E-01	4.66E-02	3.04E-04	4.90E-03	1.21E-03	26.58
2.33	1.28E-02	2.07E-01	5.09E-02	6.93E-03	1.12E-01	2.75E-02	1.12E-02	1.81E-01	4.45E-02	2.48E-04	4.01E-03	9.86E-04	26.79
2.42	1.27E-02	2.06E-01	5.02E-02	6.63E-03	1.07E-01	2.62E-02	1.11E-02	1.78E-01	4.35E-02	2.62E-04	4.23E-03	1.03E-03	25.22
2.50	1.25E-02	2.02E-01	4.89E-02	6.47E-03	1.04E-01	2.53E-02	1.08E-02	1.75E-01	4.24E-02	2.81E-04	4.53E-03	1.10E-03	23.22
2.58	1.18E-02	1.90E-01	4.55E-02	6.31E-03	1.02E-01	2.44E-02	1.03E-02	1.67E-01	3.98E-02	2.96E-04	4.78E-03	1.14E-03	22.00
2.67	1.10E-02	1.78E-01	4.19E-02	6.06E-03	9.77E-02	2.30E-02	9.71E-03	1.57E-01	3.69E-02	2.90E-04	4.68E-03	1.10E-03	21.79
2.75	1.02E-02	1.65E-01	3.84E-02	5.78E-03	9.32E-02	2.17E-02	9.08E-03	1.47E-01	3.41E-02	2.89E-04	4.66E-03	1.08E-03	21.30
2.83	9.21E-03	1.49E-01	3.39E-02	5.47E-03	8.82E-02	2.01E-02	8.27E-03	1.33E-01	3.05E-02	3.02E-04	4.87E-03	1.11E-03	19.83
2.92	8.17E-03	1.32E-01	3.01E-02	4.99E-03	8.05E-02	1.84E-02	7.39E-03	1.19E-01	2.73E-02	2.82E-04	4.55E-03	1.04E-03	19.55
3.00	7.32E-03	1.18E-01	2.74E-02	4.51E-03	7.27E-02	1.69E-02	6.64E-03	1.07E-01	2.48E-02	2.54E-04	4.09E-03	9.47E-04	20.11
3.08	6.67E-03	1.08E-01	2.57E-02	4.09E-03	6.60E-02	1.58E-02	6.05E-03	9.75E-02	2.33E-02	2.25E-04	3.62E-03	8.64E-04	21.12
3.17	6.02E-03	9.71E-02	2.36E-02	3.65E-03	5.89E-02	1.43E-02	5.45E-03	8.79E-02	2.14E-02	1.73E-04	2.79E-03	6.80E-04	25.60
3.25	5.80E-03	9.35E-02	2.31E-02	3.33E-03	5.37E-02	1.33E-02	5.16E-03	8.32E-02	2.06E-02	1.34E-04	2.16E-03	5.34E-04	26.58
3.33	5.65E-03	9.11E-02	2.24E-02	3.05E-03	4.93E-02	1.21E-02	4.94E-03	7.96E-02	1.96E-02	1.10E-04	1.77E-03	4.35E-04	26.79
3.42	5.62E-03	9.06E-02	2.21E-02	2.92E-03	4.72E-02	1.15E-02	4.87E-03	7.85E-02	1.92E-02	1.16E-04	1.86E-03	4.56E-04	25.22
3.50	5.51E-03	8.88E-02	2.16E-02	2.85E-03	4.60E-02	1.12E-02	4.78E-03	7.70E-02	1.87E-02	1.24E-04	2.00E-03	4.85E-04	23.22
3.58	5.20E-03	8.39E-02	2.01E-02	2.78E-03	4.49E-02	1.07E-02	4.55E-03	7.34E-02	1.76E-02	1.31E-04	2.11E-03	5.04E-04	22.00
3.67	4.86E-03	7.84E-02	1.85E-02	2.67E-03	4.31E-02	1.02E-02	4.28E-03	6.90E-02	1.63E-02	1.28E-04	2.06E-03	4.87E-04	21.79
3.75	4.52E-03	7.28E-02	1.69E-02	2.55E-03	4.11E-02	9.54E-03	4.00E-03	6.46E-02	1.50E-02	1.27E-04	2.05E-03	4.77E-04	21.30
3.83	4.06E-03	6.55E-02	1.50E-02	2.41E-03	3.89E-02	8.88E-03	3.65E-03	5.88E-02	1.34E-02	1.33E-04	2.15E-03	4.90E-04	19.83
3.92	3.60E-03	5.81E-02	1.33E-02	2.20E-03	3.55E-02	8.11E-03	3.26E-03	5.25E-02	1.20E-02	1.24E-04	2.01E-03	4.59E-04	19.55
4.00	3.23E-03	5.20E-02	1.21E-02	1.99E-03	3.21E-02	7.43E-03	2.93E-03	4.72E-02	1.09E-02	1.12E-04	1.80E-03	4.18E-04	20.11
4.08	2.94E-03	4.75E-02	1.13E-02	1.80E-03	2.91E-02	6.94E-03	2.67E-03	4.30E-02	1.03E-02	9.89E-05	1.60E-03	3.81E-04	21.12
4.17	2.65E-03	4.28E-02	1.04E-02	1.61E-03	2.60E-02	6.32E-03	2.40E-03	3.87E-02	9.43E-03	7.64E-05	1.23E-03	3.00E-04	25.60
4.25	2.56E-03	4.12E-02	1.02E-02	1.47E-03	2.37E-02	5.85E-03	2.27E-03	3.67E-02	9.06E-03	5.91E-05	9.52E-04	2.35E-04	26.58
4.33	2.49E-03	4.01E-02	9.88E-03	1.35E-03	2.17E-02	5.35E-03	2.18E-03	3.51E-02	8.64E-03	4.83E-05	7.79E-04	1.92E-04	26.79
4.42	2.48E-03	3.99E-02	9.76E-03	1.29E-03	2.08E-02	5.08E-03	2.15E-03	3.46E-02	8.46E-03	5.10E-05	8.22E-04	2.01E-04	25.22
4.50	2.43E-03	3.92E-02	9.50E-03	1.26E-03	2.03E-02	4.92E-03	2.11E-03	3.40E-02	8.24E-03	5.46E-05	8.81E-04	2.14E-04	23.22
4.58	2.29E-03	3.70E-02	8.84E-03	1.23E-03	1.98E-02	4.73E-03	2.01E-03	3.24E-02	7.74E-03	5.76E-05	9.29E-04	2.22E-04	22.00
4.67	2.14E-03	3.45E-02	8.14E-03	1.18E-03	1.90E-02	4.48E-03	1.89E-03	3.04E-02	7.18E-03	5.64E-05	9.09E-04	2.15E-04	21.79
4.75	1.99E-03	3.21E-02	7.46E-03	1.12E-03	1.81E-02	4.21E-03	1.77E-03	2.85E-02	6.62E-03	5.61E-05	9.05E-04	2.10E-04	21.30
4.83	1.79E-03	2.89E-02	6.60E-03	1.06E-03	1.71E-02	3.91E-03	1.61E-03	2.59E-02	5.92E-03	5.86E-05	9.45E-04	2.16E-04	19.83
4.92	1.59E-03	2.56E-02	5.85E-03	9.69E-04	1.56E-02	3.58E-03	1.44E-03	2.32E-02	5.30E-03	5.48E-05	8.84E-04	2.02E-04	19.55
5.00	1.42E-03	2.29E-02	5.32E-03	8.76E-04	1.41E-02	3.27E-03	1.29E-03	2.08E-02	4.82E-03	4.93E-05	7.94E-04	1.84E-04	20.11

SoundEarth Strategies

Table A-8
Simulated Benzene Concentrations
for the Cenex Property, Unpaved Case

	Layer 4, Sublayer 10			Layer 2, Sublayer 10			Layer 3, Sublayer 6			Layer 1, Sublayer 1			All Layers
Time (yrs)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Moisture Content (%)
5.08	1.30E-03	2.09E-02	4.99E-03	7.95E-04	1.28E-02	3.06E-03	1.18E-03	1.89E-02	4.52E-03	4.36E-05	7.03E-04	1.68E-04	21.12
5.17	1.17E-03	1.89E-02	4.59E-03	7.09E-04	1.14E-02	2.79E-03	1.06E-03	1.71E-02	4.16E-03	3.37E-05	5.43E-04	1.32E-04	25.60
5.25	1.13E-03	1.82E-02	4.49E-03	6.47E-04	1.04E-02	2.58E-03	1.00E-03	1.62E-02	3.99E-03	2.60E-05	4.20E-04	1.04E-04	26.58
5.33	1.10E-03	1.77E-02	4.36E-03	5.93E-04	9.57E-03	2.36E-03	9.59E-04	1.55E-02	3.81E-03	2.13E-05	3.43E-04	8.45E-05	26.79
5.42	1.09E-03	1.76E-02	4.30E-03	5.68E-04	9.16E-03	2.24E-03	9.46E-04	1.53E-02	3.73E-03	2.25E-05	3.62E-04	8.85E-05	25.22
5.50	1.07E-03	1.73E-02	4.19E-03	5.54E-04	8.94E-03	2.17E-03	9.28E-04	1.50E-02	3.63E-03	2.41E-05	3.88E-04	9.42E-05	23.22
5.58	1.01E-03	1.63E-02	3.90E-03	5.41E-04	8.72E-03	2.09E-03	8.84E-04	1.43E-02	3.41E-03	2.54E-05	4.09E-04	9.79E-05	22.00
5.67	9.44E-04	1.52E-02	3.59E-03	5.19E-04	8.36E-03	1.97E-03	8.32E-04	1.34E-02	3.16E-03	2.49E-05	4.01E-04	9.45E-05	21.79
5.75	8.77E-04	1.42E-02	3.29E-03	4.95E-04	7.98E-03	1.85E-03	7.78E-04	1.26E-02	2.92E-03	2.47E-05	3.99E-04	9.27E-05	21.30
5.83	7.89E-04	1.27E-02	2.91E-03	4.68E-04	7.55E-03	1.73E-03	7.08E-04	1.14E-02	2.61E-03	2.58E-05	4.17E-04	9.52E-05	19.83
5.92	7.00E-04	1.13E-02	2.58E-03	4.27E-04	6.89E-03	1.58E-03	6.33E-04	1.02E-02	2.33E-03	2.42E-05	3.90E-04	8.91E-05	19.55
6.00	6.27E-04	1.01E-02	2.34E-03	3.86E-04	6.23E-03	1.44E-03	5.68E-04	9.17E-03	2.12E-03	2.17E-05	3.50E-04	8.11E-05	20.11
6.08	5.72E-04	9.22E-03	2.20E-03	3.50E-04	5.65E-03	1.35E-03	5.18E-04	8.35E-03	1.99E-03	1.92E-05	3.10E-04	7.40E-05	21.12
6.17	5.15E-04	8.31E-03	2.02E-03	3.13E-04	5.04E-03	1.23E-03	4.67E-04	7.53E-03	1.83E-03	1.48E-05	2.39E-04	5.82E-05	25.60
6.25	4.97E-04	8.01E-03	1.98E-03	2.85E-04	4.60E-03	1.14E-03	4.42E-04	7.13E-03	1.76E-03	1.15E-05	1.85E-04	4.57E-05	26.58
6.33	4.84E-04	7.80E-03	1.92E-03	2.62E-04	4.22E-03	1.04E-03	4.23E-04	6.82E-03	1.68E-03	9.38E-06	1.51E-04	3.72E-05	26.79
6.42	4.81E-04	7.76E-03	1.90E-03	2.50E-04	4.04E-03	9.87E-04	4.17E-04	6.72E-03	1.64E-03	9.90E-06	1.60E-04	3.90E-05	25.22
6.50	4.72E-04	7.61E-03	1.85E-03	2.44E-04	3.94E-03	9.56E-04	4.09E-04	6.60E-03	1.60E-03	1.06E-05	1.71E-04	4.15E-05	23.22
6.58	4.45E-04	7.18E-03	1.72E-03	2.38E-04	3.84E-03	9.19E-04	3.90E-04	6.29E-03	1.50E-03	1.12E-05	1.80E-04	4.32E-05	22.00
6.67	4.16E-04	6.71E-03	1.58E-03	2.29E-04	3.69E-03	8.69E-04	3.67E-04	5.91E-03	1.39E-03	1.10E-05	1.77E-04	4.17E-05	21.79
6.75	3.87E-04	6.24E-03	1.45E-03	2.18E-04	3.52E-03	8.17E-04	3.43E-04	5.53E-03	1.29E-03	1.09E-05	1.76E-04	4.08E-05	21.30
6.83	3.48E-04	5.61E-03	1.28E-03	2.06E-04	3.33E-03	7.60E-04	3.12E-04	5.04E-03	1.15E-03	1.14E-05	1.84E-04	4.20E-05	19.83
6.92	3.08E-04	4.97E-03	1.14E-03	1.88E-04	3.04E-03	6.95E-04	2.79E-04	4.50E-03	1.03E-03	1.07E-05	1.72E-04	3.93E-05	19.55
7.00	2.76E-04	4.46E-03	1.03E-03	1.70E-04	2.74E-03	6.36E-04	2.50E-04	4.04E-03	9.36E-04	9.57E-06	1.54E-04	3.58E-05	20.11
7.08	2.52E-04	4.06E-03	9.69E-04	1.54E-04	2.49E-03	5.94E-04	2.28E-04	3.68E-03	8.78E-04	8.47E-06	1.37E-04	3.26E-05	21.12
7.17	2.27E-04	3.66E-03	8.92E-04	1.38E-04	2.22E-03	5.41E-04	2.06E-04	3.32E-03	8.07E-04	6.54E-06	1.06E-04	2.57E-05	25.60
7.25	2.19E-04	3.53E-03	8.72E-04	1.26E-04	2.03E-03	5.01E-04	1.95E-04	3.14E-03	7.76E-04	5.06E-06	8.15E-05	2.01E-05	26.58
7.33	2.13E-04	3.44E-03	8.46E-04	1.15E-04	1.86E-03	4.58E-04	1.86E-04	3.01E-03	7.40E-04	4.13E-06	6.67E-05	1.64E-05	26.79
7.42	2.12E-04	3.42E-03	8.36E-04	1.10E-04	1.78E-03	4.35E-04	1.84E-04	2.96E-03	7.24E-04	4.36E-06	7.04E-05	1.72E-05	25.22
7.50	2.08E-04	3.35E-03	8.14E-04	1.08E-04	1.74E-03	4.21E-04	1.80E-04	2.91E-03	7.06E-04	4.67E-06	7.54E-05	1.83E-05	23.22
7.58	1.96E-04	3.17E-03	7.57E-04	1.05E-04	1.69E-03	4.05E-04	1.72E-04	2.77E-03	6.63E-04	4.93E-06	7.95E-05	1.90E-05	22.00
7.67	1.83E-04	2.96E-03	6.97E-04	1.01E-04	1.63E-03	3.83E-04	1.62E-04	2.61E-03	6.14E-04	4.83E-06	7.79E-05	1.84E-05	21.79
7.75	1.70E-04	2.75E-03	6.39E-04	9.61E-05	1.55E-03	3.60E-04	1.51E-04	2.44E-03	5.66E-04	4.80E-06	7.74E-05	1.80E-05	21.30
7.83	1.53E-04	2.47E-03	5.65E-04	9.09E-05	1.47E-03	3.35E-04	1.38E-04	2.22E-03	5.07E-04	5.02E-06	8.09E-05	1.85E-05	19.83
7.92	1.36E-04	2.19E-03	5.01E-04	8.30E-05	1.34E-03	3.06E-04	1.23E-04	1.98E-03	4.53E-04	4.69E-06	7.57E-05	1.73E-05	19.55
8.00	1.22E-04	1.96E-03	4.55E-04	7.50E-05	1.21E-03	2.80E-04	1.10E-04	1.78E-03	4.13E-04	4.22E-06	6.80E-05	1.58E-05	20.11
8.08	1.11E-04	1.79E-03	4.27E-04	6.81E-05	1.10E-03	2.62E-04	1.01E-04	1.62E-03	3.87E-04	3.73E-06	6.02E-05	1.44E-05	21.12
8.17	1.00E-04	1.62E-03	3.93E-04	6.07E-05	9.80E-04	2.38E-04	9.06E-05	1.46E-03	3.56E-04	2.88E-06	4.65E-05	1.13E-05	25.60
8.25	9.64E-05	1.56E-03	3.84E-04	5.54E-05	8.93E-04	2.21E-04	8.58E-05	1.38E-03	3.42E-04	2.23E-06	3.59E-05	8.87E-06	26.58
8.33	9.39E-05	1.52E-03	3.73E-04	5.08E-05	8.19E-04	2.02E-04	8.21E-05	1.32E-03	3.26E-04	1.82E-06	2.94E-05	7.23E-06	26.79
8.42	9.34E-05	1.51E-03	3.68E-04	4.86E-05	7.84E-04	1.92E-04	8.10E-05	1.31E-03	3.19E-04	1.92E-06	3.10E-05	7.57E-06	25.22
8.50	9.16E-05	1.48E-03	3.59E-04	4.74E-05	7.65E-04	1.86E-04	7.94E-05	1.28E-03	3.11E-04	2.06E-06	3.32E-05	8.06E-06	23.22
8.58	8.65E-05	1.40E-03	3.34E-04	4.63E-05	7.46E-04	1.79E-04	7.57E-05	1.22E-03	2.92E-04	2.17E-06	3.50E-05	8.38E-06	22.00
8.67	8.08E-05	1.30E-03	3.07E-04	4.44E-05	7.16E-04	1.69E-04	7.12E-05	1.15E-03	2.71E-04	2.13E-06	3.43E-05	8.09E-06	21.79
8.75	7.51E-05	1.21E-03	2.81E-04	4.23E-05	6.83E-04	1.59E-04	6.66E-05	1.07E-03	2.50E-04	2.12E-06	3.41E-05	7.93E-06	21.30
8.83	6.75E-05	1.09E-03	2.49E-04	4.01E-05	6.46E-04	1.48E-04	6.06E-05	9.78E-04	2.23E-04	2.21E-06	3.57E-05	8.15E-06	19.83
8.92	5.99E-05	9.66E-04	2.21E-04	3.66E-05	5.90E-04	1.35E-04	5.42E-05	8.73E-04	2.00E-04	2.07E-06	3.33E-05	7.62E-06	19.55
9.00	5.36E-05	8.65E-04	2.01E-04	3.30E-05	5.33E-04	1.24E-04	4.86E-05	7.84E-04	1.82E-04	1.86E-06	3.00E-05	6.94E-06	20.11
9.08	4.89E-05	7.89E-04	1.88E-04	3.00E-05	4.84E-04	1.15E-04	4.43E-05	7.14E-04	1.70E-04	1.64E-06	2.65E-05	6.33E-06	21.12
9.17	4.41E-05	7.11E-04	1.73E-04	2.68E-05	4.31E-04	1.05E-04	3.99E-05	6.44E-04	1.57E-04	1.27E-06	2.05E-05	4.98E-06	25.60
9.25	4.25E-05	6.85E-04	1.69E-04	2.44E-05	3.93E-04	9.72E-05	3.78E-05	6.10E-04	1.51E-04	9.81E-07	1.58E-05	3.91E-06	26.58
9.33	4.14E-05	6.67E-04	1.64E-04	2.24E-05	3.61E-04	8.88E-05	3.62E-05	5.83E-04	1.44E-04	8.01E-07	1.29E-05	3.18E-06	26.79
9.42	4.11E-05	6.64E-04	1.62E-04	2.14E-05	3.45E-04	8.44E-05	3.57E-05	5.75E-04	1.41E-04	8.46E-07	1.36E-05	3.33E-06	25.22
9.50	4.03E-05	6.51E-04	1.58E-04	2.09E-05	3.37E-04	8.18E-05	3.50E-05	5.64E-04	1.37E-04	9.06E-07	1.46E-05	3.55E-06	23.22
9.58	3.81E-05	6.14E-04	1.47E-04	2.04E-05	3.29E-04	7.86E-05	3.33E-05	5.38E-04	1.29E-04	9.56E-07	1.54E-05	3.69E-06	22.00
9.67	3.56E-05	5.74E-04	1.35E-04	1.95E-05	3.15E-04	7.43E-05	3.13E-05	5.06E-04	1.19E-04	9.36E-07	1.51E-05	3.56E-06	21.79
9.75	3.31E-05	5.33E-04	1.24E-04	1.86E-05	3.01E-04	6.99E-05	2.93E-05	4.73E-04	1.10E-04	9.31E-07	1.50E-05	3.49E-06	21.30
9.83	2.97E-05	4.79E-04	1.10E-04	1.76E-05	2.84E-04	6.50E-05	2.67E-05	4.31E-04	9.84E-05	9.73E-07	1.57E-05	3.59E-06	19.83
9.92	2.64E-05	4.25E-04	9.72E-05	1.61E-05	2.60E-04	5.94E-05	2.38E-05	3.85E-04	8.79E-05	9.10E-07	1.47E-05	3.35E-06	19.55
10.00	2.36E-05	3.81E-04	8.83E-05	1.45E-05	2.35E-04	5.43E-05	2.14E-05	3.45E-04	8.00E-05	8.17E-07	1.32E-05	3.05E-06	20.11

SoundEarth Strategies

Table A-9
Simulated Benzene Concentrations
for the Cenex Property, Paved Case

	Layer 4, Sublayer 10			Layer 2, Sublayer 10			Layer 3, Sublayer 6			Layer 1, Sublayer 1			All Layers
Time (yrs)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Moisture Content (%)
0.08	7.94E-02	1.28E+00	3.06E-01	4.30E-02	6.93E-01	1.65E-01	7.67E-02	1.24E+00	2.95E-01	6.36E-04	1.03E-02	2.45E-03	22.32
0.17	7.87E-02	1.27E+00	3.09E-01	4.03E-02	6.50E-01	1.58E-01	6.84E-02	1.10E+00	2.69E-01	1.10E-03	1.78E-02	4.33E-03	26.73
0.25	7.73E-02	1.25E+00	3.08E-01	3.79E-02	6.11E-01	1.51E-01	6.50E-02	1.05E+00	2.59E-01	1.18E-03	1.91E-02	4.71E-03	28.06
0.33	7.48E-02	1.21E+00	2.97E-01	3.61E-02	5.83E-01	1.43E-01	6.28E-02	1.01E+00	2.49E-01	1.20E-03	1.93E-02	4.75E-03	28.52
0.42	7.52E-02	1.21E+00	2.96E-01	3.64E-02	5.87E-01	1.43E-01	6.37E-02	1.03E+00	2.51E-01	1.36E-03	2.20E-02	5.37E-03	26.63
0.50	7.48E-02	1.21E+00	2.93E-01	3.71E-02	5.98E-01	1.45E-01	6.40E-02	1.03E+00	2.51E-01	1.67E-03	2.69E-02	6.52E-03	24.00
0.58	7.13E-02	1.15E+00	2.75E-01	3.71E-02	5.99E-01	1.43E-01	6.17E-02	9.96E-01	2.38E-01	1.85E-03	2.98E-02	7.12E-03	22.78
0.67	6.72E-02	1.08E+00	2.56E-01	3.64E-02	5.86E-01	1.38E-01	5.87E-02	9.47E-01	2.23E-01	1.89E-03	3.05E-02	7.20E-03	22.57
0.75	6.32E-02	1.02E+00	2.37E-01	3.53E-02	5.69E-01	1.32E-01	5.57E-02	8.98E-01	2.09E-01	1.90E-03	3.06E-02	7.11E-03	22.22
0.83	5.83E-02	9.40E-01	2.15E-01	3.41E-02	5.50E-01	1.26E-01	5.21E-02	8.40E-01	1.92E-01	1.91E-03	3.09E-02	7.06E-03	20.99
0.92	5.30E-02	8.55E-01	1.96E-01	3.19E-02	5.15E-01	1.18E-01	4.77E-02	7.69E-01	1.76E-01	1.84E-03	2.96E-02	6.77E-03	20.64
1.00	4.84E-02	7.81E-01	1.81E-01	2.95E-02	4.76E-01	1.10E-01	4.37E-02	7.04E-01	1.63E-01	1.71E-03	2.76E-02	6.40E-03	21.06
1.08	4.47E-02	7.21E-01	1.72E-01	2.73E-02	4.40E-01	1.05E-01	4.03E-02	6.50E-01	1.55E-01	1.58E-03	2.55E-02	6.08E-03	21.83
1.17	4.05E-02	6.53E-01	1.59E-01	2.48E-02	4.00E-01	9.74E-02	3.65E-02	5.88E-01	1.43E-01	1.51E-03	2.43E-02	5.91E-03	26.59
1.25	3.92E-02	6.32E-01	1.56E-01	2.34E-02	3.78E-01	9.34E-02	3.48E-02	5.61E-01	1.39E-01	1.37E-03	2.21E-02	5.45E-03	27.99
1.33	3.86E-02	6.22E-01	1.53E-01	2.25E-02	3.62E-01	8.92E-02	3.37E-02	5.43E-01	1.34E-01	1.26E-03	2.03E-02	4.99E-03	28.48
1.42	3.93E-02	6.34E-01	1.55E-01	2.26E-02	3.65E-01	8.92E-02	3.44E-02	5.54E-01	1.35E-01	1.23E-03	1.99E-02	4.85E-03	26.59
1.50	3.97E-02	6.40E-01	1.55E-01	2.26E-02	3.65E-01	8.85E-02	3.49E-02	5.64E-01	1.37E-01	1.23E-03	1.99E-02	4.82E-03	24.00
1.58	3.84E-02	6.20E-01	1.48E-01	2.19E-02	3.54E-01	8.46E-02	3.40E-02	5.48E-01	1.31E-01	1.20E-03	1.94E-02	4.63E-03	22.78
1.67	3.66E-02	5.91E-01	1.39E-01	2.10E-02	3.39E-01	7.98E-02	3.25E-02	5.24E-01	1.24E-01	1.15E-03	1.86E-02	4.38E-03	22.57
1.75	3.47E-02	5.60E-01	1.30E-01	2.01E-02	3.24E-01	7.53E-02	3.09E-02	4.98E-01	1.16E-01	1.11E-03	1.79E-02	4.17E-03	22.22
1.83	3.23E-02	5.20E-01	1.19E-01	1.92E-02	3.10E-01	7.07E-02	2.89E-02	4.66E-01	1.07E-01	1.09E-03	1.76E-02	4.03E-03	20.99
1.92	2.94E-02	4.75E-01	1.09E-01	1.79E-02	2.88E-01	6.58E-02	2.65E-02	4.28E-01	9.78E-02	1.03E-03	1.67E-02	3.81E-03	20.64
2.00	2.69E-02	4.34E-01	1.01E-01	1.65E-02	2.65E-01	6.15E-02	2.43E-02	3.92E-01	9.07E-02	9.59E-04	1.55E-02	3.58E-03	21.06
2.08	2.49E-02	4.01E-01	9.56E-02	1.52E-02	2.45E-01	5.84E-02	2.24E-02	3.62E-01	8.63E-02	8.82E-04	1.42E-02	3.40E-03	21.83
2.17	2.25E-02	3.63E-01	8.83E-02	1.38E-02	2.23E-01	5.42E-02	2.03E-02	3.27E-01	7.96E-02	8.40E-04	1.35E-02	3.30E-03	26.59
2.25	2.18E-02	3.51E-01	8.68E-02	1.31E-02	2.11E-01	5.20E-02	1.93E-02	3.12E-01	7.70E-02	7.63E-04	1.23E-02	3.04E-03	27.99
2.33	2.15E-02	3.46E-01	8.52E-02	1.25E-02	2.02E-01	4.97E-02	1.87E-02	3.02E-01	7.44E-02	7.01E-04	1.13E-02	2.78E-03	28.48
2.42	2.19E-02	3.53E-01	8.62E-02	1.26E-02	2.03E-01	4.97E-02	1.91E-02	3.08E-01	7.53E-02	6.86E-04	1.11E-02	2.70E-03	26.59
2.50	2.21E-02	3.56E-01	8.64E-02	1.26E-02	2.03E-01	4.93E-02	1.94E-02	3.14E-01	7.61E-02	6.86E-04	1.11E-02	2.69E-03	24.00
2.58	2.14E-02	3.45E-01	8.25E-02	1.22E-02	1.97E-01	4.71E-02	1.89E-02	3.05E-01	7.30E-02	6.69E-04	1.08E-02	2.58E-03	22.78
2.67	2.04E-02	3.29E-01	7.75E-02	1.17E-02	1.88E-01	4.44E-02	1.81E-02	2.91E-01	6.87E-02	6.42E-04	1.04E-02	2.44E-03	22.57
2.75	1.93E-02	3.12E-01	7.25E-02	1.12E-02	1.80E-01	4.19E-02	1.72E-02	2.77E-01	6.44E-02	6.19E-04	9.98E-03	2.32E-03	22.22
2.83	1.79E-02	2.89E-01	6.61E-02	1.07E-02	1.72E-01	3.94E-02	1.61E-02	2.60E-01	5.93E-02	6.09E-04	9.82E-03	2.24E-03	20.99
2.92	1.64E-02	2.64E-01	6.04E-02	9.93E-03	1.60E-01	3.66E-02	1.48E-02	2.38E-01	5.44E-02	5.75E-04	9.28E-03	2.12E-03	20.64
3.00	1.50E-02	2.41E-01	5.59E-02	9.15E-03	1.48E-01	3.42E-02	1.35E-02	2.18E-01	5.05E-02	5.33E-04	8.60E-03	1.99E-03	21.06
3.08	1.38E-02	2.23E-01	5.32E-02	8.45E-03	1.36E-01	3.25E-02	1.25E-02	2.01E-01	4.80E-02	4.91E-04	7.92E-03	1.89E-03	21.83
3.17	1.25E-02	2.02E-01	4.91E-02	7.69E-03	1.24E-01	3.02E-02	1.13E-02	1.82E-01	4.43E-02	4.67E-04	7.54E-03	1.83E-03	26.59
3.25	1.21E-02	1.96E-01	4.83E-02	7.26E-03	1.17E-01	2.89E-02	1.08E-02	1.74E-01	4.29E-02	4.24E-04	6.85E-03	1.69E-03	27.99
3.33	1.19E-02	1.93E-01	4.74E-02	6.96E-03	1.12E-01	2.76E-02	1.04E-02	1.68E-01	4.14E-02	3.90E-04	6.29E-03	1.55E-03	28.48
3.42	1.22E-02	1.96E-01	4.79E-02	7.01E-03	1.13E-01	2.76E-02	1.06E-02	1.72E-01	4.19E-02	3.82E-04	6.16E-03	1.50E-03	26.59
3.50	1.23E-02	1.98E-01	4.81E-02	7.00E-03	1.13E-01	2.74E-02	1.08E-02	1.74E-01	4.23E-02	3.82E-04	6.16E-03	1.50E-03	24.00
3.58	1.19E-02	1.92E-01	4.59E-02	6.79E-03	1.10E-01	2.62E-02	1.05E-02	1.70E-01	4.06E-02	3.72E-04	6.00E-03	1.44E-03	22.78
3.67	1.13E-02	1.83E-01	4.31E-02	6.50E-03	1.05E-01	2.47E-02	1.01E-02	1.62E-01	3.82E-02	3.57E-04	5.76E-03	1.36E-03	22.57
3.75	1.08E-02	1.73E-01	4.03E-02	6.22E-03	1.00E-01	2.33E-02	9.55E-03	1.54E-01	3.58E-02	3.44E-04	5.55E-03	1.29E-03	22.22
3.83	9.98E-03	1.61E-01	3.68E-02	5.94E-03	9.58E-02	2.19E-02	8.95E-03	1.44E-01	3.30E-02	3.39E-04	5.46E-03	1.25E-03	20.99
3.92	9.11E-03	1.47E-01	3.36E-02	5.53E-03	8.91E-02	2.04E-02	8.21E-03	1.32E-01	3.03E-02	3.20E-04	5.16E-03	1.18E-03	20.64
4.00	8.32E-03	1.34E-01	3.11E-02	5.09E-03	8.21E-02	1.90E-02	7.51E-03	1.21E-01	2.81E-02	2.97E-04	4.79E-03	1.11E-03	21.06
4.08	7.69E-03	1.24E-01	2.96E-02	4.70E-03	7.58E-02	1.81E-02	6.94E-03	1.12E-01	2.67E-02	2.73E-04	4.41E-03	1.05E-03	21.83
4.17	6.96E-03	1.12E-01	2.73E-02	4.28E-03	6.90E-02	1.68E-02	6.28E-03	1.01E-01	2.46E-02	2.60E-04	4.19E-03	1.02E-03	26.59
4.25	6.74E-03	1.09E-01	2.69E-02	4.04E-03	6.52E-02	1.61E-02	5.99E-03	9.65E-02	2.38E-02	2.36E-04	3.81E-03	9.41E-04	27.99
4.33	6.64E-03	1.07E-01	2.64E-02	3.87E-03	6.25E-02	1.54E-02	5.80E-03	9.35E-02	2.30E-02	2.17E-04	3.50E-03	8.62E-04	28.48
4.42	6.77E-03	1.09E-01	2.67E-02	3.90E-03	6.29E-02	1.54E-02	5.92E-03	9.54E-02	2.33E-02	2.12E-04	3.43E-03	8.37E-04	26.59
4.50	6.83E-03	1.10E-01	2.67E-02	3.89E-03	6.28E-02	1.53E-02	6.02E-03	9.70E-02	2.36E-02	2.12E-04	3.43E-03	8.32E-04	24.00
4.58	6.62E-03	1.07E-01	2.55E-02	3.78E-03	6.09E-02	1.46E-02	5.85E-03	9.44E-02	2.26E-02	2.07E-04	3.34E-03	7.99E-04	22.78
4.67	6.31E-03	1.02E-01	2.40E-02	3.62E-03	5.83E-02	1.38E-02	5.59E-03	9.01E-02	2.13E-02	1.99E-04	3.20E-03	7.55E-04	22.57
4.75	5.98E-03	9.65E-02	2.24E-02	3.46E-03	5.58E-02	1.30E-02	5.32E-03	8.57E-02	1.99E-02	1.92E-04	3.09E-03	7.18E-04	22.22
4.83	5.55E-03	8.96E-02	2.05E-02	3.30E-03	5.33E-02	1.22E-02	4.98E-03	8.03E-02	1.84E-02	1.88E-04	3.04E-03	6.94E-04	20.99
4.92	5.07E-03	8.17E-02	1.87E-02	3.07E-03	4.96E-02	1.13E-02	4.57E-03	7.37E-02	1.68E-02	1.78E-04	2.87E-03	6.57E-04	20.64
5.00	4.63E-03	7.47E-02	1.73E-02	2.83E-03	4.57E-02	1.06E-02	4.18E-03	6.74E-02	1.56E-02	1.65E-04	2.66E-03	6.17E-04	21.06

SoundEarth Strategies

Table A-9
Simulated Benzene Concentrations
for the Cenex Property, Paved Case

	Layer 4, Sublayer 10			Layer 2, Sublayer 10			Layer 3, Sublayer 6			Layer 1, Sublayer 1			All Layers
Time (yrs)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Absorbed phase (ug/g)	Dissolved phase (ug/mL)	Vapor phase (ug/mL)	Moisture Content (%)
5.08	4.28E-03	6.90E-02	1.65E-02	2.61E-03	4.22E-02	1.01E-02	3.86E-03	6.23E-02	1.49E-02	1.52E-04	2.45E-03	5.85E-04	21.83
5.17	3.87E-03	6.25E-02	1.52E-02	2.38E-03	3.84E-02	9.34E-03	3.49E-03	5.63E-02	1.37E-02	1.45E-04	2.33E-03	5.68E-04	26.59
5.25	3.75E-03	6.05E-02	1.49E-02	2.25E-03	3.63E-02	8.96E-03	3.33E-03	5.37E-02	1.33E-02	1.31E-04	2.12E-03	5.23E-04	27.99
5.33	3.69E-03	5.96E-02	1.47E-02	2.16E-03	3.48E-02	8.56E-03	3.23E-03	5.20E-02	1.28E-02	1.21E-04	1.95E-03	4.79E-04	28.48
5.42	3.77E-03	6.07E-02	1.48E-02	2.17E-03	3.50E-02	8.55E-03	3.29E-03	5.31E-02	1.30E-02	1.18E-04	1.91E-03	4.66E-04	26.59
5.50	3.80E-03	6.13E-02	1.49E-02	2.17E-03	3.50E-02	8.48E-03	3.35E-03	5.40E-02	1.31E-02	1.18E-04	1.91E-03	4.63E-04	24.00
5.58	3.68E-03	5.94E-02	1.42E-02	2.10E-03	3.39E-02	8.11E-03	3.26E-03	5.25E-02	1.26E-02	1.15E-04	1.86E-03	4.44E-04	22.78
5.67	3.51E-03	5.66E-02	1.34E-02	2.01E-03	3.25E-02	7.65E-03	3.11E-03	5.02E-02	1.18E-02	1.11E-04	1.78E-03	4.20E-04	22.57
5.75	3.33E-03	5.37E-02	1.25E-02	1.93E-03	3.10E-02	7.21E-03	2.96E-03	4.77E-02	1.11E-02	1.07E-04	1.72E-03	3.99E-04	22.22
5.83	3.09E-03	4.98E-02	1.14E-02	1.84E-03	2.97E-02	6.78E-03	2.77E-03	4.47E-02	1.02E-02	1.05E-04	1.69E-03	3.86E-04	20.99
5.92	2.82E-03	4.55E-02	1.04E-02	1.71E-03	2.76E-02	6.31E-03	2.54E-03	4.10E-02	9.37E-03	9.91E-05	1.60E-03	3.65E-04	20.64
6.00	2.58E-03	4.16E-02	9.63E-03	1.58E-03	2.54E-02	5.89E-03	2.33E-03	3.75E-02	8.69E-03	9.19E-05	1.48E-03	3.43E-04	21.06
6.08	2.38E-03	3.84E-02	9.16E-03	1.45E-03	2.35E-02	5.60E-03	2.15E-03	3.46E-02	8.26E-03	8.46E-05	1.36E-03	3.25E-04	21.83
6.17	2.16E-03	3.48E-02	8.46E-03	1.32E-03	2.14E-02	5.20E-03	1.94E-03	3.13E-02	7.63E-03	8.05E-05	1.30E-03	3.16E-04	26.59
6.25	2.09E-03	3.37E-02	8.31E-03	1.25E-03	2.02E-02	4.98E-03	1.85E-03	2.99E-02	7.38E-03	7.31E-05	1.18E-03	2.91E-04	27.99
6.33	2.06E-03	3.32E-02	8.16E-03	1.20E-03	1.93E-02	4.76E-03	1.80E-03	2.90E-02	7.13E-03	6.72E-05	1.08E-03	2.67E-04	28.48
6.42	2.10E-03	3.38E-02	8.26E-03	1.21E-03	1.95E-02	4.76E-03	1.83E-03	2.95E-02	7.22E-03	6.57E-05	1.06E-03	2.59E-04	26.59
6.50	2.12E-03	3.41E-02	8.28E-03	1.21E-03	1.94E-02	4.72E-03	1.86E-03	3.00E-02	7.29E-03	6.58E-05	1.06E-03	2.57E-04	24.00
6.58	2.05E-03	3.30E-02	7.90E-03	1.17E-03	1.89E-02	4.51E-03	1.81E-03	2.92E-02	6.99E-03	6.41E-05	1.03E-03	2.47E-04	22.78
6.67	1.95E-03	3.15E-02	7.43E-03	1.12E-03	1.81E-02	4.26E-03	1.73E-03	2.79E-02	6.58E-03	6.15E-05	9.91E-04	2.34E-04	22.57
6.75	1.85E-03	2.99E-02	6.94E-03	1.07E-03	1.73E-02	4.01E-03	1.65E-03	2.65E-02	6.17E-03	5.93E-05	9.56E-04	2.22E-04	22.22
6.83	1.72E-03	2.77E-02	6.34E-03	1.02E-03	1.65E-02	3.77E-03	1.54E-03	2.49E-02	5.68E-03	5.83E-05	9.41E-04	2.15E-04	20.99
6.92	1.57E-03	2.53E-02	5.79E-03	9.52E-04	1.54E-02	3.51E-03	1.41E-03	2.28E-02	5.21E-03	5.51E-05	8.89E-04	2.03E-04	20.64
7.00	1.43E-03	2.31E-02	5.36E-03	8.77E-04	1.41E-02	3.28E-03	1.29E-03	2.09E-02	4.84E-03	5.11E-05	8.24E-04	1.91E-04	21.06
7.08	1.32E-03	2.14E-02	5.10E-03	8.09E-04	1.31E-02	3.11E-03	1.20E-03	1.93E-02	4.60E-03	4.70E-05	7.59E-04	1.81E-04	21.83
7.17	1.20E-03	1.93E-02	4.71E-03	7.36E-04	1.19E-02	2.89E-03	1.08E-03	1.74E-02	4.24E-03	4.48E-05	7.22E-04	1.76E-04	26.59
7.25	1.16E-03	1.87E-02	4.63E-03	6.96E-04	1.12E-02	2.77E-03	1.03E-03	1.66E-02	4.11E-03	4.07E-05	6.56E-04	1.62E-04	27.99
7.33	1.14E-03	1.84E-02	4.54E-03	6.67E-04	1.08E-02	2.65E-03	9.99E-04	1.61E-02	3.97E-03	3.74E-05	6.03E-04	1.48E-04	28.48
7.42	1.17E-03	1.88E-02	4.59E-03	6.72E-04	1.08E-02	2.65E-03	1.02E-03	1.64E-02	4.02E-03	3.66E-05	5.90E-04	1.44E-04	26.59
7.50	1.18E-03	1.90E-02	4.61E-03	6.71E-04	1.08E-02	2.63E-03	1.04E-03	1.67E-02	4.06E-03	3.66E-05	5.90E-04	1.43E-04	24.00
7.58	1.14E-03	1.84E-02	4.40E-03	6.51E-04	1.05E-02	2.51E-03	1.01E-03	1.63E-02	3.89E-03	3.57E-05	5.75E-04	1.38E-04	22.78
7.67	1.09E-03	1.75E-02	4.13E-03	6.23E-04	1.00E-02	2.37E-03	9.63E-04	1.55E-02	3.66E-03	3.42E-05	5.52E-04	1.30E-04	22.57
7.75	1.03E-03	1.66E-02	3.86E-03	5.96E-04	9.61E-03	2.23E-03	9.16E-04	1.48E-02	3.43E-03	3.30E-05	5.32E-04	1.24E-04	22.22
7.83	9.56E-04	1.54E-02	3.53E-03	5.69E-04	9.18E-03	2.10E-03	8.58E-04	1.38E-02	3.16E-03	3.25E-05	5.23E-04	1.20E-04	20.99
7.92	8.73E-04	1.41E-02	3.22E-03	5.29E-04	8.54E-03	1.95E-03	7.86E-04	1.27E-02	2.90E-03	3.07E-05	4.95E-04	1.13E-04	20.64
8.00	7.98E-04	1.29E-02	2.98E-03	4.88E-04	7.87E-03	1.82E-03	7.20E-04	1.16E-02	2.69E-03	2.84E-05	4.59E-04	1.06E-04	21.06
8.08	7.37E-04	1.19E-02	2.84E-03	4.50E-04	7.26E-03	1.73E-03	6.65E-04	1.07E-02	2.56E-03	2.62E-05	4.22E-04	1.01E-04	21.83
8.17	6.67E-04	1.08E-02	2.62E-03	4.10E-04	6.61E-03	1.61E-03	6.02E-04	9.70E-03	2.36E-03	2.49E-05	4.02E-04	9.78E-05	26.59
8.25	6.46E-04	1.04E-02	2.57E-03	3.87E-04	6.25E-03	1.54E-03	5.74E-04	9.25E-03	2.29E-03	2.26E-05	3.65E-04	9.01E-05	27.99
8.33	6.36E-04	1.03E-02	2.53E-03	3.71E-04	5.99E-03	1.47E-03	5.56E-04	8.96E-03	2.21E-03	2.08E-05	3.35E-04	8.26E-05	28.48
8.42	6.48E-04	1.05E-02	2.56E-03	3.74E-04	6.03E-03	1.47E-03	5.67E-04	9.14E-03	2.23E-03	2.04E-05	3.28E-04	8.02E-05	26.59
8.50	6.55E-04	1.06E-02	2.56E-03	3.73E-04	6.02E-03	1.46E-03	5.76E-04	9.30E-03	2.26E-03	2.04E-05	3.28E-04	7.97E-05	24.00
8.58	6.34E-04	1.02E-02	2.45E-03	3.62E-04	5.84E-03	1.40E-03	5.61E-04	9.05E-03	2.16E-03	1.98E-05	3.20E-04	7.65E-05	22.78
8.67	6.04E-04	9.75E-03	2.30E-03	3.47E-04	5.59E-03	1.32E-03	5.36E-04	8.64E-03	2.04E-03	1.90E-05	3.07E-04	7.24E-05	22.57
8.75	5.73E-04	9.25E-03	2.15E-03	3.32E-04	5.35E-03	1.24E-03	5.09E-04	8.22E-03	1.91E-03	1.84E-05	2.96E-04	6.88E-05	22.22
8.83	5.32E-04	8.58E-03	1.96E-03	3.17E-04	5.11E-03	1.17E-03	4.77E-04	7.70E-03	1.76E-03	1.81E-05	2.91E-04	6.65E-05	20.99
8.92	4.86E-04	7.83E-03	1.79E-03	2.95E-04	4.75E-03	1.09E-03	4.38E-04	7.06E-03	1.61E-03	1.71E-05	2.75E-04	6.29E-05	20.64
9.00	4.44E-04	7.16E-03	1.66E-03	2.71E-04	4.38E-03	1.01E-03	4.01E-04	6.46E-03	1.50E-03	1.58E-05	2.55E-04	5.91E-05	21.06
9.08	4.10E-04	6.61E-03	1.58E-03	2.51E-04	4.04E-03	9.64E-04	3.70E-04	5.97E-03	1.42E-03	1.46E-05	2.35E-04	5.60E-05	21.83
9.17	3.71E-04	5.99E-03	1.46E-03	2.28E-04	3.68E-03	8.95E-04	3.35E-04	5.40E-03	1.31E-03	1.39E-05	2.24E-04	5.44E-05	26.59
9.25	3.60E-04	5.80E-03	1.43E-03	2.15E-04	3.48E-03	8.58E-04	3.19E-04	5.15E-03	1.27E-03	1.26E-05	2.03E-04	5.01E-05	27.99
9.33	3.54E-04	5.71E-03	1.41E-03	2.07E-04	3.33E-03	8.20E-04	3.09E-04	4.99E-03	1.23E-03	1.16E-05	1.87E-04	4.59E-05	28.48
9.42	3.61E-04	5.82E-03	1.42E-03	2.08E-04	3.35E-03	8.20E-04	3.15E-04	5.09E-03	1.24E-03	1.13E-05	1.83E-04	4.46E-05	26.59
9.50	3.64E-04	5.87E-03	1.43E-03	2.08E-04	3.35E-03	8.13E-04	3.21E-04	5.17E-03	1.26E-03	1.13E-05	1.83E-04	4.43E-05	24.00
9.58	3.53E-04	5.69E-03	1.36E-03	2.01E-04	3.25E-03	7.77E-04	3.12E-04	5.03E-03	1.20E-03	1.10E-05	1.78E-04	4.26E-05	22.78
9.67	3.36E-04	5.42E-03	1.28E-03	1.93E-04	3.11E-03	7.33E-04	2.98E-04	4.81E-03	1.13E-03	1.06E-05	1.71E-04	4.03E-05	22.57
9.75	3.19E-04	5.14E-03	1.20E-03	1.84E-04	2.97E-03	6.91E-04	2.83E-04	4.57E-03	1.06E-03	1.02E-05	1.65E-04	3.83E-05	22.22
9.83	2.96E-04	4.78E-03	1.09E-03	1.76E-04	2.84E-03	6.49E-04	2.66E-04	4.28E-03	9.78E-04	1.00E-05	1.62E-04	3.70E-05	20.99
9.92	2.70E-04	4.36E-03	9.96E-04	1.64E-04	2.64E-03	6.04E-04	2.43E-04	3.93E-03	8.98E-04	9.49E-06	1.53E-04	3.50E-05	20.64
10.00	2.47E-04	3.98E-03	9.23E-04	1.51E-04	2.44E-03	5.64E-04	2.23E-04	3.59E-03	8.33E-04	8.80E-06	1.42E-04	3.29E-05	21.06

GENERAL NOTES

1. An initial instantaneous release was assumed. Concentrations for depth intervals between those sampled were assumed to be equal to the highest concentration from the overlying or underlying sampled interval, as recommended by the FAQ update to the NJDEP SESOIL Guidance, dated January 27, 2011.
2. In the scenarios evaluating the effects of pavement, Layer 1 was assigned permeability values of 3.97E-12 cm^2 (Time Oil property simulation) and 5.00E-12 cm^2 (Cenex property simulation), to maintain an identical thickness-weighted harmonic mean permeability of 6.15E-11 cm^2 between the two properties. The hydrologic portion of SESOIL uses only this thickness-weighted harmonic mean permeability value in its calculation of run-off and soil moisture flux, so this adjustment is consistent with an assumption of identical conditions for the two Properties.
3. Soil samples were analyzed by U.S. Environmental Protection Agency Method 8021B.

OTHER INPUTS

- The input for soil pH was not used because the hydrolysis process was not simulated.
- All rations between layers were set to 1 (consistent properties).
- SESOIL parameters POLIN, TRANS, SINK, LIG, ISRM and ASL were all set to 0 in all layers, as recommended by the NJDEP SESOIL Guidance.
- Parameter VOLF was set to 1 in all layers to simulate the effects of volatilization.

SUPPORTING REFERENCES

Bauer, H.H. and J.J. Vaccaro. 1990. *Estimates of Ground-Water Recharge to the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho, for Predevelopment and Current Land-Use Conditions.* U.S. Geological Survey, Water Resources Investigation Report 88-4108.

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Hetrick, D.M., S.J. Scott, and M.J. Barden (Hetrick et al.). 1994. *The New SESOIL User's Guide. Wisconsin Department of Natural Resources*. PUBL-SW-200-94 (Rev).

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FIGURE A-1

DETERMINATION OF BULK SOIL CONCENTRATIONS FROM MODEL OUTPUT

Dry-weight bulk concentration values for each sublayer were calculated from the model results using the following equation, which is modified from Hetrick et al. (1994; Equation 9), to express bulk concentration in terms of mass.

$$C_T = \frac{mC_{aq} + \rho_b C_s + (n-m)C_a}{\rho_b}$$

Where:

C_T is the dry-weight bulk concentration
m is the bulk moisture content (expressed as a fraction)
C_{aq} is the dissolved phase concentration (ug/mL)
ρ_b is the dry-weight bulk density
C_s is the adsorbed phase concentration (ug/g)
n is the porosity
C_a is the vapor phase concentration (ug/mL)

Figure A-2
Simulated Total Benzene Concentrations in the Vadose Zone
Time Oil Property
Paved Case

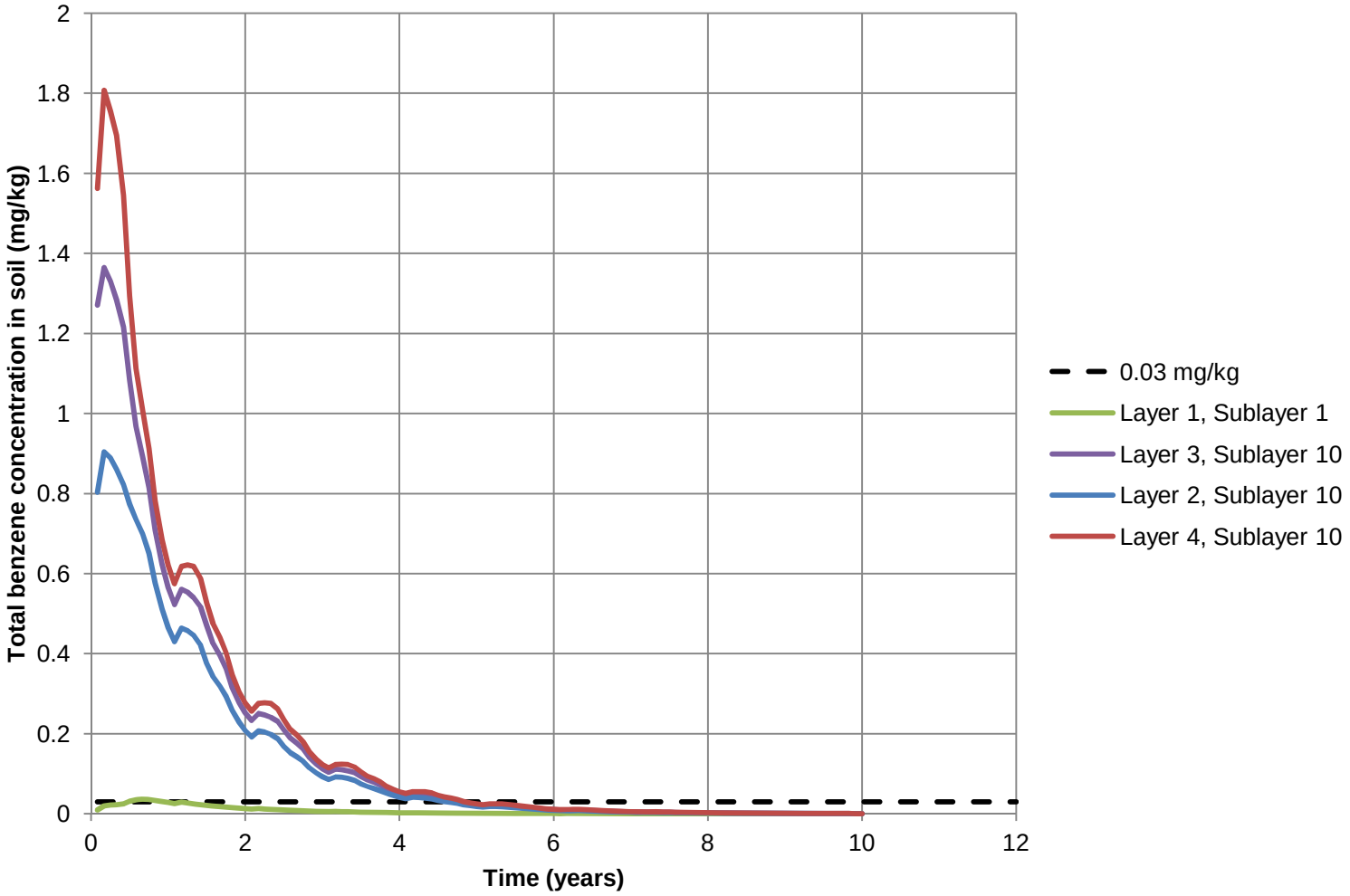

Figure A-3
Simulated Total Benzene Concentrations in the Vadose Zone
Time Oil Property
Unpaved Case

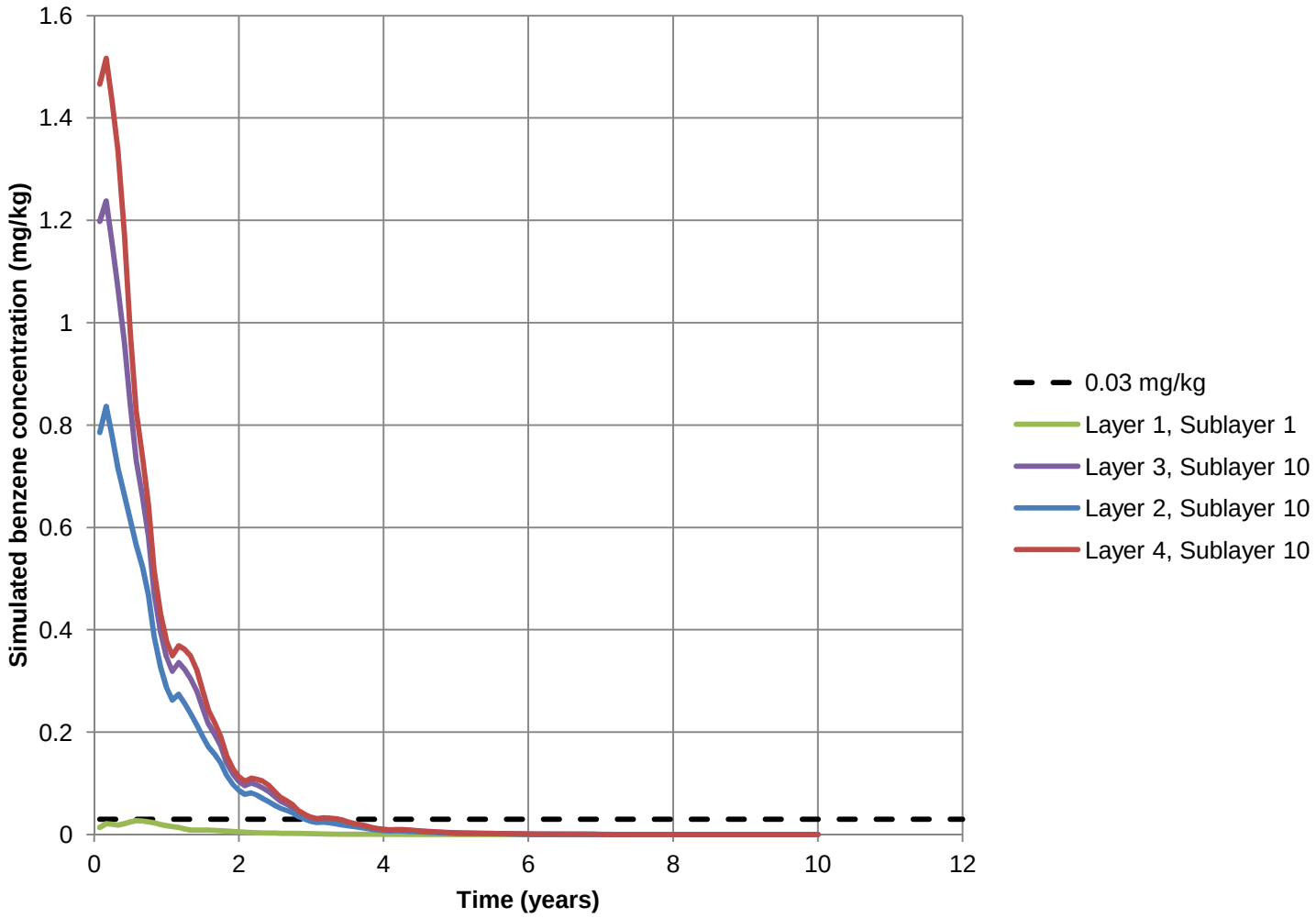

Figure A-4
Simulated Total Benzene Concentrations in the Vadose Zone
Cenex Property
Paved Case

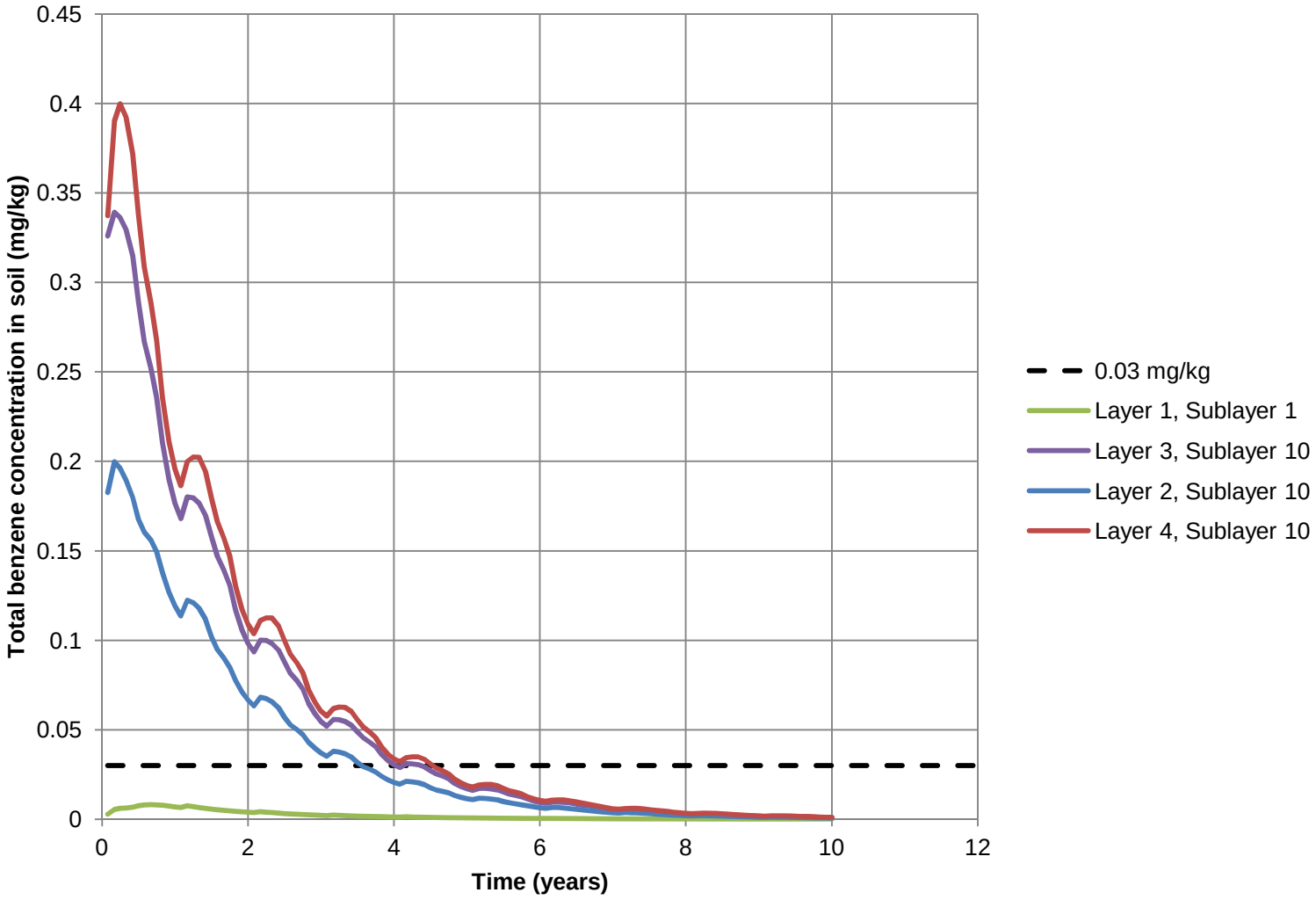

Figure A-5
Simulated Total Benzene Concentrations in the Vadose Zone
Cenex Property
Unpaved Case