Groundwater Compliance Monitoring Plan

318 State Avenue NE
Olympia, Washington

for
City of Olympia

April 16, 2010

GeoEngineers
Earth Science + Technology

Groundwater Compliance Monitoring Plan

318 State Avenue NE
Olympia, Washington

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Prepared for:

City of Olympia
P.O. Box 1967
Olympia, Washington 98507-1967

Attention: Sheri Zimny

Prepared by:

GeoEngineers, Inc.
1101 South Fawcett Avenue, Suite 200
Tacoma, Washington 98402
253.383.4940

Garrett R. Leque
Environmental Scientist

Tony C. Mathis, PE, LG, LHG
Associate, Environmental Engineer

Iain H. Wingard
Associate, Environmental Scientist

GRL:TCM:IHW:tt

GEOENGINEERS

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1.0 INTRODUCTION

This groundwater Compliance Monitoring Plan (CMP) describes the procedures for performing groundwater monitoring to assess compliance with Model Toxic Control Act (MTCA) cleanup levels (CULs) at the 318 State Avenue property (Property), located in Olympia, Washington. The City of Olympia (City) entered into the Washington State Department of Ecology's (Ecology) Voluntary Cleanup Program (VCP) in February 2009 with the goal of achieving a No Further Action (NFA) determination for the Property. The remedial actions selected in cooperation with Ecology for the Property were the removal of soil and fill material with chemical concentrations greater than MTCA (CULs) and monitored natural attenuation of chlorinated organic solvents in groundwater at concentrations greater than the CULs. Remedial actions performed in 2009 removed soil and fill material with concentrations of chlorinated organic solvents greater than MTCA CULs for unrestricted land use (ULU) from the Property that was a source of chemicals in groundwater. The groundwater monitoring presented in this CMP is being performed to monitor natural attenuation of chlorinated organic solvents in groundwater after completion of remedial actions for soil.

This CMP describes procedures for monitoring well installation, well development, quarterly sampling and analysis and water level measurement to monitor the concentrations of chlorinated organic solvents present in groundwater, some of which are at concentrations greater than the groundwater CULs at the Property, and to monitor the effects of natural attenuation on the observed groundwater concentrations of chlorinated organic solvents. This CMP also includes sampling and analysis to further assess the presence of arsenic in groundwater where monitoring is performed to assess natural attenuation of chlorinated organic solvents.

The following section, Section 2.0, describes the Property and Section 3.0 provides background on Property investigations and remedial actions. The methodology and procedures for groundwater compliance monitoring including selection of monitoring locations, monitoring well installation and development, groundwater sampling and analysis and water level monitoring are presented in Section 4.0. The standard operating procedures for field investigation activities are provided in Appendix A. A Quality Assurance Project Plan (QAPP) is included as Appendix B and a Health and Safety Plan (HASP) for groundwater compliance monitoring is included as Appendix C.

2.0 PROPERTY LOCATION AND DESCRIPTION

The Property is approximately 1.1 acres in size and is located within the City of Olympia, Thurston County, Washington. The Property is situated between the southern end of the East and West Bays of Budd Inlet (Figure 1) and is bounded on the south by State Avenue NE, on the east by Adams Street NE and on the west by Franklin Street NE (Figure 2). The Property is bounded on the north by several commercial buildings and Olympia Avenue NE. The Property is located within the Southeast quarter of Section 14, Township 18 North, Range 2W, and the tax parcel number for the Property is 78503200400.

The Property is relatively flat, with ground surface elevations ranging from approximately Elevation 11 to Elevation 12 feet national geodetic vertical datum (NGVD). The western half of the Property is paved with asphalt. The eastern half is exposed gravel where a former

Washington State Department of Transportation (WSDOT) Transportation Data Office (TDO) was located and where remedial actions to address contaminated soil were performed in 2009.

3.0 PROPERTY BACKGROUND

3.1. Property History

The Property and adjacent properties were undeveloped until at least 1888. The western portion of the Property was part of the shoreline of Budd Inlet and the eastern portion of the Property was part of the submerged marine or intertidal area of Budd Inlet. The Property and surroundings were filled with material dredged from the Port of Olympia beginning in the late 1800s. After filling, various Property users occupied the eastern half of the Property, including Olympia Foundry and Machinery Company, Pioneer Iron Works and Capital City Iron Works.

The Property was purchased by the State of Washington Highway Commission (the precursor to the Washington State Department of Transportation or WSDOT) in March 1923, for use as a soils testing and materials laboratory. Various automotive/truck sheds, machine/automotive shops and the materials testing laboratory were located throughout the Property.

A fire burned and damaged buildings and equipment at the Property in 1936. The WSDOT facility was rebuilt and the automotive/truck sheds were replaced with a smaller automotive service facility and an office and testing laboratory. A 1950 addition gave the WSDOT building its appearance shown in Figure 2. In 1968, the automotive facility structures and operations were removed and the office and testing laboratory building was renovated to accommodate a traffic data collections and analysis office (TDO). The TDO was demolished and removed from the Property in 2007. The City of Olympia purchased the Property from WSDOT in 2009 (GeoEngineers 2009a).

3.2. Summary of Soil Investigation Results and Remedial Actions

Multiple investigations were performed between July 2006 and June 2009 that included sampling and chemical analysis of soil on and adjacent to the Property. The results from the soil sample analyses were compared to MTCA CULs for ULU to identify chemicals of concern (COC) and to delineate the areas requiring remediation at the Property. Chemicals were found in soil at concentrations greater than MTCA CULs in two areas. The results of the soil investigations were documented in the Remedial Investigation (RI) report (GeoEngineers, 2009a) and Test Pit Investigation Report for the 318 State Avenue NE Property (GeoEngineers, 2009b).

Based on remedial investigation of the property, COCs identified for soil include the following:

- Trichloroethene (TCE) – TCE was detected at concentrations greater than the MTCA Method A soil CUL (30 micrograms per kilogram [μg/kg]) that is based on protection of groundwater.
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) – The detected concentrations of benzo(a)pyrene and the toxicity equivalency soil concentration (TEQ) for cPAHs were greater than MTCA Method A soil CUL (100 μg/kg) based on soil ingestion.

- Arsenic – Arsenic was detected at concentrations greater than the Method A soil CUL (20 milligrams per kilogram [mg/kg]) based on background concentrations.
- Lead – Lead was detected at concentrations greater than the Method A soil CUL (250 mg/kg) based on soil ingestion.

Benzene was also included as a COC for soil at the request of Ecology. The results of the remedial investigation indicated that benzene was not a COC because benzene was not detected in any groundwater samples at a concentration greater than the MTCA Method A groundwater CUL and the benzene concentrations in soil were less than Method B soil CUL for direct contact. However, in a meeting on June 10, 2009, Ecology requested that soil and fill with benzene concentrations greater than the MTCA Method A CUL (30 µg/kg) be remediated at the Property.

Soil containing TCE, cPAHs, arsenic, lead and benzene at concentrations greater than MTCA CULs were located in two areas referred to as Contaminated Soil Zones 1 and 2 (CSZ 1 and CSZ 2) (Figure 2). Soil in CSZ 1 and CSZ 2 contained the following COCs:

- Soil in CSZ 1 contained TCE, cPAHs, arsenic, lead and benzene at concentrations greater than the CULs. TCE was detected at concentrations greater than the CUL at seven locations in CSZ 1 at depths generally ranging between 2 and 8 feet below ground surface (bgs). cPAHs were present at concentrations greater than the CUL in the eastern portion of CSZ 1 at depths generally ranging from 2 to 4 feet bgs. Arsenic and lead were detected at concentrations greater than CULs at three locations generally at depths of 2 to 4 feet bgs. Benzene was also present at three locations at depths ranging from 3 to 7.5 feet bgs at concentrations greater than the MTCA Method A soil CUL.
- Soil in CSZ 2 contained lead and benzene at concentrations greater than the CULs. Lead and benzene were detected at one location at a depth of 3 to 3.5 feet bgs.

Remedial actions were performed in September and October 2009 to remove soil with concentrations of TCE, cPAHs, arsenic, lead and benzene greater than MTCA CULs. Remedial actions included removal and off-site disposal of approximately 6,800 tons of soil and fill material from CSZ 1 and CSZ 2. Soil sampling and analysis was performed to confirm that material with concentrations of COCs greater than MTCA CULs were removed from CSZ 1 and CSZ 2.

Confirmation samples were collected from 18 locations situated in the sidewalls and bottom of CSZ 1 and analyzed for volatile organic compounds (VOCs), cPAHs, arsenic and lead. The VOC analysis consisted of 34 compounds including chlorinated organic solvents (i.e., TCE and associated degradation products) as well as benzene, ethylbenzene, toluene and xylene. Five confirmation samples were also collected from the sidewalls and bottom of CSZ 2 and analyzed for lead and benzene. The COCs were either not detected or were detected at concentrations less than CULs in the confirmation samples collected from the final limits of the excavations in CSZ 1 and CSZ 2. Remedial actions for soil and results of confirmation soil samples are presented in the Remedial Action Construction Report (RACR) for the 318 State Avenue property (GeoEngineers, 2010).

Remedial actions for soil consisted of removing material that was a source of chemicals in groundwater. TCE as well as all other chlorinated compounds were not detected in the majority of confirmation samples collected from CSZ 1, and where detected in confirmation samples, the concentrations were less than MTCA CULs for unrestricted land use. Similarly, cPAHs, arsenic, lead and benzene were not detected in the majority of confirmation samples collected from CSZ 1 and CSZ 2, and where detected the concentrations were less than MTCA CULs for ULU.

3.3. Summary of Groundwater Investigation Results

Multiple investigations were performed between March 2008 and March 2009 that included sampling and chemical analysis of groundwater at and adjacent to the Property. Similar to soil, the results from the groundwater sample analyses were compared to MTCA CULs for ULU to identify COCs and identify the extent of groundwater at concentrations greater than the CULs. The results of groundwater investigations were documented in the RI report (GeoEngineers, 2009a) and Groundwater Sampling Report for the 318 State Avenue NE Property (GeoEngineers, 2009c).

Based on the remedial investigation of the property, COCs identified for groundwater include the following:

- TCE - TCE was detected in groundwater within CSZ 1 at a concentration greater than the MTCA Method A groundwater CUL (5.0 micrograms per liter [µg/l]) that is based on drinking water during one out of three rounds of groundwater sampling and analysis.
- Vinyl chloride – Vinyl chloride was detected in groundwater in and adjacent CSZ 1 at concentrations greater than the MTCA Method A groundwater CUL (0.2 µg/l) that is based on drinking water during two of three rounds of groundwater sampling and analysis.
- Arsenic - Arsenic was detected in groundwater at and adjacent to the Property at concentrations greater than the MTCA Method A groundwater CUL (5 µg/l) based on the background concentration in Washington State during all three rounds of groundwater sampling and analysis.

Although cPAHs, lead and benzene were identified as COCs for soil, cPAHs, lead and benzene are not COCs for groundwater as these compounds have never been detected in groundwater at concentrations greater than the MTCA Method A or B groundwater CULs.

Although arsenic was identified as a COC for groundwater based on the results of remedial investigation at the Property, the arsenic concentrations in groundwater are a result of area-wide groundwater conditions. Arsenic has been detected in groundwater in a total of 14 wells located both on and adjacent to the Property at concentrations greater than the MTCA Method A groundwater CUL. The highest arsenic concentration in groundwater was detected upgradient of the Property. Additionally, soil at the Property is not a significant source to arsenic concentrations in groundwater. Before remedial actions at the Property, the average arsenic concentration in soil was less than 6 mg/kg, and all but two out of 78 soil samples had detected arsenic concentrations below the MTCA Method A soil CUL that is based on background arsenic concentrations for Washington State (Ecology, 1994). The detected concentrations of arsenic in soil that were greater than background (i.e., 20 mg/kg) were 23 and 40 mg/kg, only slightly or moderately greater than background. Both of the locations with arsenic in soil at concentrations greater than the MTCA Method A soil CUL were located in CSZ 1 and the arsenic concentrations in groundwater in CSZ 1 were not higher than concentrations in groundwater outside of CSZ 1 at upgradient and crossgradient locations. Because arsenic concentrations in groundwater are the result of area-wide groundwater conditions, active remediation for groundwater (i.e., groundwater treatment) to address arsenic concentrations is not warranted at the Property.

As stated above, vinyl chloride has been detected in groundwater within and around CSZ 1 at concentrations greater than the MTCA Method A groundwater CUL. Vinyl chloride is a degradation product of TCE when it undergoes reductive degradation. Intermediate degradation products from the reductive degradation of TCE also include 1,1-, cis-, and trans-dichloroethene (DCE), which have also been detected in groundwater in and around CSZ 1. The presence of vinyl chloride and other intermediate degradation products demonstrates that degradation and natural attenuation of chlorinated solvents is occurring at the Property. Based on the demonstrated degradation of chlorinated solvents at the Property, natural attenuation was selected as the remedy for remediation of groundwater, upon removal of source material in soil and fill at CSZ 1.

Groundwater gradients measured during three rounds of groundwater monitoring indicate that groundwater flows generally north-northwest through north-northeast. Groundwater levels were not observed to be tidally influenced based on water level measurements recorded in wells at both high and low tide on August 15, 2008. The tidal fluctuation between high and low tide on August 15 was approximately 15 feet.

4.0 GROUNDWATER COMPLIANCE MONITORING

4.1. Introduction

Groundwater compliance monitoring will be performed to monitor concentrations and natural attenuation of chlorinated organic solvents in groundwater at the Property. Natural attenuation includes biodegradation, diffusion, dilution, sorption, volatilization, and/or chemical and biochemical stabilization of contaminants to reduce contaminant toxicity, mobility or volume to levels that are protective of human health and the environment. The natural attenuation process will be monitored via quarterly groundwater monitoring that will include the following:

- Groundwater sampling at six existing monitoring well locations and two new monitoring well locations.
- Analysis for chlorinated organic solvents and geochemical indicators of natural attenuation including pH, redox potential, dissolved oxygen, sulfate and iron.
- Monitoring of groundwater gradients by measuring water levels at all existing wells and the two new monitoring well locations.

Additionally, analysis for arsenic will be performed to provide additional information concerning the areal extent of arsenic concentrations. Arsenic analysis will be performed on the groundwater samples being collected for the purposes of evaluating natural attenuation of chlorinated organic compounds.

The following sections provide a description of the components of groundwater compliance monitoring.

4.2. Groundwater Monitoring Locations

Groundwater compliance monitoring locations were selected based on the following:

- Location relative to the remedial action area CSZ 1 where source material was removed as part of remedial actions for soil;
- Information concerning groundwater gradients; and
- The results of previous groundwater sampling.

Six existing monitoring well locations, as well as two additional well locations in and around CSZ 1, were selected for groundwater compliance monitoring. Table 1 summarizes the wells that were selected for monitoring and the rationale and objective for each monitoring location. The groundwater compliance monitoring locations are shown in Figure 2. Groundwater compliance monitoring is not being performed in CSZ 2 because groundwater in the well formerly located in CSZ 2 (MW-15) did not contain COCs at concentrations exceeding MTCA Method A CULs during three rounds of groundwater monitoring performed prior to remedial actions for soil.

The existing monitoring wells selected for compliance monitoring are positioned at locations around the periphery of CSZ 1 (Figure 2). Monitoring well MW-13 is located south and upgradient of CSZ 1 and the Property and monitoring well MW-04 is located at the southern Property boundary adjacent to CSZ 1. Monitoring wells MW-03, MW-16 and MW-08 are located downgradient of CSZ 1, between CSZ 1 and the northern Property boundary and monitoring well MW-09 is located east of CSZ 1 and the eastern Property boundary.

Chlorinated organic compounds have not been detected at concentrations greater than CULs in groundwater from upgradient monitoring well MW-13. Vinyl chloride has been detected at a concentration greater than the MTCA Method A CUL in groundwater from monitoring wells MW-03, MW-04, MW-08, MW-09 and MW-16 in one or more previous sampling events. Chlorinated organic compounds have not been detected at concentrations greater than CULs in the remaining, existing groundwater monitoring wells located on and adjacent to the Property (i.e., MW-01, MW-10, MW-11, MW-12 and MW-14) and, therefore, are in compliance with MTCA CULs and have not been included as groundwater compliance monitoring locations. Table 2 summarizes the results for chlorinated organic solvents and associated degradation projects in groundwater at the Property.

New monitoring wells will be installed at two locations for groundwater compliance monitoring. One new well, MW-17, will be installed within CSZ 1 where soil and fill material with concentrations greater than CULs were removed to assess post-soil remediation groundwater concentrations and to allow measurement of water levels and evaluation of groundwater gradients. One new well, MW-18, will be installed north of CSZ 1 at the northern Property boundary as requested by Ecology. In a meeting on June 10, 2009, Ecology requested that a new well be installed at the location of MW-18 upon completion of soil remedial actions to monitor groundwater compliance with the CULs at the northern property boundary.

Monitoring wells MW-17 and MW-18 will be constructed by a licensed drilling contractor in accordance with Washington Administrative Code (WAC) 173-160, *Minimum Standards for Construction and Maintenance of Wells.* Upon completion of each soil boring, and prior to well installation, the water level within the boring will be measured to help select an appropriate well design. The well screens will be placed across the water table (i.e., across the interface between the saturated and unsaturated zones) to allow for monitoring of seasonally influenced water level fluctuations. Following completion of the monitoring well, the well will be sufficiently developed prior to conducting groundwater monitoring activities. The standard operating procedures for field activities are included in Appendix A.

4.3. Monitoring Well Sampling and Analysis

Low-flow/low-turbidity sampling techniques will be used to minimize the suspension of sediment in the groundwater samples. Measurements including electrical conductivity, dissolved oxygen, pH, salinity, total dissolved solids, turbidity, oxidation-reduction potential and temperature will be collected using water quality instruments. Groundwater samples for laboratory and ferrous iron analyses will be collected once water quality parameters have stabilized. Ferrous iron will be measured in the field using field test kits provided by the analytical laboratory. Groundwater samples for laboratory analysis will be collected in laboratory-prepared containers, placed into a cooler with ice and logged on the chain-of-custody in accordance with quality assurance procedures. Additional information regarding field and laboratory quality assurance/quality control (QA/QC) procedures is provided in the QAPP (Appendix B).

The laboratory analyses that will be performed on groundwater samples are summarized in Table 1 and will include the following:

- Chlorinated solvents and associated degradation products including tetrachloroethene, TCE, 1,1-DCE, Cis-DCE, Trans-DCE and vinyl chloride by Environmental Protection Agency (EPA) Method 8260;
- Total arsenic EPA Method 6020; and
- Sulfate by EPA Method 300.0.

Analyses will be performed by TestAmerica Laboratory in Fife, Washington.

4.4. Monitoring of Groundwater Gradients

Water levels will be measured in each existing well (i.e., MW-01, MW-03, MW-04, MW-08, MW-09, MW-10, MW-11, MW-12, MW-13, MW-14 and MW-16,) and the two new monitoring wells (MW-17 and MW-18) during each groundwater monitoring event. The water level data will be used to construct groundwater gradient contour "snapshots" for the property. The groundwater gradient information will be used to evaluate groundwater flow direction during each monitoring event.

5.0 TIMING OF GROUNDWATER MONITORING AND REPORTING

Groundwater monitoring will be performed quarterly for one year to monitor the natural attenuation of chlorinated organic compounds and assess compliance with MTCA CULs. The results for chlorinated organic compounds will be compared to MTCA Method A groundwater CULs to assess whether groundwater at the Property is in compliance with the CULs.

The initial round of quarterly monitoring will be performed upon review of the Groundwater Compliance Monitoring Plan by Ecology. Installation of the new monitoring wells will be performed as part of the initial quarter of groundwater monitoring. Upon completion of monitoring well installation and development, groundwater monitoring will be performed at the new wells and selected existing monitoring wells.

The results of groundwater monitoring activities will be presented in quarterly groundwater monitoring reports. A Compliance Monitoring Report will be prepared upon completion of four quarters of groundwater monitoring.

A data summary report will be prepared upon completion of each quarter of groundwater monitoring that will include the following:

- Summary of the quarterly sample collection activities;
- Tabulated summary of water quality parameters, geochemical indicators and analytical results for chlorinated organic solvents and arsenic;
- Figure showing groundwater gradient contours;
- Discussion of the results of the quarter's groundwater monitoring and comparison of the results to groundwater CULs;
- Laboratory analytical report; and
- Data quality review of the laboratory analytical results.

The quarterly monitoring reports for the 1st, 2nd and 3rd quarters of groundwater compliance monitoring will be submitted to Ecology 30 days after receiving the final laboratory report for each monitoring event. Upon completion of the 4th quarter of monitoring, a Compliance Monitoring Report will be prepared that includes the following:

- A data summary report for the 4th quarter of groundwater monitoring provided in an appendix that also includes the data summary reports for the 1st, 2nd and 3rd quarters of groundwater compliance monitoring;
- Discussion of the results for all four quarters of groundwater compliance monitoring and comparison of the results to groundwater CULs; and
- Conclusions and recommendations concerning groundwater natural attenuation for chlorinated organic compounds and compliance with groundwater CULs at the Property.

The Compliance Monitoring Report will be submitted to Ecology within 45 days after receiving the final laboratory report for the 4th quarter of groundwater monitoring.

6.0 REFERENCES

GeoEngineers 2009a Final Draft Remedial Investigation, 318 State Avenue NE, Olympia Washington, February 19, 2009.

GeoEngineers 2009b Draft Test Pit Investigation Report, 318 State Avenue NE, Olympia Washington, June 25, 2009.

GeoEngineers 2009c Final Draft Groundwater Sampling, 318 State Avenue NE, Olympia Washington, April 14, 2009.

GeoEngineers 2010 Remedial Action Construction Report, 318 State Avenue NE, Olympia Washington, January 5, 2010.

TABLE 1

GROUNDWATER COMPLIANCE MONITORING LOCATIONS, RATIONALE, SCREEN INTERVAL AND ANALYSES

318 STATE AVENUE NE
OLYMPIA, WASHINGTON

Well Designation	General Location	Rationale/Objective	Well Screen Interval	Analyses
MW-13	South of Property	Existing monitoring well located upgradient of Property and soil remedial action area CSZ 1	MW-13 well screen installed from approximately 3 to 11 feet below ground surface (bgs) on 10/30/2008	VOCs[1] (EPA 8260) Arsenic (EPA 6010) Sulfate (EPA 300.0) Iron (Fe^{+2}) (Field test kit)
		Evaluate concentrations of chlorinated solvents and/or degradation products		
		Chlorinated solvents not previously detected in groundwater at concentrations greater than cleanup levels		
MW-04	Southern Property Boundary	Existing monitoring well located on southern Property boundary and adjacent to soil remedial action area CSZ 1	MW-04 well screen installed from approximately 3 to 11 feet bgs on 03/28/2008	VOCs[1] (EPA 8260) Arsenic (EPA 6010) Sulfate (EPA 300.0) Iron (Fe^{+2}) (Field test kit)
		Evaluate concentrations of chlorinated solvents and/or degradation products and geochemical indicators of natural attenuation		
		Vinyl chloride previously detected in groundwater at concentrations greater than cleanup level prior to soil remedial action		
MW-17	Within Remedial Action Area CSZ 1	New monitoring well located within remedial action area CSZ 1	Install well screen across water table observed on day of drilling. Groundwater is at a depth of approximately 4 to 6 feet bgs based on previous investigation water level measurements. Based on previous investigation, well screen interval likely to be from 3 to 11 feet bgs.	VOCs[1] (EPA 8260) Arsenic (EPA 6010) Sulfate (EPA 300.0) Iron (Fe^{+2}) (Field test kit)
		Evaluate concentrations of chlorinated solvents and/or degradation products and geochemical indicators of natural attenuation		
		Multiple chlorinated solvents detected in groundwater at concentrations greater than cleanup levels in CSZ 1 prior to soil remedial action		
MW-03	Northwest of Remedial Action Area CSZ 1	Existing monitoring well located northwest and downgradient of remedial action area CSZ 1	MW-03 well screen installed from approximately 3 to 11 feet bgs on 03/26/2008	VOCs[1] (EPA 8260) Arsenic (EPA 6010) Sulfate (EPA 300.0) Iron (Fe^{+2}) (Field test kit)
		Evaluate concentrations of chlorinated solvents and/or degradation products and geochemical indicators of natural attenuation		
		Multiple chlorinated solvents detected in groundwater at concentrations greater than cleanup levels prior to soil remedial action		

Well Designation	General Location	Rationale/Objective	Well Screen Interval	Analyses
MW-18	Northern Property Boundary	New monitoring well located north and downgradient of remedial action area CSZ 1 on the northern property boundary Evaluate concentrations of chlorinated solvents and/or degradation products and geochemical indicators of natural attenuation New monitoring well to be installed as requested by Ecology	Install well screen across water table observed on day of drilling. Groundwater is at a depth of approximately 4 to 6 feet bgs based on previous investigation water level measurements. Based on previous investigation, well screen interval likely to be from 3 to 11 feet bgs.	VOCs[1] (EPA 8260) Arsenic (EPA 6010) Sulfate (EPA 300.0) Iron (Fe^{+2}) (Field test kit)
MW-16	North of Remedial Action Area CSZ 1	Existing monitoring well located north and downgradient of remedial action area CSZ 1 Evaluate concentrations of chlorinated solvents and/or degradation products and geochemical indicators of natural attenuation Vinyl chloride previously detected in groundwater at concentrations greater than cleanup level prior to soil remedial action	MW-16 well screen installed from approximately 3 to 11 feet bgs on 10/31/2008	VOCs[1] (EPA 8260) Arsenic (EPA 6010) Sulfate (EPA 300.0) Iron (Fe^{+2}) (Field test kit)
MW-08	North of Remedial Action Area CSZ 1	Existing monitoring well located north and downgradient of remedial action area CSZ 1 Evaluate concentrations of chlorinated solvents and/or degradation products and geochemical indicators of natural attenuation Vinyl chloride previously detected in groundwater at concentrations greater than cleanup level prior to soil remedial action	MW-08 well screen installed from approximately 3 to 11 feet bgs on 03/27/2008	VOCs[1] (EPA 8260) Arsenic (EPA 6010) Sulfate (EPA 300.0) Iron (Fe^{+2}) (Field test kit)
MW-09	East of Remedial Action Area CSZ 1	Existing monitoring well located east of and crossgradient of remedial action area CSZ 1 Evaluate concentrations of chlorinated solvents and/or degradation products and geochemical indicators of natural attenuation Vinyl chloride previously detected in groundwater at concentrations greater than cleanup level prior to soil remedial action	MW-09 well screen installed from approximately 3 to 11 feet bgs on 03/27/2008	VOCs[1] (EPA 8260) Arsenic (EPA 6010) Sulfate (EPA 300.0) Iron (Fe^{+2}) (Field test kit)

Note:

[1]VOCs = Volatile organic compounds including tetrachloroethene (PCE), trichloroethene (TCE), 1,1-dichloroethene (DCE), cis-DCE, trans-DCE and vinyl chloride.

TABLE 2

SUMMARY OF REMEDIAL INVESTIGATION RESULTS FOR CHLORINATED ORGANIC COMPOUNDS IN GROUNDWATER

318 STATE AVENUE NE

OLYMPIA, WASHINGTON

Analyte	MTCA[1] Cleanup Level	MW-01			MW-03			MW-04			MW-08			MW-09		
		3/31/2008	10/30/2008	3/11/2009	3/31/2008	10/30/2008	3/11/2009	3/31/2008	10/30/2008	3/11/2009	4/1/2008	10/31/2008	3/12/2009	4/1/2008	10/31/2008	3/10/2009
Volatile Organic Compounds (µg/l)																
Tetrachloroethene	5[2]	0.1 U	0.47 U	0.1 U	0.1 U	0.47 U	0.1 U	0.1 U	0.47 U	0.1 U	0.1 U	0.47 U	0.1 U	0.1 U	0.47 U	0.1 U
Trichloroethene	5[2]	0.1 U	0.4 U	0.1 U	**3.8**	0.4 U	**0.95**	**0.35**	0.4 U	**0.13**	0.1 U	0.4 U	0.1 U	0.1 U	0.4 U	0.1 U
1,1-Dichloroethene	400[3]	0.1 U	1 U	0.1 U	**0.32**	1 U	0.1 U	0.1 U	1 U	0.1 U	0.1 U	1 U	0.1 U	0.1 U	1 U	0.1 U
Cis-1,2-Dichloroethene	80[3]	0.1 U	1 U	0.1 U	**1.7**	1 U	**0.22**	**0.15**	1 U	**0.14**	0.1 U	1 U	0.1 U	0.1 U	1 U	0.1 U
Trans-1,3-Dichloropropene	NE	0.1 U	1 U	0.1 U	0.1 U	1 U	0.1 U	0.1 U	1 U	0.1 U	0.1 U	1 U	0.1 U	0.1 U	1 U	0.1 U
Vinyl Chloride	0.2[2]	0.02 U	0.18 U	0.02 U	**1.7**	0.18 U	**1**	**0.35**	0.18 U	**0.4**	0.02 U	0.18 U	**0.86**	**0.8**	0.18 U	0.02 U

Analyte	MTCA[1] Cleanup Level	MW-10		MW-11		MW-12		MW-13		MW-14		MW-15		MW-16	
		11/4/2008	3/10/2009	11/4/2008	3/10/2009	11/4/2008	3/10/2009	11/4/2008	3/10/2009	11/6/2008	3/11/2009	11/6/2008	3/11/2009	11/6/2008	3/11/2009
Volatile Organic Compounds (µg/l)															
Tetrachloroethene	5[2]	0.47 U	0.1 U	0.47 U	0.1 U	0.47 U	0.1 U	0.47 U	0.1 U	**0.49**	0.1 U	0.47 U	0.1 U	**0.5**	0.1 U
Trichloroethene	5[2]	0.4 U	0.1 U	0.4 U	0.1 U	0.4 U	0.1 U	0.4 U	0.1 U	0.4 U	0.1 U	0.4 U	0.1 U	0.4 U	**0.53**
1,1-Dichloroethene	400[3]	1 U	0.1 U	1 U	0.1 U	1 U	0.1 U	1 U	0.1 U	1 U	0.1 U	1 U	0.1 U	1 U	0.1 U
Cis-1,2-Dichloroethene	80[3]	1 U	0.1 U	1 U	**0.33**	1 U	0.1 U	1 U	0.1 U	1 U	0.1 U	1 U	0.1 U	1 U	**0.2**
Trans-1,3-Dichloropropene	NE	1 U	0.1 U	1 U	0.1 U	1 U	0.1 U	1 U	0.1 U	1 U	0.1 U	1 U	0.1 U	1 U	0.1 U
Vinyl Chloride	0.2[2]	0.18 U	**0.074**	0.18 U	0.02 U	0.18 U	0.02 U	0.18 U	**0.086**	0.18 U	0.02 U	0.18 U	**0.11**	0.18 U	**2.1**

Notes:

[1] Model Toxics Control Act (MTCA) Cleanup Regulation Chapter 173-340 WAC. MTCA Method A cleanup levels are presented for chemicals that have Method A criteria. Method B cleanup levels are presented for chemicals that do not have Method A criteria.

[2] MTCA Method A cleanup level.

[3] MTCA Method B cleanup level.

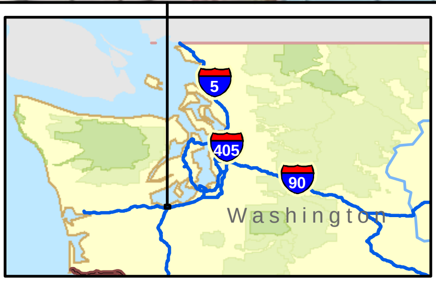
U = The analyte was not detected at a concentration greater than the indicated reporting limit.

µg/l = microgram per liter

NE = Cleanup level not established by Washington State Department of Ecology

Shaded items indicate that the chemical concentration is greater than the MTCA cleanup level.

Values presented in **bold** indicate that the chemical was detected in the specific sample.



N
W E
S

2,000 0 2,000
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

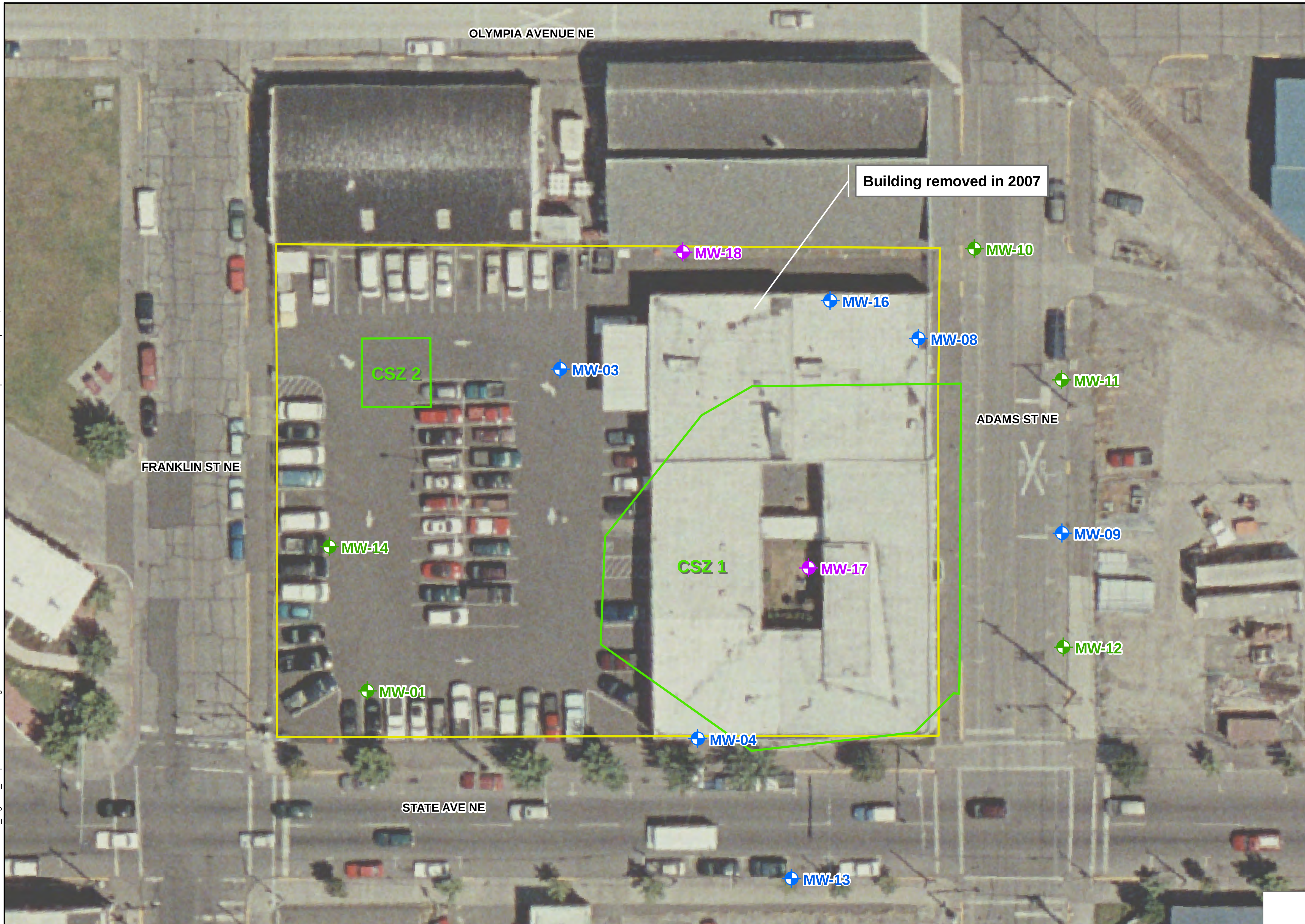
Data Sources: 2008 Shaded Relief from ESRI, 2008 Topographic Maps from National Geographic Society
Projection: NAD_1983_StatePlane_Washington_North_FIPS_4601_Feet
Datum: D_North_American_1983

Vicinity Map

318 State Avenue NE
Olympia, Washington

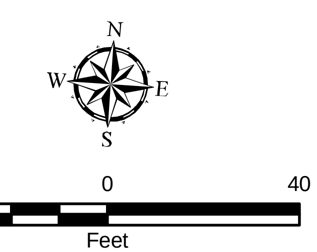
GeoEngineers

Figure 1



Legend

- Approximate Property Boundary
- MW-04 — Existing Monitoring Well to be Sampled for Groundwater Analysis
- MW-17 — New Monitoring Well to be Sampled for Groundwater Analysis
- MW-01 — Existing Monitoring Well to be Used to Monitor Groundwater Gradients
- CSZ 1 — Contaminated Soil Zones (CSZ) Remediated in September-October 2009



Groundwater Compliance Monitoring Locations

318 State Avenue NE
Olympia, Washington

GEOENGINEERS

Figure 2

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Sources: Approximate Property Boundary from Thurston County parcels (revised by GeoEngineers). Aerial photograph (2003) from Thurston County Data Center. Data Frame Rotated 356 degrees.

Projection: NAD_1983_StatePlane_Washington_South_FIPS_4602_Feet
Datum: D_North_American_1983

Office: TAC Path: P:\0\0415049\GIS\MXDs\041504906_Figure2_ProposedGWMonitoring.mxd Map Revised: April 16, 2010 KKS

APPENDIX A
Standard Operating Procedures for Field Activities

APPENDIX A
STANDARD OPERATING PROCEDURES FOR FIELD ACTIVITIES

This appendix identifies the field procedures to be implemented during groundwater compliance monitoring.

A.1 Underground Utility Locate

Prior to drilling, an underground utility locate (public and private) will be conducted in the area of the proposed boring locations to identify subsurface utilities and/or potential underground physical hazards. A public utility locate (one-call) will be performed, and a private utility locating company will be contracted to mark underground utilities in the vicinity of the proposed borings.

A.2 Monitoring Well Construction

Drilling and construction of the monitoring wells will be conducted by a Washington State licensed driller in accordance with the *Minimum Standards for Construction and Maintenance of Wells* (Chapter 173-160 WAC; Ecology, 2006). Wells will be constructed of 2-inch-diameter, flush-threaded Schedule 40 polyvinyl chloride (PVC) casing with machine-slotted PVC screen (0.010 inch). Installation of the wells will be observed by a GeoEngineers representative, who will maintain a detailed log of the materials encountered during drilling and depths and construction details of the wells. The borings are anticipated to be advanced to a depth of approximately 11 or 12 feet bgs. The screened intervals are anticipated to extend between approximately 3 feet and 11 feet bgs.

Following placement of the well screen and casing in the borehole, a filter pack will be installed around the well screen. The filter pack will extend from the bottom of the well to a minimum of 1 foot above the top of the screen. Filter pack material will consist of commercially prepared 10-20 silica sand.

A bentonite seal at least 1-foot thick will be placed above the sand pack to about 1.5 feet bgs. The surface of each well will be completed with a concrete seal and surface pad extending from the top of the bentonite seal to slightly above the ground surface. Locking steel flush-mount monuments will be cemented in place from the surface to a depth of about 1.5 feet bgs.

A.3 Monitoring Well Development

The monitoring wells will be developed to remove water introduced into the wells during drilling (if any), stabilize the filter pack and formation materials surrounding the well screens and restore the hydraulic connection between the well screens and the surrounding soil. The well screens will be gently surged with a decontaminated stainless steel bailer after installation. Development will continue until a minimum of five casing volumes of water have been removed and turbidity of the discharged water is relatively low. The goal of well development will be to reduce the turbidity content of the water to less than 25 NTU. Up to 10 well volumes of water will be removed from the wells in an effort to attain the 25 NTU goal. The removal rate and volume of groundwater removed will be recorded during well development procedures. Water that is removed from the well during well development activities will be stored on site in labeled 55-gallon drums, pending off-site disposal. Depths to water in the monitoring wells will be measured prior to development.

A.4 Groundwater Monitoring and Sampling

Water levels will be measured in each existing well (i.e., MW-01, MW-03, MW-04, MW-08, MW-09, MW-10, MW-11, MW-12, MW-13, MW-14 and MW-16,) and the two new monitoring wells (MW-17 and MW-18) during each groundwater monitoring event. Groundwater levels will be measured to the nearest 0.01 foot using an electric water level indicator. The water levels will be measured relative to the top of the north side of the casing rim.

Groundwater samples will be obtained using low-flow/low-turbidity sampling techniques to minimize the suspension of sediment in the samples. Groundwater samples will be obtained from monitoring wells using dedicated submersible pumps and disposable polyethylene tubing. Groundwater will be pumped at an approximate 0.5 liter per minute rate.

A water quality measuring system with a flow-through cell (e.g., a Horiba U-22 or similar equipment) will be used to monitor the following water quality parameters during purging: electrical conductivity, dissolved oxygen, pH, salinity, total dissolved solids, oxidation-reduction potential and temperature. A Hach turbidimeter and a Hach field test kit will be used to measure turbidity and ferrous iron, respectively. It will be assumed that ambient groundwater conditions will have been reached once the parameters measured by the Horiba and Hach instruments vary by less than 10 percent on three consecutive measurements. The stabilized field measurements will be documented on field forms. If all field parameters do not stabilize after five well volumes of water have been removed, samples will be collected.

Following well purging, the flow through cell will be disconnected and groundwater samples will be collected in laboratory-prepared containers.

The samples will be placed into a cooler with ice and logged on the chain-of-custody using the procedures described in the Quality Assurance Project Plan (QAPP) provided in Appendix B. Purge water will be stored in labeled 55-gallon drums on site for subsequent characterization and off-site disposal.

A.5 Decontamination

Sampling equipment will be decontaminated using procedures described in the QAPP.

A.6 Sample Handling

Sample handling procedures, including labeling, container and preservation requirements, and holding times are described in the QAPP.

A.7 Disposal of Investigation-Derived Materials

A.7.1 Soil

Soil cuttings from the borings for MW-17 and MW-18 will be placed in a labeled and sealed 30-gallon drum. The drum will be temporarily stored on site pending off-site disposal at a permitted facility.

A.7.2 Groundwater and Decontamination Water

Development and purge water removed from the monitoring wells and decontamination water generated during all sampling activities will be stored on site in labeled and sealed 55-gallon drums. The drums will be temporarily stored at a secure location on site pending receipt of analytical results and off-site disposal at a permitted facility.

A.7.3 Disposition of Incidental Waste

Incidental waste generated during sampling activities includes items such as gloves, plastic sheeting, paper towels and similar expended and discarded field supplies. These materials are considered *de minimis* and will be disposed of in a local trash receptacle or county disposal facility.

APPENDIX B
Quality Assurance Project Plan (QAPP)

APPENDIX B
QUALITY ASSURANCE PROJECT PLAN

The Quality Assurance Project Plan (QAPP) serves as the primary guide for the integration of quality assurance (QA) and quality control (QC) functions into monitoring activities. The QAPP presents the objectives, procedures, organization, functional activities and specific QA and QC activities designed to achieve data quality goals established for the project. This QAPP is based on guidelines specified in Washington Administrative Code (WAC) Chapter 173-340-820 and Environmental Protection Agency (EPA) Guidelines (EPA, 1999, 2004).

Throughout the project, environmental measurements will be conducted to produce data that are scientifically valid, of known and acceptable quality and meet established objectives. QA/QC procedures will be implemented so that precision, accuracy, representativeness, completeness and comparability (PARCC) of data generated meet the specified data quality objectives.

B.1 Project Organization and Responsibility

Descriptions of the responsibilities, lines of authority and communication for the key positions for QA and QC are provided below. The project organization facilitates the efficient performance of project work, allows for an independent quality review and permits resolution of any QA issues before submittal.

B.1.1 Project Leadership and Management

The Project Manager’s duties consist of providing concise technical work statements for project tasks, selecting project team members, determining subcontractor participation, establishing budgets and schedules, adhering to budgets and schedules, providing technical oversight, and providing overall production and review of project deliverables. Nick Rohrbach is the Project Manager for activities at the Property. The Associate–in-Charge is responsible to the City of Olympia for fulfilling contractual and administrative control of the project. Iain Wingard is the Associate-in Charge.

B.1.2 Field Coordinator

The Field Coordinator is responsible for the daily management of activities in the field. Specific responsibilities include the following:

- Develops schedules and allocates resources for field tasks.
- Coordinates data collection activities to be consistent with information requirements.
- Collects field data and submits samples to laboratory.
- Assures that data are correctly and completely reported.
- Implements field sampling in accordance with SAP requirements.
- Schedules sample delivery to the analytical laboratory.
- Assures that appropriate sampling, testing and measurement procedures are followed.
- Participates in QA corrective actions as required.

The Field Coordinator for activities at the Property will be Mike Sullivan or John Deeds.

B.1.3 Quality Assurance Leader

The GeoEngineers project Quality Assurance Leader is Iain Wingard, who is responsible for the project's overall QA. The Project QA Leader is responsible for coordinating QA/QC activities as they relate to the acquisition of field data. The QA Leader has the following responsibilities:

- Serves as the official contact for laboratory data QA concerns.
- Responds to laboratory data, QA needs, resolves issues, and answers requests for guidance and assistance.
- Reviews the implementation of the QAPP and the adequacy of the data generated from a quality perspective.
- Maintains the authority to implement corrective actions as necessary.
- Reviews and approves the laboratory QA Plan.
- Evaluates the laboratory's final QA report for any condition that adversely impacts data generation.
- Ensures that appropriate sampling, testing, and analysis procedures are followed and that correct quality control checks are implemented.
- Monitors laboratory compliance with data quality requirements.

B.1.4 Laboratory Management

The Laboratory's QA Coordinator administers the Laboratory QA Plan and is responsible for QC. Specific responsibilities of this position include:

- Ensures implementation of the QA Plan.
- Serves as the laboratory point of contact.
- Activates corrective action for out-of-control events.
- Issues the final QA/QC report.
- Administers QA sample analysis.
- Complies with the specifications established in the project plans as related to laboratory services.
- Participates in QA audits and compliance inspections.

The chemical analytical laboratory QA Coordinator will be determined by the laboratory (TestAmerica, Tacoma, Washington).

B.1.5 Health and Safety

The Field Coordinator will be responsible for implementing safe work practices during sampling activities. The Field Coordinator will conduct a tailgate safety meeting the morning before beginning field activities. The Field Coordinator will terminate any work activities that are unsafe.

B.2 DATA QUALITY OBJECTIVES

The QA objective for technical data is to collect environmental monitoring data of known, acceptable and reportable quality. The QA objectives established for the project are:

- Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis, and data reporting that will facilitate consistency and thoroughness of data generated.
- Achieve the acceptable level of confidence and quality required so that data generated are scientifically valid and of known and documented quality. This will be performed by establishing criteria for PARCC parameters and by testing data against these criteria.

The sampling design, field procedures, laboratory procedures and QC procedures are set up to provide high-quality data for use in this project. Specific data quality factors that may affect data usability include quantitative factors (precision, bias, accuracy, completeness and reporting limits) and qualitative factors (representativeness and comparability). The measurement quality objectives (MQO) associated with these data quality factors are summarized in Table 1 and are discussed below.

B.2.1 Analytes

The analytes for groundwater samples submitted to the laboratory during groundwater compliance monitoring are the following:

- Tetrachloroethene (PCE), trichloroethene (TCE), 1,1-dichloroethene (DCE), Cis-DCE, Trans-DCE and vinyl Chloride by EPA Method 8260;
- Total arsenic by EPA Method 6010; and
- Sulfate by EPA Method 300.0.

Iron will be measured in the field use field test kits.

B.2.2 Detection Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as the method detection limit (MDL). Individual instruments often can detect but not accurately quantify compounds at concentrations lower than the MDL, referred to as the instrument detection limit (IDL). Although results reported near the MDL or IDL provide insight to site conditions, quality assurance dictates that analytical methods achieve a consistently reliable level of detection known as the practical quantitation limit (PQL) or reporting limit (RL). The contract laboratory will provide numerical results for all analytes and report them as detected above the RL or undetected at the RL.

Achieving a stated detection limit for a given analyte is helpful in providing statistically useful data. Intended data uses, such as comparison to numerical criteria or risk assessments, typically dictate specific project target reporting limits (TRLs) necessary to fulfill stated objectives. For this project, the TRLs are values that are less than Model Toxics Control Act (MTCA) Method A cleanup levels (CULs). The project analytes, applicable CULs, and laboratory TRLs are shown in Table 2. The TRLs were obtained from Test America, Tacoma, Washington. The analytical methods and processes selected will provide RLs less than the TRLs under ideal conditions. Therefore, a particular TRL is considered a target because several factors may influence final RLs. Data users must be aware that high non-detect values, although correctly reported, can bias statistical summaries. Careful interpretation is required to correctly characterize site conditions.

B.2.3 Precision

Precision is the measure of mutual agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicate or split samples, replicate analyses, and duplicate spiked environmental samples (matrix spike duplicates) and laboratory control duplicates. The closer the measured values are to each other, the more precise the measurement process. Precision error may affect data usefulness. Good precision is indicative of relative consistency and comparability between different samples. Precision will be expressed as the relative percent difference (RPD) for spike sample comparisons and field duplicate comparisons. This value is calculated by:

$$RPD = 100[(Xs - Xd)/(Xs + Xd)]/2, \quad \text{where}$$

RPD = relative percent difference

Xs = sample analytical result

Xd = duplicate sample analytical result

The RPD will be calculated for appropriate sample sets and compared to the applicable criteria. Precision can also be expressed as the percent difference (%D) between replicate analyses. Persons performing the evaluation must review one or more pertinent documents (USEPA, October 1999; USEPA, October 2004a) that address criteria exceedances and courses of action. The relative percent difference goal for this effort is 50 percent in analyses, unless the duplicate sample concentrations are less than 5 times the reporting limit.

B.2.4 Accuracy

Accuracy is a measure of bias in the analytic process. The closer the measurement value is to the true value, the greater the accuracy. This measure is defined as the difference between the reported value versus the actual value and is often measured with the addition of a known compound to a sample. The amount of known compound reported in the sample, or percent recovery, assists in determining the performance of the analytical system in correctly quantifying the compounds of interest. Since most environmental data collected represent one point spatially and temporally rather than an average of values, accuracy plays a greater role than precision in assessing the results. In general, if the percent recovery is low, non-detect results may indicate that compounds of interest are not present when in fact these compounds are present. Detected compounds may be biased low or reported at a value less than actual environmental conditions. The reverse is true when recoveries are high. Non-detect values are considered accurate while detected results may be higher than the true value.

Accuracy will be expressed as the percent recovery of a surrogate compound (also known as "system monitoring compound"), a matrix spike result, or from a standard reference material where:

$$PR = 100(Xss - Xs)/T, \quad \text{where}$$

PR = percent recovery

Xss = spike sample analytical result

Xs = sample analytical result

T = known spike concentration

Persons performing the evaluation must review one or more pertinent documents (USEPA, October 1999; USEPA, October 2004) that address criteria exceedances and courses of action. Accuracy criteria for surrogate spikes, matrix spikes and laboratory control spikes are found in Table 1.

B.2.5 Representativeness, Completeness and Comparability

Representativeness expresses the degree to which data accurately and precisely represent the actual site conditions. The determination of the representativeness of the data will be performed by completing the following:

- Comparing actual sampling procedures to those delineated within this Compliance Monitoring Plan and QAPP.
- Comparing analytical results of field duplicates to determine the variations in the analytical results.
- Invalidating nonrepresentative data or identifying data to be classified as questionable or qualitative. Only representative data will be used in subsequent data reduction, validation and reporting activities.

Completeness establishes whether a sufficient amount of valid measurements were obtained to meet project objectives. The number of samples and results expected establishes the comparative basis for completeness. Completeness goals are 90 percent useable data for samples/analyses planned. If the completeness goal is not achieved an evaluation will be made to determine if the data are adequate to meet study objectives.

Comparability expresses the confidence with which one set of data can be compared to another. Although numeric goals do not exist for comparability, a statement on comparability will be prepared to determine overall usefulness of data sets, following the determination of both precision and accuracy.

B.2.6 Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Some analytical methods specify a holding time for analysis only. Holding times for the analytes in this project are shown in Table 3.

B.2.7 Blanks

According to the *National Functional Guidelines for Organic Data Review* (USEPA, 1999), "The purpose of laboratory (or field) blank analysis is to determine the existence and magnitude of contamination resulting from laboratory (or field) activities. The criteria for evaluation of blanks apply to any blank associated with the samples (e.g., method blanks, instrument blanks, trip blanks, and equipment blanks)." Trip blanks are placed with samples during shipment; method blanks are created during sample preparation and follow samples throughout the analysis process.

Analytical results for blanks will be interpreted in general accordance with *National Functional Guidelines for Organic Data Review* and professional judgment. Blanks are discussed further in Section B.6.

B.3 SAMPLE COLLECTION, HANDLING AND CUSTODY

B.3.1 Sampling Equipment Decontamination

Groundwater samples will be collected from each well using dedicated equipment. General decontamination procedures for any other equipment (e.g., the water level indicator) will consist of the following: 1) wash with non-phosphate detergent solution (Alconox and distilled water), 2) rinse with distilled water, and 3) second distilled water rinse. Field personnel will limit cross-contamination by changing gloves between sampling events or more frequently as needed. Wash water used to decontaminate the sampling equipment will be combined with well purge water in on-site drums for proper off-site disposal.

B.3.2 Sample Containers and Labeling

The Field Coordinator will establish field protocol to manage field sample collection, handling and documentation. Samples obtained will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Table 3.

Sample containers will be labeled with the following information at the time of collection:

- project number,
- sample name, and
- date and time of collection.

Samples will be named according to the following example:

- MW-04-052810-W,

  Where:

  - "MW-04" indicates monitoring well number 4
  - "052810" indicates May 28, 2010 and,
  - "W" indicates the sample is a water sample

The sample collection activities will be noted on field logs. The Field Coordinator will monitor consistency between the Compliance Monitoring Plan, sample containers/labels, field logs and the chain of custody.

B.3.3 Sample Storage

Samples will be placed in a cooler with "wet ice" immediately after they are collected. The objective of the cold storage will be to attain a sample temperature of approximately 4 degrees Celsius. Holding times will be observed during sample storage.

B.3.4 Sample Shipment

The samples will be transported and delivered to the analytical laboratory in coolers. Field personnel will transport and hand-deliver samples to the laboratory or to a laboratory courier. All analyses for this project are anticipated to be performed using the Test America Tacoma laboratory, and sample shipping is not anticipated.

B.3.5 Chain-Of-Custody Records

Field personnel are responsible for the security of samples from the time the samples are collected until the samples have been received by the laboratory or courier. A chain-of-custody form will be completed at the end of the field day for samples being shipped to the laboratory. Information to be included on the chain-of-custody form includes:

- Project name and number.
- Sample identification numbers.
- Date and time of sampling.
- Sample matrix and number of containers from each sampling point, including preservatives used.
- Analyses to be performed or samples to be archived.
- Names of sampling personnel and transfer of custody acknowledgment spaces.

The original chain-of-custody record will be signed by the field collector and bear a unique tracking number. Field personnel shall retain carbon copies and place the original and remaining copies in a plastic bag, placed within the cooler or taped to the inside lid of the cooler before sealing the container for transport. This record will accompany the samples during transit by the field team member or courier to the laboratory.

B.3.6 Laboratory Custody Procedures

The laboratory will follow their standard operating procedures (SOPs) to document sample handling from time of receipt (sample log-in) to reporting. Documentation will include at a minimum, the analysts name or initial, and the time and date of analysis.

B.3.7 Field Documentation

Field documentation provides important information about potential problems or special circumstances surrounding sample collection. Field personnel will maintain daily field logs while on site. The field logs will be prepared on field report forms. Entries in the field logs and associated sample documentation forms will be made in pencil on Rite-in-the-Rain logs, or waterproof ink on standard paper, and corrections will consist of line-out deletions that are initialed and dated. Individual logs will become part of the project files.

At a minimum, the following information will be recorded during the collection of each sample:

- Sample location and description
- Sampler's name(s)
- Date and time of sample collection
- Type of sample
- Type of sampling equipment used
- Field instrument readings as appropriate
- Field observations and details that are pertinent to the integrity/condition of the samples (e.g., weather conditions, performance of the sampling equipment, sample depth control, etc.)
- Sample preservation

In addition to the sampling information, the following specific information also will be recorded in the field log for each day of sampling:

- Names of field personnel
- Time of Property arrival/departure
- Other personnel present at the Property, as appropriate
- Summary of pertinent meetings or discussions with regulatory agency personnel
- Deviations from the Compliance Monitoring Plan, Site Safety Plan and QAPP procedures
- Changes in personnel and responsibilities with reasons for the changes
- Levels of safety protection
- Calibration readings for any equipment used and equipment model and serial number

The handling, use and maintenance of field logs are the field coordinator's responsibilities.

B.4 CALIBRATION PROCEDURES

B.4.1 Field Instrumentation

Equipment and instrumentation calibration facilitates accurate and reliable field measurements. Field and laboratory equipment used on the project will be calibrated and adjusted in general accordance with the manufacturer's recommendations. Methods and intervals of calibration and maintenance will be based on the type of equipment, stability characteristics, required accuracy, intended use and environmental conditions. The basic calibration frequencies are described below.

B.4.2 Laboratory Instrumentation

For analytical chemistry, calibration procedures will be performed in general accordance with the methods cited and laboratory standard operating procedures. Calibration documentation will be retained at the laboratory and readily available for a period of six months.

B.5 DATA REPORTING AND LABORATORY DELIVERABLES

The laboratory will report data in formatted hardcopy and digital form. Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the field sample identification, the laboratory identification, reporting units, qualifiers, analytical method, analyte tested, analytical result, extraction and analysis dates, and detection limit (RL only). Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues. Laboratory electronic data deliverables (EDD) will be established by GeoEngineers, Inc., with the contract laboratory. Final results will be sent to the Project Manager.

B.6 INTERNAL QUALITY CONTROL

Table 4 summarizes the types and frequency of QC samples to be collected, including both field QC and Laboratory QC samples. The following sections describe field and laboratory QC samples.

B.6.1 Field Quality Control

Field QC samples serve as a control and check mechanism to monitor the consistency of sampling methods. The following sections provide a description of field QC samples.

FIELD DUPLICATES

In addition to replicate analyses performed in the laboratory, field duplicates also serve as measures for precision. Field duplicates are used to evaluate the consistency of the sampling techniques used by field personnel. Additionally, field duplicates are used to evaluate the precision and consistency of laboratory analytical procedures and methods.

One field duplicate groundwater sample will be collected during each round of monitoring and analyzed for the same analytes as the parent sample. The field duplicate will be collected by "splitting" the water approximately equally between parent and duplicate containers for each analyte.

TRIP BLANKS

One trip blank will be placed in each cooler that contains samples to be analyzed for VOCs. The blank samples will be analyzed for the same VOCs as the parent sample.

B.6.2 Laboratory Quality Control

Laboratory quality control procedures will be evaluated through a formal data validation process. The analytical laboratory will follow standard method procedures that include specified QC monitoring requirements. These requirements will vary by method but generally include:

- method blanks
- internal standards

- calibrations
- matrix spike/matrix spike duplicates (MS/MSD)
- laboratory control spikes/spike duplicates (LCS/LCSD)
- laboratory replicates or duplicates
- surrogate spikes

The following sections provide a description of the laboratory QC samples.

LABORATORY BLANKS

Laboratory procedures employ the use of several types of blanks but the most commonly used blank for QA/QC assessments are method blanks. Method blanks are laboratory QC samples that consist of either a soil-like material having undergone a contaminant destruction process or HPLC water. Method blanks are extracted and analyzed with each batch of environmental samples undergoing analysis. Method blanks are particularly useful during volatiles analysis since VOCs can be transported in the laboratory through the vapor phase. If a substance is found in the method blank then one (or more) of the following occurred:

- Measurement apparatus or containers were not properly cleaned and contained contaminants.
- Reagents used in the process were contaminated with a substance(s) of interest.
- Contaminated analytical equipment was not properly cleaned.
- Volatile substances in the air with high solubility or affinities toward the sample matrix contaminated the samples during preparation or analysis.

It is difficult to determine which of the above scenarios occurred if blank contamination occurs. However, it is assumed that the conditions that affected the blanks also likely affected the project samples. Given method blank results, validation rules assist in determining which substances in samples are considered "real," and which ones are attributable to the analytical process. Furthermore, EPA guidelines state, ". . . there may be instances where little or no contamination was present in the associated blank, but qualification of the sample is deemed necessary. Contamination introduced through dilution water is one example."

CALIBRATIONS

Several types of calibrations are used, depending on the method, to determine whether the methodology is "in control" by verifying the linearity of the calibration curve and to assure that the sample results reflect accurate and precise measurements. The main calibrations used are initial calibrations, daily calibrations and continuing calibration verification.

MATRIX SPIKE/MATRIX SPIKE DUPLICATES (MS/MSD)

MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. MS/MSD data is reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix affects cannot be determined due to dilution and/or high levels of related substances in the sample. A matrix spike is evaluated by spiking a known amount of one or more of the target analytes ideally at a concentration of 5 to 10 times higher than the sample result. A percent recovery is calculated by subtracting the sample result from the spike result, dividing by the spiked amount, and multiplying by 100.

The samples for the MS and MSD analyses should be collected from a sampling location that is believed to exhibit low-level contamination. A sample from an area of low-level contamination is needed because the objective of MS/MSD analyses is to determine the presence of matrix interferences, which can best be achieved with low levels of contaminants. Additional sample volume will be collected for these analyses. This MS/MSD sample will be a composite to achieve a level of representativeness and reproducibility in the data. For the first round of groundwater monitoring, the MS/MSD sample will be collected from one of the downgradient wells at the Property (i.e., not MW-4 or MW-13). Subsequent choosing of the location for MS/MSD samples will be based on results of the first round of sampling.

LABORATORY CONTROL SPIKES/LABORATORY CONTROL SPIKE DUPLICATES (LCS/LCSD)

Also known as blanks spikes, LCS samples are similar to MS samples in that a known amount of one or more of the target analytes are spiked into a prepared media and a percent recovery of the spiked substances are calculated. The primary difference between a MS and LCS is that the LCS spike media is considered “clean” or contaminant free. For example, HPLC water is typically used for LCS water analyses. The purpose of an LCS is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance, and analyst performance. LCS data must be reviewed in context with other controls to determine if out-of-control events occur.

LABORATORY REPLICATES/DUPLICATES

Laboratories often utilize MS/MSDs, LCS/LCSDs and/or replicates to assess precision. Replicates are a second analysis of a field-collected environmental sample. Replicates can be split at varying stages of the sample preparation and analysis process, but most commonly occur as a second analysis on the extracted media.

SURROGATE SPIKES

The purposes of using a surrogate are to verify the accuracy of the instrument being used and extraction procedures. Surrogates are substances similar to, but not one of, the target analytes. A known concentration of surrogate is added to the sample and passed through the instrument, noting the surrogate recovery. Each surrogate used has an acceptable range of percent recovery. If a surrogate recovery is low, sample results may be biased low and depending on the recovery value, a possibility of false negatives may exist. Conversely, when recoveries are above the specified range of acceptance a possibility of false positives exist, although non-detected results are considered accurate.

B.7 DATA REDUCTION AND ASSESSMENT PROCEDURES

B.7.1 Data Reduction

Data reduction involves the conversion or transcription of field and analytical data to a useable format. The laboratory personnel will reduce the analytical data for review by the QA Leader and Project Manager.

B.7.2 Field Measurement Evaluation

Field data will be reviewed at the end of each day by following the QC checks outlined below. Field data documentation will be checked against the applicable criteria as follows:

- Sample collection information
- Field instrumentation and calibration
- Sample collection protocol
- Sample containers, preservation and volume
- Field QC samples collected at the frequency specified
- Sample documentation and chain of custody protocols
- Sample delivery

Cooler receipt forms and sample condition forms provided by the laboratory will be reviewed for out-of-control incidents. If anything is found to be out-of-control the project manager will implement corrective actions to ensure that additional out-of-control incidents do not occur. The final report will contain what effects, if any, the out-of-control incident may have on data quality. Sample collection information will be reviewed for correctness before inclusion in a final report.

B.7.3 Field Quality Control Evaluation

A field QC evaluation will be conducted by reviewing field logs and daily reports, discussing field activities with staff, and reviewing field QC samples (trip blanks and field duplicates). Trip blanks will be evaluated using the same criteria as method blanks.

B.7.4 Laboratory Data Quality Control Evaluation

The laboratory data assessment will consist of a formal review of the following QC parameters:

- Holding times
- Method blanks
- Matrix spike/spike duplicates
- Laboratory control spikes/spike duplicates
- Surrogate spikes
- Replicates

In addition to these QC mechanisms, other documentation such as cooler receipt forms and case narratives will be reviewed to fully evaluate laboratory QA/QC.

B.7.5 Corrective Action

Any deviation from the established criteria will be documented, and the data will be qualified, as appropriate. If significant quality assurance problems are encountered, appropriate corrective action as determined by GeoEngineers' project manager, GeoEngineers' associate/principle and/or the analytical laboratory will be implemented as appropriate.

8.0 REFERENCES

Model Toxics Control Act (MTCA) Cleanup Regulations*, Washington Administrative Code, Chapter 173-340.* Washington State Department of Ecology.

USEPA. October 1999. Contract Laboratory Program National Functional Guidelines for Organic Data Review.

USEPA. October 2004. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.

TABLE B-1

MEASUREMENT QUALITY OBJECTIVES

318 STATE AVENUE NE

OLYMPIA, WASHINGTON

Laboratory Analysis	Reference Method	Check Standard (LCS) %R Limits[1]	Matrix Spike (MS) %R Limits[1]	Surrogate Standards (SS) %R Limits [2]	MS Duplicate Samples or Lab Duplicate RPD Limits[3]	Field Duplicate Samples RPD Limits[3]
VOCs	EPA 8260 B	60%-140%	60%-140%	60%-140%	≤30%	≤30%
Arsenic	EPA 6020	75%-125%	75%-125%	NA	≤20%	≤30%
Sulfate	EPA 300.0	50%-150%	50%-150%	35%-165%	≤30%	≤30%

Notes:

Method numbers refer to EPA SW-846 Analytical Methods.

[1] Recovery ranges are goals. Actual percent recovery limits are based on laboratory control limits. Limits will vary for individual analytes and may be outside of the limits shown.

[2] Surrogate standard limits are approximate. Actual percent recovery limits are based on laboratory control limits. Limits will vary for individual analytes and may be outside of the limits shown.

[3] RPD control limits are only applicable if the concentrations are greater than 5 times the method reporting limit (MRL). For results less than 5 times the MRL, the difference between the sample and duplicate must be less than the MRL.

VOCs = Volatile organic compounds including tetrachloroethene (PCE), trichloroethene (TCE), 1,1-dichloroethene (DCE), cis-DCE, trans-DCE and vinyl chloride.

LCS = Laboratory Control Sample

%R = Percent Recovery

RPD = Relative Percent Difference

NA = Not Applicable

TABLE B-2

ANALYTES, CLEANUP LEVELS, AND TARGET REPORTING LIMITS

318 STATE AVENUE NE
OLYMPIA, WASHINGTON

Analyte	MTCA[1] Cleanup Level	Laboratory Reporting Limit
Volatile Organic Compounds (µg/l)		
Tetrachloroethene	5	0.1
Trichloroethene	5[2]	0.1
1,1-Dichloroethene	400[3]	0.1
Cis-1,2-Dichloroethene	80[3]	0.1
Trans-1,2-Dichloroethene	160[3]	0.1
Vinyl Chloride	0.2[2]	0.1
Total Metals (mg/l)		
Arsenic	0.005[2]	0.002
Conventionals (mg/l)		
Sulfate	NA	1.2

Notes:

[1] Model Toxics Control Act (MTCA) Cleanup Regulation Chapter 173-340 WAC. MTCA Method A cleanup levels are presented for chemicals that have Method A criteria. Method B cleanup levels are presented for chemicals that do not have Method A criteria.

[2] MTCA Method A cleanup level.

[3] MTCA Method B cleanup level.

mg/l = milligram per liter

µg/l = microgram per liter

NA = Not applicable; cleanup level not established by Washington State Department of Ecology

TABLE B-3

TEST METHODS, SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIME[1]

318 STATE AVENUE NE

OLYMPIA, WASHINGTON

Analysis	Method	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times
VOCs	EPA 8260B	120 mL	Three - 40 mL VOA Vials (no headspace)	0 to 6 degrees C HCl - pH<2	14 days preserved 7 days unpreserved
Arsenic	EPA 6020	500 mL	1 L poly bottle	0 to 6 degrees C HNO_3 - pH<2	180 days
Sulfate	EPA 300.0	250 mL	250 mL poly	0 to 6 degrees C	28 days

Notes:

[1] Holding Times are based on elapsed time from date of collection

VOCs = Volatile organic compounds including tetrachloroethene (PCE), trichloroethene (TCE), 1,1-dichloroethene (DCE), cis-DCE, trans-DCE and vinyl chloride.

VOA = Volatile organic analysis

HCl = Hydrochloric Acid

HNO_3 = Nitric Acid

mL = milliliter

L = liter

TABLE B-4

QUALITY CONTROL SAMPLES TYPE AND FREQUENCY

318 STATE AVENUE NE

OLYMPIA, WASHINGTON

Parameter	Field Quality Control		Laboratory Quality Control			
	Field Duplicates	Trip Blanks	Method Blanks	LCS	MS / MSD	Lab Duplicates
VOCs	1 per round of monitoring	1/cooler	1/batch	1/batch	1 MS/batch	1/batch
Arsenic	1 per round of monitoring	NA	1/batch	1/batch	1 MS/batch	1/batch
Sulfate	1 per round of monitoring	NA	1/batch	1/batch	1 MS/batch	1/batch

Notes:

An analytical batch is defined as a group of samples taken through a preparation procedure and sharing a method blank, LCS, and MS/ MSD (or MS and lab duplicate).

No more than 20 field samples can be contained in one batch.

LCS = Laboratory control sample

MS = Matrix spike sample

MSD = Matrix spike duplicate sample

VOCs = Volatile organic compounds including tetrachloroethene (PCE), trichloroethene (TCE), 1,1-dichloroethene (DCE), cis-DCE, trans-DCE and vinyl chloride.

APPENDIX C
Health and Safety Plan

SITE HEALTH & SAFETY PLAN

318 STATE AVENUE NE
OLYMPIA, WASHINGTON

APRIL 16, 2010

GEOENGINEERS

File No. 0415-049-06

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GEOENGINEERS, INC.
SITE HEALTH AND SAFETY PLAN
318 STATE AVENUE NE
FILE NO. 0415-049-06

This HASP is to be used in conjunction with the GeoEngineers Safety Program Manual. Together, the written safety programs and this HASP constitute the site safety plan for this site. This plan is to be used by GeoEngineers personnel on this site and must be available on-site. If the work entails potential exposures to other substances or unusual situations, additional safety and health information will be included, and the plan will need to be approved by the GeoEngineers Health and Safety Manager. All plans are to be used in conjunction with current standards and policies outlined in the GeoEngineers Health and Safety Program Manual.

Liability Clause: If requested by subcontractors, this site safety plan may be provided for informational purposes only. In this case, Form C-3 shall be signed by the subcontractor. Please be advised that this Site Safety Plan is intended for use by GeoEngineers Employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this Site Safety Plan. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by them.

1.0 GENERAL PROJECT INFORMATION

Project Name:	318 State Avenue NE
Project Number:	0415-049-06
Type of Project:	Well Installation and Groundwater Sampling
Start/Completion:	To Be Determined
Subcontractors:	To Be Determined

2.0 WORK PLAN

The work to be performed consists of installing two 2-inch-diameter groundwater monitoring wells to depths of up to 12 feet below ground surface (bgs) at the Site, developing the wells, and sampling them along with 8 other existing monitoring wells. After this round of work, at least three more quarters of groundwater sampling are anticipated. This HASP is for the initial work as well as the follow up groundwater monitoring.

2.1 SITE DESCRIPTION AND HISTORY

The Site is approximately 1.1 acres in size and is located within the City of Olympia, Thurston County, Washington. The property is generally situated between the southern end of the East and West Bays of Budd Inlet (Figure 1) and is bounded on the south by State Avenue, on the east by Adams Street and on the west by Franklin Street (Figure 2). The Site is bounded on the north by several commercial buildings and Olympia Avenue.

The Site is relatively flat, with ground surface elevations ranging from approximately 11 to 12 feet national geodetic vertical datum (NGVD). The western half of the property is paved with asphalt and the eastern half of the Site is exposed soil and gravel in the former location of a Transportation Data Office (TDO).

The Site was undeveloped until at least 1888. The western portion of the property was part of the shoreline of Budd Inlet and the eastern portion of the property was part of the submerged marine or intertidal area of Budd Inlet.

In the late 1800s, Budd Inlet was dredged and this material was placed as fill to extend the peninsula to the north and east. Some filling of the Site had occurred by 1891 that extended the upland portion of the property to the east. In 1891, the Olympia Foundry and Machinery Company established a foundry building and machine shop on the southeastern portion of the property. However, the area to the east and northeast of the foundry and machine shop were still a part of Budd Inlet. During foundry operations the remainder of the eastern portion of the Site was filled; primarily during 1911 and 1912, when almost 22 blocks were added to downtown Olympia using dredged fill generated during development of a deep-water harbor and fill sloughs north and east of the City. This dredged material comprises fill currently present from the Site to the current shoreline of the East Bay of Budd Inlet. The western portion of the Site remained undeveloped during the late 1800s to 1923.

Two automotive/truck sheds, a machine/automotive shop, and a materials testing laboratory that was part of the TDO were located on the Site in 1924.

A fire burned and damaged buildings and equipment at the Site in 1936. By 1939, the TDO was rebuilt including a portion of the pre-existing laboratory structure. The TDO was demolished and removed from the property in 2007.

Multiple investigations were performed at the Property between July 2006 and May 2009. The scope and results of investigation activities performed between July 2006 and October 2008 are described in the RI Report (GeoEngineers, 2009a). Additional groundwater and soil sampling was performed in March and May of 2009, respectively. The scope and results of the March 2009 groundwater monitoring activities are described in the Draft Final Groundwater Sampling Report (GeoEngineers, 2009b). The scope and results of additional soil sampling activities are described in the Test Pit Investigation Report (GeoEngineers, 2009c).

A remedial action was performed at the Site during September and October 2009. The purpose of the remediation was to remove contaminated soil and debris identified during the RI from the Property. Contaminated soil and debris contained chemicals of concern, which included arsenic, lead, chlorinated solvents, benzene and cPAHs at concentrations greater than MTCA cleanup levels. Approximately 6,800 tons of contaminated soil and debris was excavated from the Property and disposed of at the Riverbend Landfill in McMinneville, Oregon. Additionally, a previously unidentified UST was decommissioned by complete removal and previously unidentified asbestos-containing material was properly abated and disposed of offsite. Confirmation soil samples collected at the limits of the excavations indicate that concentrations of chemicals of concern at the excavation limits were below the MTCA cleanup levels. Following remediation and backfill activities, the ground surface and hard-surfaced areas at the Property was restored to the approximate surface elevation that existed before remediation.

2.2 List of Field Activities

Check the activities to be completed during the project

	Site reconnaissance		Field Screening of Soil Samples
X	Exploratory Borings		Vapor Measurements
	Construction Monitoring	X	Groundwater Sampling
	Surveying	X	Groundwater Depth Measurement
	Test Pit Exploration		Product Sample Collection
X	Monitoring Well Installation		Soil Stockpile Testing
X	Monitoring Well Development		Remedial Excavation
	Soil Sample Collection		Underground Storage Tank (UST) Removal Monitoring
	Remediation System Monitoring		Recovery of Free Product

3.0 LIST OF FIELD PERSONNEL AND TRAINING

Name of Employee on Site	Level of HAZWOPER Training (24-/40-hr)	Date of 8-Hr Refresher Training	Date of HAZWOPER Supervisor Training	First Aid/ CPR	Date of Other Trainings	Date of Respirator Fit Test
Mike Sullivan	40 hr	2/18/10	NA	11/30/09	NA	2/3/10
John Deeds	40 hr	2/18/10	NA	4/7/09	NA	3/8/10

CHAIN of COMMAND	TITLE	NAME	TELEPHONE NUMBERS
1	Project Manager	Nick Rohrbach	253.732.2138
2	HAZWOPER Supervisor	Nick Rohrbach	253.312.8626
3	Field Engineer/Geologist	Mike Sullivan/ John Deeds	253.219.8640 253.312.8628
4	Site Safety and Health Supervisor*	Mike Sullivan / John Deeds	253.219.8640/ 253.312.8628
5	Client Assigned Site Supervisor	NA	NA
6	Health and Safety Program Manager	Wayne Adams	253.350.4387
N/A	Subcontractor(s)	To Be Determined	To Be Determined
	Current Owner	City of Olympia	360.753.8211

* **Site Safety and Health Supervisor --** The individual present at a hazardous waste site responsible to the employer and who has the authority and knowledge necessary to establish the site-specific health and safety plan and verify compliance with applicable safety and health requirements.

4.0 EMERGENCY INFORMATION

Hospital Name and Address: Providence St Peter Hospital
413 Lily Road NE
Olympia, Washington 98506

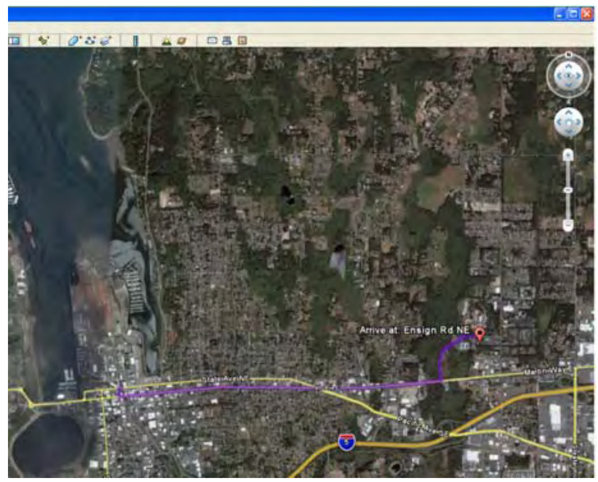
Phone Numbers [Main / ER (Automated)]: Phone: **(360) 491-9480 / (360) 493-7289**

Distance:

Route to Hospital:

1. Go south on Franklin or Adams Streets, go 1 block
2. Turn left (east) on 4th Avenue east, go 1.6 miles
3. Continue on Martin Way 0.5 miles
4. Turn left at Ensign Road NE, 0.5 miles

Hospital is on your left



Ambulance:	9-1-1
Poison Control:	Seattle (206) 253-2121; Other (800) 732-6985
Police:	9-1-1
Fire:	9-1-1
Location of Nearest Telephone:	Cell phones are carried by field personnel.
Nearest Fire Extinguisher:	Located in the GeoEngineers vehicle on-site.
Nearest First-Aid Kit:	Located in the GeoEngineers vehicle on-site.

4.1 STANDARD EMERGENCY PROCEDURES

Get help

- send another worker to phone 9-1-1 (if necessary)
- as soon as feasible, notify GeoEngineers' Project Manager

Reduce risk to injured person

- turn off equipment
- move person from injury location (if in life-threatening situation only)

- keep person warm
- perform CPR (if necessary)

Transport injured person to medical treatment facility (if necessary) -

- by ambulance (if necessary) or GeoEngineers vehicle
- stay with person at medical facility
- keep GeoEngineers manager apprised of situation and notify Human Resources Manager of situation

5.0 HAZARD ANALYSIS

- *Note: A hazard assessment will be completed at every site prior to beginning field activities. Updates will be included in the daily log. This list is a summary of hazards listed on the form.*

5.1 PHYSICAL HAZARDS

X	Drill rigs
	Backhoe
	Trackhoe
	Crane
	Front End Loader
	Excavations/trenching (1:1 slopes for Type B soil)
	Shored/braced excavation if greater than 4 feet of depth
	Overhead hazards/power lines
	Tripping/puncture hazards (debris on-site, steep slopes or pits)
	Unusual traffic hazard – Street traffic
	Heat/Cold, Humidity
X	Utilities/ utility locate

- Utility checklist will be completed as required for the location to preventing drilling or digging into utilities. Note: These procedures should be added to the standard GeoEngineers utility checklist.
- Work areas will be marked with reflective cones, barricades and/or caution tape. Personnel wearing high-visibility vests; vests are mandatory to ensure personnel can be seen by vehicle and equipment operators.
- Field personnel will be aware at all time of the location and motion of heavy equipment in the area of work to ensure a safe distance between personnel and the equipment. Personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus. Personnel will approach operating heavy equipment only when they are certain the operator has indicated that it is safe to do so through hand signal or other acceptable means.
- Heavy equipment and/or vehicles used on this site will not work within 20 feet of overhead utility lines without first ensuring that the lines are not energized. This distance may be reduced to 10 feet depending on the client and the use of a safety watch. Working equipment around overhead power lines requires distance and a spotter.

Keep a safe distance from energized parts which is a minimum of 10 feet for 50 kV and under. The minimum distance will be more for higher voltages (above 50kV). The only exception is for trained and qualified electrical workers using insulated tools designed for high voltage lines.

Never touch an overhead line if it has been brought down by machinery or has fallen. Never assume lines are de-energized. When a machine is in contact with an overhead line, **DO NOT** allow anyone to come near or touch the machine. Stay away from the machine and summon outside assistance. Never touch a person who is in contact with a live power line.

When mechanical equipment is being operated near overhead power lines, employees standing on the ground may not contact the equipment unless it is located so that the required clearance cannot be violated even at the maximum reach of the equipment.

- Personnel will avoid tripping hazards and other hazardous encumbrances.
- Heat stress control measures are being implemented according to the GeoEngineers, Inc. program with water provided on-site. See Additional Programs at end of this HASP.

5.2 ENGINEERING CONTROLS

__________ Trench shoring (1:1 slope for Type B Soils)
__________ Location work spaces upwind/wind direction monitoring
__________ Other soil covers (as needed)
__________ Other (specify)____

5.3 CHEMICAL HAZARDS (POTENTIALLY PRESENT AT SITE)

Note: Remediation was performed at the Site as described in Section 2.1. Presumably contaminant concentrations in soil have been reduced to below MTCA Method A cleanup levels. To be conservative, the concentrations shown below are the maximum concentrations observed BEFORE remediation.

Maximum Soil Chemistry (mg/kg)	
	Petroleum Products
	Naphthalenes or paraffins
1	Aromatic hydrocarbons (benzene, ethylbenzene, toluene, xylenes [BETX])
	Gasoline
	Diesel fuel
	Waste oil
	Other petroleum fuels (list) ____________________________
	Organic Compounds
2.3	Chlorinated hydrocarbons (TCE) (MTCA Method A is 0.3 mg/kg to compare)
4.8	Carcinogenic Polycyclic aromatic hydrocarbons (cPAHs) (MTCA A = 0.1)
	Pesticides/Herbicides
	Other ____
	Metals
840	Lead
	Copper
	Chromium

	Zinc
40	Arsenic

5.3.1 Trichloroethene (TCE)

The PEL is 100 ppm (OSHA) or 50 ppm (ACGIH) for an 8-hour average. The PID will detect TCE. Central nervous system effects are the primary effects noted from acute inhalation exposure to trichloroethene in humans, with symptoms including sleepiness, confusion, and feelings of euphoria. Effects on the gastrointestinal system, liver, kidneys and skin have also been noted.

Trichloroethene absorption by inhalation, dermal, and oral exposure is very rapid. Trichloroethene is metabolized in humans and animals to a number of substances which themselves are known to be toxic: chloral hydrate, trichloroacetic acid, dichloroacetic acid and trichloroethanol.

TCE is very lipophilic; hence, all routes of exposure can contribute to TCE absorption. Inhalation is the most important route of TCE uptake by which absorption is very rapid. The initial rate of uptake of inhaled TCE is quite high, leveling off after a few hours of exposure.

TCE defats the skin and disrupts the stratum corneum, thereby enhancing its own absorption. The rate of absorption probably increases with greater dermal disruption. However, dermal route is generally not a significant route of exposure.

5.3.2 Other Hazards

Characteristics of other potential contaminants of concern are summarized in the table below.

Summary of Chemical Hazards

Compound/ Description	Airborne Exposure Limits/IDLH	Exposure Routes	Toxic Characteristics
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAH)	PEL 0.2 mg/m^3 TLV 0.2 mg/m^3 REL 0.1 mg/m^3 IDLH 80 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Dermatitis, bronchitis, potential carcinogen
Arsenic	PEL 0.01 mg/m^3 TLV 0.01 mg/m^3 Ceiling 0.002 mg/m^3 IDLH 5 mg/m^3	Inhalation, skin absorption, ingestion, skin and/or eye contact	Ulcerated nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, potential carcinogen
Lead (and inorganic compounds as lead)	PEL 0.05 mg/m^3 TLV 0.05 mg/m^3 REL 0.05 mg/m^3 IDLH 100 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia, facial pallor, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic, anemia, gingival lead line, tremor, wrist and ankle paralysis, encephalopathy, kidney disease, irritated eyes, hypotension

Notes:
IDLH = immediately dangerous to life or health
mg/m^3 = milligrams per cubic meter
PEL = permissible exposure limit
TLV = threshold limit value

Biological Hazards and Procedures

Y/N	Hazard	Procedures
	Poison Ivy or other vegetation	
	Insects or snakes	
X	Used hypodermic needs or other infectious hazards	**Do not pick up or contact**
	Others	

Site personnel shall avoid contact with or exposures to potential biological hazards encountered.

Additional Hazards (Update in Daily Report)

The Site is a parking lot that is currently not supposed to be being used; however there is always the potential for a member of the general public to drive onto the Site. Be careful.

6.0 AIR MONITORING PLAN

Work upwind if at all possible.

Check instrumentation to be used:

__X__ Photoionization Detector (PID)

______ Other (i.e., detector tubes): ____

Check monitoring frequency/locations and type (specify: work space, borehole, breathing zone):

______ **15 minutes - Continuous during soil disturbance activities or handling samples**

______ 15 minutes

______ 30 minutes

__X__ Hourly (in breathing zone during excavations, drilling, sampling)

Additional personal air monitoring for specific chemical exposure:

Action levels:

- The workspace will be monitored using a photoionization detector (PID). These instruments must be properly maintained, calibrated and charged (refer to the instrument manuals for details). Zero this meter in the same relative humidity as the area in which it will be used and allow at least a 10-minute warm-up prior to zeroing. Do not zero in a contaminated area. The PID can be tuned to read chemicals specifically if there are not multiple contaminants on-site. It can be tuned to detect one chemical with the response factor entered into the equipment, but the PID picks up all volatile organic compounds (VOCs) present. The ionization potential (IP) of the chemical has to be less than the PID lamp (11.7 / 10.6eV), and the PID does not detect methane. The ppm readout on the instrument is relative to the IP of isobutylene (calibration gas), so conversion must be made in order to estimate ppm of the chemical on-site.
- An initial vapor measurement survey of the site should be conducted to detect "hot spots" if contaminated soil is exposed at the surface. Vapor measurement surveys of the workspace should be conducted at least hourly or more often if persistent petroleum-related odors are detected. Additionally, if vapor concentrations exceed 5 ppm above background continuously for a 5-minute period as measured in the breathing zone, upgrade to Level C personal protective equipment (PPE) or move to a noncontaminated area.

- Standard industrial hygiene/safety procedure is to require that action be taken to reduce worker exposure to organic vapors when vapor concentrations exceed one-half the TLV. Because of the variety of chemicals, the PID will not indicate exposure to a specific PEL and is therefore not a preferred tool for determining worker exposure to chemicals. If odors are detected, then employees shall upgrade to respirators with Organic Vapor cartridges and will contact the Health and Safety Program Manager for other sampling options.

Air Monitoring Action Levels

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; every 60 minutes and in event of odors	Background to 5 ppm in breathing zone	Use Level D or Modified Level D PPE
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; every 60 minutes and in event of odors	5 to 25 ppm in breathing zone	Upgrade to Level C PPE
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; every 60 minutes	> 25 ppm in breathing zone	Stop work and evacuate the area. Contact Certified Industrial Hygienist (CIH) for guidance.
Combustible Atmosphere	Environmental Remedial Actions	PID	Start of shift; every 60 minutes	>10% LEL or >1,000 ppm	Depends on contaminant. The PEL is usually exceeded before the lower explosive limit (LEL).

7.0 SITE CONTROL PLAN

The Site is currently vacant. The general public may access the Site. Use cones and/or flagging to secure a work zone that is approximately a 15-foot radius around your vehicle and the drill rig. If approached by any individual, use necessary precautions to keep them safe and away from the work area. A site map is included in the SAP for this project. Practice the buddy system with the driller and helpers (see Section 7.3). At the safety tailgate meeting, discuss an appropriate means of communicating during emergencies and establish a safe zone (see Section 7.4). Discuss the hospital / hospital route with drillers at the safety tailgate meeting (see Section 4.0).

7.1 TRAFFIC OR VEHICLE ACCESS CONTROL PLANS

The Site is a parking lot that is currently being used and there is always the potential for a member of the general public to drive onto the Site. Be careful.

7.2 SITE WORK ZONES

Hot zone/exclusion zone: *Within 15 feet of boring*

______	**Method of delineation/ excluding non-site personnel**
______	Fence
X	Survey Tape (optional)
X	Traffic Cones (required)

____
_____________ Other

The contamination reduction zone should be between the drill rig and your vehicle.

The decontamination zone should be at your tailgate; decontaminate before you eat, smoke or leave the Site (see Section 7.5).

7.3 Buddy System

Personnel on-site should use the buddy system (pairs), particularly whenever communication is restricted. If only one GeoEngineers employee is on-site, a buddy system can be arranged with subcontractor/ contractor personnel.

7.4 Site Communication Plan

Positive communications (within sight and hearing distance or via radio) should be maintained between pairs on-site, with the pair remaining in proximity to assist each other in case of emergencies. The team should prearrange hand signals or other emergency signals for communication when voice communication becomes impaired (including cases of lack of radios or radio breakdown). In these instances, you should consider suspending work until communication can be restored; if not, the following are some examples for communication:

1. Hand gripping throat: Out of air, can't breathe.
2. Gripping partner's wrist or placing both hands around waist: Leave area immediately, no debate.
3. Hands on top of head: Need assistance.
4. Thumbs up: Okay, I'm all right: or I understand.
5. Thumbs down: No, negative.

7.5 Decontamination Procedures

Decontamination consists of removing outer protective Tyvek clothing and washing soiled boots and gloves using bucket and brush provided on-site in the contamination reduction zone. Inner gloves will then be removed, and respirator, hands and face will be washed in either a portable wash station or a bathroom facility in the support zone. Employees will perform decontamination procedures and wash prior to eating, drinking or leaving the site.

7.6 Waste Disposal or Storage

PPE disposal (specify): Used PPE to be placed disposed of as indicated below.

______ On-site, pending analysis and further action

______ Secured (list method) ____

X Other (describe destination, responsible parties): ______ In bag into GeoEngineers dumpster

______

8.0 PERSONAL PROTECTIVE EQUIPMENT

Level D PPE is required at this Site. Be prepared to upgrade to level C in the event that air monitoring indicates the need to do so (see Section 6.0). Inspect PPE before work. Properly store and maintain your PPE. Wash clothes after working at this Site.

Air monitoring will be conducted for establishing the level of respiratory protection.

- Half-face combination organic vapor/high efficiency particulate air (HEPA) or P100 cartridge respirators will be available on-site to be used as necessary. P100 cartridges are to be used only if PID measurements are below the site action limit. P100 cartridges are used for protection against dust, metals and asbestos, while the combination organic vapor/HEPA cartridges are protective against both dust and vapor. Ensure that the PID or TLV will detect the chemicals of concern on-site.
- Level D PPE will be worn at all times on the site. Potentially exposed personnel will wash gloves, hands, face and other pertinent items to prevent hand-to-mouth contact. This will be done prior to hand-to-mouth activities including eating, smoking, etc. Adequate personnel and equipment decontamination will be used to decrease potential ingestion and inhalation.Individual PELs or action limits are not expected to be exceeded given the planned activities. If there are waste oil contaminants in the soil and conditions are damp, airborne dust is not likely to be an issue. If conditions are dry and dust is visible during site activities, personnel will use P100 cartridges on their respirators. **Personal Protective Equipment (PPE).** The minimum level of protective equipment for these sites is Level D. After the initial and/or daily hazard assessment has been completed, select the appropriate protective gear (that is, PPE) to preserve worker safety. Task-specific levels of PPE shall be reviewed with field personnel during the pre-work briefing conducted prior to the start of site operations.

Check applicable personal protection gear to be used:

__X__ Hardhat (if overhead hazards, or client requests)
__X__ Steel-toed boots (if crushing hazards are a potential or if client requests)
__X__ Safety glasses (if dust, particles, or other hazards are present or client requests)
__X__ Hearing protection (if it is difficult to carry on a conversation 3 feet away)
__X__ Rubber boots (if wet conditions)

Gloves (specify):

__X__ Nitrile
_____ Latex
_____ Liners
_____ Leather
__X__ Other (specify) _As necessary_________________________________

Protective clothing:

__X__ **Tyvek as needed**

_____ Saranex (personnel shall use Saranex if liquids are handled or splash may be an issue)

__X__ Cotton

__X__ Rain gear (as needed)

__X__ Layered warm clothing (as needed)

Inhalation hazard protection:

__X__ Level D

__X__ Level C (have your respirator with organic vapor/HEPA or P100 filters)

Limitations of Protective Clothing

PPE clothing ensembles designated for use during site activities shall be selected to provide protection against known or anticipated hazards. However, no protective garment, glove or boot is entirely chemical-resistant, nor does any PPE provide protection against all types of hazards. To obtain optimum performance from PPE, site personnel shall be trained in the proper use and inspection of PPE. This training shall include the following:

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after breaks unless it has been properly decontaminated.

Respirator Selection, Use and Maintenance

If respirators are required, site personnel shall be trained before use on the proper use, maintenance and limitations of respirators. Additionally, they must be medically qualified to wear a respiratory protection in accordance with 29 CFR 1910.134. Site personnel who will use a tight-fitting respirator must have passed a qualitative or quantitative fit test conducted in accordance with an OSHA-accepted fit test protocol. Fit testing must be repeated annually or whenever a new type of respirator is used. Respirators will be stored in a protective container.

Respirator Cartridges

If site personnel are required to wear air-purifying respirators, the appropriate cartridges shall be selected to protect personnel from known or anticipated site contaminants. The respirator/cartridge combination shall be certified and approved by the National Institute for Occupational Safety and Health (NIOSH). A cartridge change-out schedule shall be developed based on known site contaminants, anticipated contaminant concentrations and data supplied by the cartridge manufacturer related to the absorption capacity of the cartridge for specific contaminants. Site personnel shall be made aware of the cartridge change-out schedule prior to the initiation of site activities. Site personnel shall also be instructed to change respirator cartridges if they detect increased resistance during inhalation or detect vapor breakthrough by smell, taste or feel, although breakthrough is not an acceptable method of determining the change-out schedule. At a minimum, cartridges should be changed at least once daily.

Respirator Inspection and Cleaning

Inspect your respirator at the project site before and after use, if used. Site personnel shall inspect respirators prior to each use in accordance with the manufacturer's instructions. In addition, site personnel wearing a tight-fitting respirator shall perform a positive and negative pressure user seal check each time the respirator is donned, to ensure proper fit and function. User seal checks shall be performed in accordance with the GeoEngineers respiratory protection program or the respirator manufacturer's instructions.

9.0 ADDITIONAL ELEMENTS

9.1 HEAT STRESS PREVENTION

List all the site-specific procedures for preventing heat stress.

1) Drink water and pay attention to the signs of heat stress. Take breaks and add or subtract clothing layers as necessary to avoid heat stress.

State and federal OSHA regulations provide specific requirements for handling employee exposure to heat stress. GeoEngineers' program complies with these requirements and will be implemented in all areas where heat stress is identified as a potential health issue.

General requirements for preventing heat stress apply to outdoor work environments from May 1 through September 30, annually, only when employees are exposed to outdoor heat at or above an applicable temperature listed in Table 1. To determine which temperature applies to each worksite, select the temperature associated with the general type of clothing or personal protective equipment (PPE) each employee is required to wear.

Table 1. Heat Stress

Type of Clothing	Outdoor Temperature Action Levels
Nonbreathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52°
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°
All other clothing	89°

Keeping workers hydrated in a hot outdoor environment requires that more water be provided than at other times of the year. GeoEngineers is prepared to supply at least one quart of drinking water per employee per hour. When employee exposure is at or above an applicable temperature listed in Table 1, Project Managers shall ensure that:

- A sufficient quantity of drinking water is readily accessible to employees at all times; and
- All employees have the opportunity to drink at least one quart of drinking water per hour.

9.2 EMERGENCY RESPONSE

Indicate what site-specific procedures you will implement.

- Personnel on-site should use the "buddy system" (pairs).
- Visual contact should be maintained between "pairs" on-site, with the team remaining in proximity to assist each other in case of emergencies.
- If any member of the field crew experiences any adverse exposure symptoms while on-site, the entire field crew should immediately halt work and act according to the instructions provided by the Site Safety and Health Supervisor.
- Wind indicators visible to all on-site personnel should be provided by the Site Safety and Health Supervisor to indicate possible routes for upwind escape. Alternatively, the Site Safety and Health Supervisor may ask on-site personnel to observe the wind direction periodically during site activities.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team, contact of the PM, and reevaluation of the hazard and the level of protection required.
- If an accident occurs, the Site Safety and Health Supervisor and the injured person are to complete, within 24 hours, an Accident Report for submittal to the PM, the Health and Safety Program Manager and Human Resources. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

10.0 A SAMPLING AND MONITORING PLAN FOR DRUMS AND CONTAINERS

10.1 SITE CONTROL MEASURES

See Section 7.0.

10.2 SPILL CONTAINMENT PLANS (DRUM AND CONTAINER HANDLING)

The drums containing soil (drill cuttings) and water (purge/decontamination water) will be stored in a secured (fenced and locked) area on-site to be determined, pending proper disposal.

10.3 STANDARD OPERATING PROCEDURES FOR SAMPLING, MANAGING AND HANDLING DRUMS AND CONTAINERS

Drums and containers used during the sampling meet the appropriate Department of Transportation (DOT), OSHA and U.S. Environmental Protection Agency (EPA) regulations for the waste that they contain. Site operations shall be organized to minimize the amount of drum or container movement. When practicable, drums and containers shall be inspected and their integrity shall be ensured before they are moved. Label all drums. Before drums or containers are moved, all employees involved in the transfer operation shall be warned of the potential hazards associated with the contents.

Drums or containers and suitable quantities of proper absorbent shall be kept available and used where spills, leaks or rupture may occur. Major spills are not anticipated to occur given the small volume of soil and water generated and the fact that the drums will be placed in a locked, fenced area.

10.4 PERSONNEL MEDICAL SURVEILLANCE

GeoEngineers employees are not in a medical surveillance program because they do not fall into the category of "Employees Covered" in OSHA 1910.120(f)(2), which states a medical surveillance program is required for the following employees:

> (1) All employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;
>
> (2) All employees who wear a respirator for 30 days or more a year or as required by state and federal regulations;
>
> (3) All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and
>
> (4) Members of HAZMAT teams.

10.5 SANITATION

Local businesses could be utilized for sanitation.

10.6 LIGHTING

All work will be performed during daylight hours.

11.0 DOCUMENTATION TO BE COMPLETED FOR HAZWOPER PROJECTS

The following forms are required for Hazardous Waste Operations and Emergency Response (HAZWOPER) projects:

- Field Log
- Health and Safety Plan acknowledgment by GeoEngineers employees (Form C-2)
- Contractors Health and Safety Plan Disclaimer (Form C-3)
- Conditional forms available at GeoEngineers office: Accident Report

NOTE: The Field Report is to contain the following information:

- Updates on hazard assessments, field decisions, conversations with subcontractors, client or other parties, etc.;
- Air monitoring/calibration results, including: personnel, locations monitored, activity at the time of monitoring, etc.;
- Actions taken;
- Action level for upgrading PPE and rationale; and
- Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).

12.0 DOCUMENTATION EXPECTED TO BE COMPLETED

NOTE: The Field Log is to contain the following information:

- Updates on hazard assessments, field decisions, conversations with subconsultants, client or other parties.
- Actions taken
- Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).
- Required forms:
- Field Log
- FORM C-1 HEALTH & SAFETY MEETING
- FORM C-2 SITE SAFETY PLAN – GEOENGINEERS' EMPLOYEE ACKNOWLEDGMENT
- FORM C-3 SUBCONTRACTOR AND SITE VISITOR SITE SAFETY FORM

13.0 APPROVALS

1.	Plan Prepared	Jodie Lathrop Signature	04/16/10 Date
2.	Plan Approval	Jon Wengierd PM Signature	04/16/10 Date
3.	Health & Safety Officer	Wayne Adams Health & Safety Program Manager	04/16/10 Date

FORM C-1
HEALTH AND SAFETY PRE-ENTRY BRIEFING
318 STATE AVENUE NE
FILE NO. 0415-049-06

Inform employees, contractors and subcontractors or their representatives about:

- The nature, level and degree of exposure to hazardous substances they're likely to encounter;
- All site-related emergency response procedures; and
- Any identified potential fire, explosion, health, safety or other hazards.

Conduct briefings for employees, contractors and subcontractors, or their representatives as follows:

- A pre-entry briefing before any site activity is started; and
- Additional briefings, as needed, to make sure that the Site-specific HASP is followed.

Make sure all employees working on the Site are informed of any risks identified and trained on how to protect themselves and other workers against the Site hazards and risks

Update all information to reflect current sight activities and hazards.

All personnel participating in this project must receive initial health and safety orientation. Thereafter, brief tailgate safety meetings will be held as deemed necessary by the Site Safety and Health Supervisor.

The orientation and the tailgate safety meetings shall include a discussion of emergency response, Site communications and site hazards.

Company Employee

Date	Topics	Attendee	Name	Initials

FORM C-2
SITE SAFETY PLAN – GEOENGINEERS' EMPLOYEE ACKNOWLEDGMENT
318 STATE AVENUE NE
FILE NO. 0415-049-06

(All GeoEngineers' Site workers shall complete this form, which should remain attached to the Safety Plan and filed with other project documentation).

I hereby verify that a copy of the current Safety Plan has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document completely and acknowledge an understanding of the safety procedures and protocol for my responsibilities on Site. I agree to comply with all required, specified safety regulations and procedures.

Print Name	Signature	Date

FORM C-3
SUBCONTRACTOR AND SITE VISITOR SITE SAFETY FORM
318 STATE AVENUE NE
FILE NO. 0415-049-06

I verify that a copy of the current Site Safety Plan has been provided by GeoEngineers, Inc. to inform me of the hazardous substances on Site and to provide safety procedures and protocols that will be used by GeoEngineers' staff at the Site. By signing below, I agree that the safety of my employees is the responsibility of the undersigned company.

Print Name	Signature	Firm	Date