Work Plan
Interim Action (Source Removal)

Frenchies' Fill-N-Food
Moxee, Washington

for
Washington State Department of Ecology

December 21, 2012

GeoEngineers
Earth Science + Technology

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File No. 0504-075-00

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1.0 INTRODUCTION

This document presents an Interim Action Work Plan (IAWP), which describes interim remedial actions related to source removal at the Frenchies' Fill-N-Food property in Moxee, Washington. The approximate location of Frenchies' Fill-N-Food property (herein referred to as the "site") is shown in the Vicinity Map, Figure 1. This Work Plan is submitted to the Washington State Department of Ecology (Ecology) by GeoEngineers, Inc. (GeoEngineers) pursuant to the Scope of Work and Fee Estimate provided in the Interim Action and Groundwater Monitoring Work Amendment dated May 22, 2012 for this project.

Components of this document include: (1) a description of the planned interim action; (2) a summary of site history and current site conditions; (3) the data analysis program; (4) a brief discussion of alternatives evaluated as part of the proposed interim action; (5) a brief schedule of proposed activities associated with the interim action; 5) an interim cleanup action approach and (6) the reporting format.

2.0 DESCRIPTION OF INTERIM ACTION

2.1. General

Major elements of the proposed interim action for cleanup of soil include:

- Installation of temporary shoring along the existing building at the site and along East Moxee Avenue;
- Excavation of shallow soil with petroleum hydrocarbon concentrations greater than Model Toxics Control Act (MTCA) Method A Cleanup levels (unrestricted land use) within the site;
- Off-site disposal of contaminated soil in a landfill facility(s) permitted to accept site contaminated waste;
- Installation of infiltration galleries for potential introduction of in-situ chemical oxidation compounds;
- Backfilling with imported soil and removing temporary shoring; and
- Paving excavations.

2.2. Purpose

The purpose of the IAWP is to remove identified contaminated shallow (vadose zone) soil at the site. The objective of the IAWP is to:

- Reduce the potential for dermal contact with or ingestion of contaminated soil; and
- Reduce the potential for further migration of contaminants (principally petroleum hydrocarbons) from soil to groundwater, particularly in advance of future groundwater cleanup activities.

This report is intended to provide information and rationale for the preferred interim cleanup action for source removal. As described in the subsequent **Site Background** section of this Work Plan, site soil and groundwater is contaminated with petroleum hydrocarbons.

2.3. General Requirements

The intent of the IAWP is to achieve cleanup standards for a portion of the site, i.e. cleanup of vadose zone soil. It is possible, depending on conditions encountered during the cleanup, that soil located below the water table might be excavated and disposed off-site. However, the intent of the IAWP is not to excavate and dispose of all contaminated soil.

Based on the current information, MTCA Method A cleanup levels (unrestricted land use) will be the target cleanup levels for contaminants in soil.

2.4. Relationship to Cleanup Action

Currently, the planned cleanup actions for treatment of petroleum hydrocarbon-contaminated unsaturated and saturated soil and groundwater is remedial excavation and off-site disposal of the soil. Petroleum hydrocarbon concentrations are expected to decline through natural attenuation after the source of contamination is removed from the site. However, future interim actions related to treatment of groundwater may include conducting a pilot test utilizing in-situ chemical oxidation (ISCO) methods to evaluate the effectiveness of that alternative. Utilizing excavation and off-site disposal of vadose zone contaminated soil should not preclude the use of this proposed groundwater cleanup method, or other potential soil and groundwater cleanup alternatives.

3.0 SITE CONDITIONS

3.1. Property Description

The site is located on the southwest corner of the intersection of East Moxee Avenue and North Spokane Street within the south central portion of downtown Moxee, Washington. The existing Site building is centrally located along the western property boundary. The remainder of the Site is paved with asphaltic concrete and is relatively level. The Site is currently used as a bakery and hair salon and measures about 0.09 acres. East Moxee Avenue and North Spokane Street bound the property to the north and east, respectively. The adjacent property to the south is a City Park. The adjacent property to the west is City property and is occupied by a preschool facility named Kid's Korner. The site is relatively level. The general location of the site and the general site layout is depicted on Site Plan, Figure 2.

3.2. Site History and Previous Site Characterization Activities

The Site previously operated as a gasoline station and auto service center until about 1994. During January 1994, Cayuse Environmental (Cayuse) and their excavation contractor removed three 4,000-gallon and one 6,000-gallon gasoline underground storage tanks (USTs) from the Site. The associated UST removal report (Cayuse, 1994) indicated the four USTs were located south of the "store" building (assumed to be the existing building) and the associated fuel lines ran from the tanks to fuel dispensers located north of the store. The four USTs removed in 1994 reportedly were installed during the mid-1980s and replaced four previously-installed gasoline USTs at the site. Precise UST and dispenser locations were not provided in the Cayuse report. The Cayuse report indicated approximately 1,800 cubic yards of petroleum-impacted soil were excavated during UST removal activities. Soil samples contained concentrations of gasoline-range petroleum hydrocarbons (GRPH) greater than MTCA Method A cleanup criteria. Groundwater was encountered about 10 feet below grade during excavation activities. Laboratory results indicated a grab sample collected from groundwater accumulated in the excavation contained GRPH concentrations greater than MTCA Method A cleanup criteria.

GeoEngineers conducted site assessments for Ecology at the Site in February and September/October 2012, including the installation of four monitoring wells (MW-1 through MW-4). GeoEngineers conducted the first quarterly groundwater assessment in October 2012. Soil and groundwater assessment results indicate vadose zone and unsaturated soils in soil samples obtained from DP-3 through DP-5 and DP-8 through D-10, MW-2 and MW-3 and in groundwater samples obtained from MW-2 and MW-3 are contaminated with GRPH and volatile organic compounds (VOCs) on and downgradient (west) of the site. Groundwater has been measured at depths between about 9.86 feet to 11.5 feet below ground surface (bgs) during the soil assessment activities and at depths of between 15.26 feet to 16.11 feet below the top of the monitoring well casings during quarterly groundwater monitoring activities.

3.3. Subsurface Conditions

3.3.1. Geology and Soils Review

The Washington Department of Natural Resources, "Geologic Map of the East Half of the Yakima 1:100,000 Quadrangle, Washington (1994)" indicates that one geologic unit, Quaternary Loess deposits (Ql) is mapped near the site. The Loess deposits include Eolian (wind-blown) silt and fine sand; which locally include multiple caliche layers and tephra beds. The caliche beds consist of soils that have been cemented with calcium carbonate. The tephra beds consists of materials ejected from a volcano that have been transported through the air and deposited in measureable layers.

The U.S. Department of Agriculture Soil Conservation Service for Yakima County (1985) indicates that native soils at the site include flood plain and terrace deposits composed of Umapine alkaline silt loam. Silt with varying amounts of sand and gravel and sand with silt were observed during GeoEngineers February 2012 soil assessment at the site.

3.3.2. Soil Conditions

3.3.2.1. GENERAL

Soil conditions at the site were interpreted by GeoEngineers based on review of soil samples obtained from 13 (DP-1 through DP-13) direct-push borings and 4 borings/monitoring wells (MW-1 through MW-4) drilled and installed using hollow-stem auger techniques in February and September 2012, respectively. The approximate locations of the borings and monitoring wells are shown on Figure 2. Direct-push borings DP-1 through DP-13 were advanced to depths in the range of about 8 to 16 feet below current site grade using a truck-mounted Geoprobe® 5400 drill rig. Soil borings MW-1 through MW-4 were drilled using a hollow stem auger to depths of 22 feet below current site grade. Soil samples from the direct-push and augered borings were obtained at discrete intervals for field-screening of petroleum hydrocarbons using photoionization detector

(PID) and water sheen methods. Select soil samples also were collected and submitted to an analytical laboratory. A detailed description of the field exploration program and logs of the borings and monitoring wells are presented in GeoEngineers' "Soil Assessment" (May 21, 2012) and "Soil and Groundwater Assessment" (expected to be published in December 2012) reports .

3.3.2.2. OBSERVED SOIL CONDITIONS

Shallow native soil conditions at the site generally consists of interbedded silt and fine sand with varying amounts of gravel. Overlying fill material was observed in direct push borings DP-2, DP-5, DP-10, and DP-13 and is composed primarily of silt or gravel (depending on location) and ranges from about 1 to 13½ feet in observed thickness. Groundwater was encountered in the borings at about 10 to 18.5 feet bgs.

Headspace vapors were not detected and no sheen to slight sheens were observed on soil from borings DP-6, DP-7, DP-11 through DP-13, MW-1 and MW-4. Headspace vapor measurements ranged between 30 parts per million (ppm) and 2,060 ppm and slight to heavy sheens were observed from the remaining borings. Stained soil also was observed from soil samples collected from boring DP-1, DP-3, DP-5, and DP-13. Field screening indications of contaminated soil were observed both above and below the static water level.

3.3.3. Groundwater Conditions

Groundwater was measured at direct-push and augered boring locations at depths in the range of about 10 to 18½ feet below current site grade at the time of drilling. Groundwater was measured in monitoring wells MW-1 through MW-4 during the October 2012 monitoring event at depths in the range of 15.26 feet (MW-4) to 16.11 feet (MW-1). Summary of Groundwater Level Measurements, Table 1 presents a summary of groundwater elevations obtained during the October 2012 monitoring event. Groundwater Elevations, October 19, 2012, Figure 3 shows groundwater elevations and estimated groundwater flow directions for the site during a previous monitoring event in October 2012.

4.0 CHEMICAL ANALYTICAL TESTING RESULTS

4.1. General

A total of 16 soil samples and 4 groundwater samples were collected and submitted for analytical testing. Selected soil samples were analyzed for GRPH, VOCs, EDB, EDC, naphthalenes and lead. Groundwater samples from the four monitoring wells were analyzed for GRPH, VOCs, EDB, EDC, naphthalenes and lead. A summary of soil and groundwater analytical results from samples collected from soil borings and groundwater monitoring wells is presented in Summary of Chemical Analytical Results – Direct Push Boring Soil Samples, Table 2, Summary of Chemical Analytical Results – Hollow-Stem Auger Soil Samples, Table 3 and Summary of Chemical Analytical Results – Groundwater, Table 4.

4.2. Soil Analytical Results

Twelve soil samples from the direct push borings and four soil samples from the hollow stem auger borings were analyzed by TestAmerica for GRPH, VOCs, and naphthalenes. Soil samples from the direct push borings were also analyzed for EDB, EDC and lead. Chemical analytical results are summarized in Tables 2 and 3. Chemical analytical results are compared to MTCA Method A cleanup levels for Unrestricted Land Use and are summarized by the following:

- GRPH was detected at concentrations greater than MTCA Method A cleanup levels of 100 milligrams per kilogram (mg/kg) (30 mg/kg if benzene is present) in soil samples from borings DP-2 through DP-5, DP-8 through DP-10, MW-2 and MW-3. GRPH concentrations exceeding cleanup levels ranged from 65.2 mg/kg in the sample collected from DP-9 to 23,200 mg/kg in the sample collected from DP-8. GRPH was either not detected or detected at concentrations less than MTCA Method A cleanup levels in samples collected from the remaining seven borings.
- VOCs (BTEX, MTBE, n-hexane, and/or naphthalenes) were detected at concentrations greater than MTCA Method A cleanup levels from borings DP-3 through DP-5, DP-8, DP-10 and MW-2. Note that the reporting limit (RL) for benzene was reported by TestAmerica at concentrations greater than the MTCA cleanup level (0.03 mg/kg) for samples from borings DP-6 and DP-7. VOCs were either not detected or detected at concentrations less than MTCA Method A cleanup levels in samples collected from the remaining 10 borings.
- EDB and EDC were not detected in the 12 soil samples submitted for laboratory analysis. TestAmerica reported the RL for EDB in the sample collected from boring DP-5 at a concentration greater than the MTCA cleanup level (5 micrograms per kilogram).
- Lead was either not detected or detected at concentrations less than the MTCA Method A cleanup level in the analyzed samples.

4.3. Groundwater Analytical Results

Four groundwater samples from monitoring wells MW-1 through MW-4 were analyzed by TestAmerica for GRPH, VOCs, and naphthalenes. Chemical analytical results are summarized in Table 4. Chemical analytical results are compared to MTCA Method A cleanup levels for Unrestricted Land Use and are summarized by the following:

- GRPH were detected at a concentration of 1,030 micrograms per liter (µg/L) in the sample collected from MW-2 and at a concentration of 5,640 µg/L in the sample collected from MW-3. These concentrations exceed the MTCA Method A cleanup level of 800 µg/L (when benzene is present). GRPH were either not detected or detected at concentrations less than respective MTCA Method A cleanup levels in samples collected from the two remaining monitoring wells.
- Benzene was detected at a concentration of 71.6 µg/L in the sample collected from MW-3, which exceeds the MTCA Method A cleanup level of 5 µg/L. Benzene was either not detected or detected at concentrations less than the MTCA Method A cleanup levels in samples collected from the remaining monitoring wells.
- Ethylbenzene, xylenes, hexane, naphthalenes and 1,2-Dichloroethane (EDC) were either not detected or detected at concentrations less than respective MTCA Method A cleanup levels.
- MTBE, toluene, EDB, and lead were not detected.

4.4. Summary

Results of field screening and analytical testing indicate that the predominant areas of petroleum contamination at the site appear to be near or below the groundwater table. Contaminated soil and groundwater also appears to extend from near the former fuel dispenser area, towards the southwest. Figure 2 presents borings locations and planned remedial excavation limits at the site. where results of analytical testing indicate soil and/or groundwater contamination greater than MTCA Method A cleanup levels. A graphical depiction of cross section A-A' is presented in Cross Section A-A', Figure 4. The cross section also presents the location where results of analytical testing indicate soil and/or groundwater contamination greater than MTCA Method A cleanup levels.

5.0 ALTERNATIVES

Several potential remedial alternatives for shallow (vadose) zone soil contamination were evaluated, including excavation and off-site disposal and in-situ treatment, such as remedial excavation, soil vapor extraction (SVE), and in-situ treatment. SVE and in-situ treatment generally do best at sites with very permeable and porous soils so that the percent oxygen concentrations in soil and groundwater can be increased, thus increasing the rate of biodegradation and natural attenuation of the contaminants in soil and groundwater. Soils at the Frenchies' site vary between sands with silt to silt which would minimize the effectiveness of SVE and in-situ treatment at the site. Therefore, we considered excavation and off-site disposal at a permitted disposal facility as the baseline alternative as a comparison to other alternatives. Excavation and off-site disposal meets applicable criteria in MTCA by: (1) protecting human health and the environment (removing shallow soil contamination); (2) providing for compliance monitoring; and (3) providing for a reasonable restoration time frame. Therefore, this option has been selected for cleanup of shallow soil contamination as part of this interim action.

6.0 SCHEDULE

Following review by Ecology and incorporation of mutually agreed-to comments, the draft Interim Action Report will be submitted for public comment. Following the public comment period (if required), Ecology will address any public comments received and provide final comments. The Interim Action Report will be finalized within 30 days following receipt of final comments from Ecology.

7.0 INTERIM ACTION APPROACH

7.1. General

For the purposes of this report and the interim action, Ecology is defined as the Owner and will retain a Contractor to implement the interim action. Construction Plans and Specifications have been prepared so Ecology can solicit bids for the construction work. GeoEngineers will provide oversight and documentation of the construction work on behalf of Ecology; in this report and related documents, GeoEngineers is defined as the Engineer.

Activities associated with source removal include: (1) obtaining necessary permits and providing appropriate notifications; (2) preparing work plans; (3) mobilization and demobilization; (4) establishing work zones and temporary stockpile locations, if needed; (5) excavating contaminated soil; (6) collecting confirmation soil samples of excavated areas; (7) installing infiltration galleries; (8) transporting and disposing excavated soil to approved landfills; (9) incorporating dust control measures during site activities; and (10) backfilling and paving excavations.

7.2. Notifications and Permits

The Contractor shall be a Washington State licensed UST decommisioner and be responsible for obtaining and paying for all permits and inspections required for removing the UST and other site work. Required notification/permits may include, but are not necessarily limited to:

- Yakima Regional Clean Air Agency notification for site earthwork activities;
- City of Moxee notification of site earthwork activities and submittal, and acquisition of appropriate permits, such as grading permits, and approvals;
- Completion and submittal of a SEPA Checklist; and
- Any other permits or notifications required to complete the work such as permits or notifications required to cap utilities, street obstruction permits, temporary easements, or hydrant permits.

The Contractor also shall provide notification to the Engineer of the planned disposal landfills and shall provide proof that the landfills have agreed to accept the waste material before commencing with Interim Action activities.

7.3. Health and Safety Plan and Work Plan Preparation

The Contractor shall submit a Health and Safety Plan (HASP) detailing the specific safety requirements and safety procedures for the work. The Contractor shall establish work zones to protect worker safety and health and to reduce the potential for off-site contamination.

The Contractor shall, at a minimum, meet all requirements of WAC 296-155, Safety Standards for Construction. Contractor shall also comply with WAC 296-62, Part P, which governs hazardous waste operations in Washington State. Hazardous waste operations regulations (including a requirement for 40-hour or 80-hour OSHA hazardous waste training) will apply whenever exposure to hazardous materials is possible. The plan must be Site specific, addressing hazards at the Site. A generic plan or corporate-wide plan is not acceptable. The Engineer may halt or delay operations if Contractor does not provide an acceptable plan before the scheduled start date. An acceptable plan is a plan that meets the local, state, and federal requirements in the opinion of the Engineer's safety staff. The Engineer reserves the right to require future modifications to the plan to meet requirements of local, state and federal regulations.

The Contractor shall submit a copy of the Contractor's Health and Safety Plan (HASP) to the Engineer a minimum of 7 days before mobilization to the Site. The Engineer will review the Health and Safety Plan and if any modifications are requested, the Contractor shall submit a copy of the modified Health and Safety Plan to Engineer before beginning Site work. The Contractor shall not begin work until the HASP has been finalized and approved by the Engineer.

Contractor shall ensure their employees and their subcontractors perform their work in accordance with the HASP and all local, state and federal regulations. The Engineer reserves the right to exclude subcontractors, or subcontractor employees who perform work in an unsafe manner or who do not comply with the project health and safety plan. Contractor shall supervise work of subcontractors at all times. Subcontractors shall never perform work without Contractor supervision. Exceptions to this requirement will be considered on a case-by-case basis. At least one Contractor employee shall have current first aid and CPR training while Contractor is on Site.

The Engineer will be responsible for generating and maintaining a Site-specific HASP for all personnel on Site representing the Engineer. The Engineer's HASP will meet all local, state, and federal regulations.

The Contractor shall be required to submit a work plan detailing procedures and schedules for UST removal, soil excavation and off-site disposal, soil backfill and final site restoration. The work plan will identify personnel that have the required 40-Hour Hazardous Waste Operations (HAZWOPER) training and licenses for site excavation and UST work. The Contractor shall not commence work until the work plan and HASP have been approved by the Engineer. The Contractor shall revise the work plan and HASP as necessary for additional items included in the work as necessary.

7.4. Mobilization and Demobilization

The Contractor shall mobilize all equipment required to complete excavation and backfilling work. A temporary security fence shall be constructed around the perimeter of the Site, encompassing work areas, to reduce public access to the site.

7.5. Temporary Erosion and Sediment Control

The Contractor shall install temporary erosion and sediment control facilities where appropriate. The contractor shall use personnel with appropriate 40-hour OSHA Hazardous Waste training and shall follow approved work plans and all applicable regulations when doing any excavation work on the Site.

7.6. Utility Locating

The Contractor shall be responsible for locating underground utilities at the site, including calling the local "One-Call" utility locating service. The Contractor shall complete any other work necessary to locate underground utilities. The Contractor shall take all appropriate actions to protect utilities during excavation activities. The Contractor shall be responsible for obtaining any and all permits required to complete utility work. Utilities may include, but are not necessarily limited to: water, sewer, electricity, phone, and gas. The Contractor also shall be responsible for coordinating such work with the applicable utility company or local municipality. Excavation and impacted material handling conducted as part of utility capping activities shall be completed by personnel with appropriate 40-hour OSHA Hazardous Waste training in accordance with approved work plans and all applicable regulations.

7.7. Work Zones and Soil Stockpile Locations

The contractor shall establish work zones and temporary soil stockpile locations, if needed, for soil excavation activities before initiating earthwork activities. These work zones include:

- The Exclusion Zone;
- Decontamination Zone;
- Temporary Stockpile Area; and
- Support Zone/Contractor Staging Area

The Exclusion Zone shall consist of the area of active excavation and proximity.

The Decontamination Zone shall be set up adjacent to the Exclusion Zone, such that personnel and equipment must pass through the Decontamination Zone from the Exclusion Zone before entering the Support Zone or exiting the site. During excavation activities, the Decontamination Zone shall be located on the northeast side of the site. Equipment and materials utilized during excavation activities shall be decontaminated at this location. Water generated from decontamination procedures shall be containerized. The Contractor shall not discharge or transport water off-site for disposal without approval from the Engineer.

The Decontamination Zone also shall include a health and safety station, which shall contain first aid equipment, emergency eyewash, environmental monitoring equipment, and facilities for site personnel to conduct decontamination activities. Decontamination activities shall follow procedures contained in the Site Health and Safety Plan.

Temporary Stockpile Areas shall be established in the field in coordination with the Engineer and the City of Moxee, if necessary, based on the progress of the work.

The Support Zone/Contractor Staging Area shall be established on site at a suitable location such that it is separated from the Exclusion Zone by the Decontamination Zone.

In order to facilitate the completion of the work, Work Zones and stockpile areas can be moved with approval from the Engineer. The Contractor shall be responsible to prevent cross contamination or re-contamination of areas where the work has been completed. Any cross contaminated or re-contaminated areas as determined by the Engineer shall be removed and disposed of at the contractor's expense.

7.8. Excavation

Based on results of soil sampling and analytical testing, the areas of most contaminated soil generally are located in north and northwest of the Frenchies' building (near DP-3 through DP-5, DP-8 through DP-10, MW-2 and MW-3). Excavation depths to remove contaminated vadose zone soil to target cleanup levels likely will to extend to depths of about 10 feet below current site grade (approximate depth to the groundwater table). Based on the results of the recent explorations and analytical testing, and review of previous reports and documentation, approximately 1,800 tons of contaminated soil will be excavated and disposed of off-site.

The Contractor shall be responsible for monitoring stability of temporary excavations. Excavations along East Moxee Avenue and the Frenchies' building will be shored in accordance to the shoring recommendations provided in Appendix A. Excavations deeper than 4 feet on the east and west sides of the excavation shall be sloped should not be steeper than 2H:1V (horizontal to vertical).

Flatter slopes will be necessary if loads are imposed near excavations a distance equal to or less than one half the depth of the excavation, such as from excavation spoils or equipment.

7.9. Dust Control During Earthwork

The contractor shall implement dust and vapor control measures during earthwork activities. Additional information regarding required monitoring activities is presented in **Section 8.0 Compliance Monitoring Plan.**

7.10. Confirmation Sampling

The Engineer will collect confirmation samples from excavations and submit for analytical testing for GRPH, VOCs, naphthalenes and lead. Because the interim action is intended to remove shallow, vadose zone contaminated soil, confirmation sampling will be focused on the lateral extents of the remedial excavations. Confirmation sampling of excavation bottoms are not planned, unless groundwater conditions at the time of excavation allow for sampling. If results indicate that target cleanup levels have been met at the lateral extents of the excavations, then excavations will be backfilled. If sample results are greater than MTCA Method A cleanup levels for unrestricted land use, then excavation shall continue laterally in the area sampled. Following additional excavation, confirmation samples will be collected from the newly excavated area. This process will be repeated until results of analytical testing indicate that target cleanup levels have been reached. Additional information on the testing program is presented in **Section 8.0 Compliance Monitoring Plan.**

7.11. Disposal of Contaminated Soil

Contaminated soil shall be disposed of at an approved landfill permitted to accept petroleum contaminated waste. Contaminated soil shall be covered and secured during transport, and shall be handled, transported and disposed of in accordance with all applicable local, state and federal regulations governing non-hazardous waste.

7.12. Final Grading Plan

Following completion of excavation and off-site transport of contaminated soil and review of confirmation testing results (see **Section 8.0 Compliance Monitoring Plan**), excavations shall be backfilled and paved. The site shall be brought back to approximately current site grade, and graded such that surface water will not be concentrated and allowed to flow off-site. Backfill and asphaltic concrete on finished backfilled areas will be placed in accordance with the recommendations provided in Appendix A.

8.0 COMPLIANCE MONITORING PLAN

8.1. General

Compliance monitoring is required during remediation of any site and consists of protection monitoring, performance monitoring, and confirmation monitoring. Protection monitoring is conducted to ensure that human health and the environment are adequately protected during site activities. Performance monitoring is conducted to confirm that the cleanup action has attained the cleanup performance standards. Confirmation monitoring is conducted to confirm that the long-term effectiveness of the cleanup action is adequate after the cleanup standards have been attained.

8.2. Protection Monitoring

8.2.1. General

Protection monitoring shall be included in the HASP submitted by the Contractor(s) prior to the beginning of work. Protection monitoring for this project will include air monitoring during site excavation activities and monitoring of the Equipment Decontamination Area. The Contractor's HASP will specify the frequency and types of personnel monitoring, and environmental sampling techniques and instrumentation to be used by the Contractor in addition to any minimum requirements contained in the project specifications, including methods of maintenance and calibration of monitoring and sampling equipment. The submitted HASP(s) shall include the corrective actions and upgrading of personnel protection based on monitoring of air, personnel, and environmental sampling, with specific action levels identified.

The Engineer also will complete an independent air monitoring program during soil excavation activities as part of their HASP. Air will be monitored periodically throughout the day at the site perimeter during active excavation and loading activities at the Site boundaries using a portable hand-held electronic particulate meter (Haz-Dust, Model HD-1100 or equivalent). The Engineer will immediately notify the Contractor and require corrective action if particulate readings for dust exceed 5 milligrams per cubic meter (mg/m^3).

8.2.2. Monitoring of Equipment Decontamination Area

The Decontamination Zone and Staging Area will be inspected daily for damage by both the Contractor and Engineer. Any damage to the areas as determined by either the Contractor or Engineer shall be repaired immediately in order to prevent contaminated material on construction equipment from leaving the Site in an uncontrolled manner.

8.3. Confirmation Sampling

After excavating the contaminated soil as shown in Figure 4, the Engineer will collect confirmation samples from the limits of the remedial excavations. As stated previously, samples will be collected from the lateral extents of excavations, and not from the bottom of excavations. Confirmation samples from excavation sidewalls will be collected at approximate 15 to 25 foot spacings. About 10 to 15 samples will be collected and analyzed for GRPH, VOC and naphthalene compounds. If chemical analytical results indicate that contaminant concentrations exceed the established Site specific cleanup levels, the area where target cleanup concentrations are exceeded will be over-excavated and re-sampled following the same procedures as outlined above. Details of the confirmation sampling activities are provided in the Sampling and Analysis Plan, Appendix B.

8.4. Quality Assurance Project Plan

The general QA objectives for this project are to develop and implement procedures for obtaining and evaluating data of a specified quality that can be used to assess Site conditions and risks. Field QA procedures to be followed include collecting equipment blanks and duplicate samples, and completing all appropriate sample documentation. Measurement data should have an appropriate degree of accuracy and reproducibility. Samples collected should be representative of actual field conditions and samples should be collected and analyzed using proper chain-of-custody procedures. The Quality Assurance Plan developed as part of the original work Plan for this project is providedin Appendix C .

9.0 REPORTING

Upon completion of the work, the Engineer will write a Cleanup Action Report that provides documentation of the cleanup in accordance with WAC 173-340-400(6)(b). The report shall also contain an opinion from the Engineer, based on testing and inspections, as to whether the cleanup action has been completed in substantial compliance with the plans and specifications and related documents. Supporting documentation such as laboratory data sheets, waste manifests, bills of lading, and other pertinent information shall be included in the report.

TABLES

Table 1

Summary of Groundwater Level Measurements

Frenchies' Fill-N-Food

Moxee, Washington

Well Number	Date Measured	Grid Northing[1] (feet)	Grid Easting[1] (feet)	Top of Casing Elevation[2] (feet)	Monitoring Well Headspace (ppm)	Depth to Groundwater[3] (feet)	Groundwater Elevation (feet)
MW-1	10/19/12	445516.9131	1669628.5314	1,053.91	14.7	16.11	1,037.80
MW-2	10/19/12	445550.4938	1669546.4951	1,053.53	980	16.00	1,037.53
MW-3	10/19/12	445506.0355	1669547.5414	1,053.54	37.4	16.05	1,037.49
MW-4	10/19/12	445501.8313	1669479.9925	1,052.57	0	15.26	1,037.31

Notes:

[1]Grid northing and easting are referenced to NAVD88, Washington State Plane Coordinate System, South Zone.

[2]Top of well casing elevations are referenced to the North American Vertical Datum of 1988 (NAVD88).

[3]Depth to water measurements obtained from top of well casing.

Table 2

Summary of Chemical Analytical Results - Direct Push Boring Soil Samples[1]

Frenchies' Fill-N-Food

Moxee, Washington

Sample Number		DP-1	DP-2	DP-3	DP-4	DP-5	DP-6	DP-7	DP-8	DP-9	DP-10	DP-11	DP-12	MTCA Method A Cleanup Levels[2]
Date Sampled		02/29/12	02/29/12	02/29/12	02/29/12	02/29/12	02/29/12	02/29/12	02/29/12	02/29/12	02/29/12	02/29/12	02/29/12	
Sample Depth (feet bgs)		10-10.5	10.5-11	6.5-7	9.5-10	11-11.5	10-10.5	9.5-10	7-8	2.5-3	6.5-7.5	10-11	10-11	
GRPH[3] (mg/kg)		20.0	167	5,630	5,090	286	<12.9	<13.7	23,200	65.2	512	<8.48	<9.69	30/100
MTBE[4] (mg/kg)		<0.0402	<0.0481	<0.485	<0.705	<0.0463	<0.0774	<0.0824	<0.736	<0.0441	<0.0667	<0.0509	<0.0581	0.1
Benzene[4] (mg/kg)		<0.0201	<0.0240	<0.242	0.847	0.113	<0.0129	<0.0137	0.380	0.0286	<0.0334	<0.0254	<0.0291	0.03
Ethylbenzene[4] (mg/kg)		<0.134	<0.160	16.5	24.5	<0.154	<0.258	<0.275	77.8	0.391	0.653	<0.170	<0.194	6
Toluene[4] (mg/kg)		<0.134	<0.160	<1.62	4.91	<0.154	<0.258	<0.275	7.37	<0.147	<0.222	<0.170	<0.194	7
Total Xylenes[4] (mg/kg)		<2.01	<2.40	43.3	94.3	<2.32	<3.87	<4.12	445	<2.20	<3.34	<2.54	<2.91	9
2-Methylnaphthalene[5] (mg/kg)		<0.0120	<0.0132	12.4	3.16	1.13	<0.0156	<0.0159	8.74	0.117	1.79	<0.0135	<0.0141	5
1-Methylnaphthalene[5] (mg/kg)		<0.0120	<0.0132	4.57	1.21	0.438	<0.0156	<0.0159	3.30	0.0421	0.709	<0.0135	<0.0141	5
Naphthalene[5] (mg/kg)		<0.268	<0.321	38.5	19.6	0.827	<0.516	<0.550	108	0.637	5.32	<0.339	<0.388	5
1,2-Dichloroethane (EDC)[4] (mg/kg)		<0.134	<0.160	<1.62	<2.35	<0.154	<0.258	<0.275	<2.45	<0.147	<0.222	<0.170	<0.194	NE
1,2-Dibromoethane (EDB)[6] (µg/kg)		<1.21	<1.22	<1.21	<1.38	<12.4	<1.62	<1.57	<1.28	<1.17	<1.28	<1.32	<1.40	5
Hexane[4] (mg/kg)		<0.134	<0.160	<1.62	7.36	0.574	<0.258	<0.275	5.57	<0.147	<0.222	<0.170	<0.194	NE
C5-C6 Aliphatics (mg/kg)	VPH[7]	--	--	<27	--	--	--	--	<74	--	--	--	--	NE
C6-C8 Aliphatics (mg/kg)	VPH[7]	--	--	180	--	--	--	--	1,600	--	--	--	--	NE
C8-C10 Alphatics (mg/kg)	VPH[7]	--	--	370	--	--	--	--	1,800	--	--	--	--	NE
C10-C12 Alphatics (mg/kg)	VPH[7]	--	--	470	--	--	--	--	1,700	--	--	--	--	NE
C8-C10 Aromatics (mg/kg)	VPH[7]	--	--	230	--	--	--	--	1,400	--	--	--	--	NE
C10-C12 Aromatics (mg/kg)	VPH[7]	--	--	370	--	--	--	--	1,600	--	--	--	--	NE
C12-C13 Aromatics (mg/kg)	VPH[7]	--	--	100	--	--	--	--	370	--	--	--	--	NE
Total VPH (mg/kg)	VPH[7]	--	--	1,700	--	--	--	--	8,500	--	--	--	--	NE
C10-C12 Aliphatics (mg/kg)	EPH[8]	--	--	340	--	--	--	--	410	--	--	--	--	NE
C12-C16 Aliphatics (mg/kg)	EPH[8]	--	--	85	--	--	--	--	96	--	--	--	--	NE
C16-C21 Aliphatics (mg/kg)	EPH[8]	--	--	14	--	--	--	--	14	--	--	--	--	NE
C21-C34 Alphatics (mg/kg)	EPH[8]	--	--	<6.1	--	--	--	--	<6.3	--	--	--	--	NE
C10-C12 Aromatics (mg/kg)	EPH[8]	--	--	300	--	--	--	--	450	--	--	--	--	NE
C12-C16 Aromatics (mg/kg)	EPH[8]	--	--	85	--	--	--	--	140	--	--	--	--	NE
C16-C21 Aromatics (mg/kg)	EPH[8]	--	--	9.8	--	--	--	--	13	--	--	--	--	NE
C21-C34 Aromatics (mg/kg)	EPH[8]	--	--	<6.1	--	--	--	--	<6.3	--	--	--	--	NE
Lead[9] (mg/kg)		13.1	2.95	8.86	4.25	6.28	<2.27	<2.12	11.1	27.6	5.72	2.46	3.28	250

Notes:

[1]Samples analyzed by TestAmerica Laboratories, Inc. located in Spokane Valley, Washington.

[2]Washington State Model Toxics Control Act (MTCA) Method A Unrestricted Land Use cleanup levels. Bold font indicates analyte concentrations in excess of respective cleanup levels.

[3]Gasoline-range petroleum hydrocarbons (GRPH) analyzed using Northwest Method NWTPH-Gx. GRPH cleanup levels are 30 mg/kg when benzene is detected and 100 mg/kg when benzene is not detected.

[4]Volatile organic compounds (VOCs) analyzed using Environmental Protection Agency (EPA) Method 8260C. Total Xylenes includes o-xylene and m,p-xylene.

[5]Naphthalene concentration analyzed using EPA Method 8260C. 1-methylnaphthalene and 2-methylnaphthalene analyzed by EPA Method 8270. MTCA Method A cleanup level (5 mg/kg) refers to the sum of naphthalene, 1-methylnaphthalene and 2-methylnaphthalene.

[6]1,2-Dibromoethane (EDB) analyzed using EPA Method 8011.

[7]Volatile petroleum hydrocarbons (VPH) analyzed using Nprthwest Method NWTPH/VPH.

[8]Extractable petroleum hydrocarbons (EPH) analyzed using Nprthwest Method NWTPH/EPH.

[9]Total lead analyzed using EPA Method 6010C.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram; bgs = below ground surface; NE = Not Established; MTBE=methyl tertiary-butyl ether

Table 3

Summary of Chemical Analytical Results - Hollow-Stem Auger Soil Samples[1]

Frenchies' Fill-N-Food

Moxee, Washington

Boring / Sample Depth (feet) / Date Sampled	MTCA Method A Cleanup Levels[2]	MW-1	MW-2	MW-3	MW-4
Sample Depth (feet)		10	15	15	11
Date Sampled		09/25/12	09/25/12	09/25/12	09/25/12
Method EPA 8260C - NWTPH-Gx and Volatile Organic Compounds (mg/kg)					
Gasoline-range hydrocarbons	30/100[3]	<4.94	**3,800**	**474**	<8.30
Methyl tert-butyl ether	0.10	<0.00593	<0.0106	<0.00998	<0.00996
Benzene	0.03	<0.00494	**0.128**	<0.00831	<0.00830
Ethylbenzene	6	<0.0989	4.63	<0.166	<0.166
Toluene	7	<0.0989	<0.177	<0.166	<0.166
o-Xylene	9[4]	<0.198	<0.354	<0.333	<0.332
m,p-Xylene	9[4]	<0.395	5.95	<0.665	<0.664
Xylenes (total)	9[4]	<1.48	5.95	<2.49	<2.49
Method EPA 8270 mod. - Polynuclear Aromatic Compounds (PAH) by GC/MS with Selected Ion Monitoring (mg/kg)					
Naphthalene	5[5]	<0.0103	0.123	<0.0132	<0.0130
2-Methylnaphthalene	5[5]	<0.0103	0.0876	<0.0132	<0.0130
1-Methylnaphthalene	5[5]	<0.0103	0.508	<0.0132	<0.0130

Notes:

[1]Chemical analyses conducted by TestAmerica Laboratories, Inc. of Spokane, Washington. All analyte concentrations presented in mg/kg.

[2]Washington State Model Toxics Control Act (MTCA) Method A Unrestricted Land Use cleanup levels. **Bold** font indicates analyte concentrations in excess of respective cleanup levels.

[3]Gasoline-range petroleum hydrocarbon cleanup levels in soil are 30 mg/kg when benzene is detected and 100 mg/kg when benzene is not detected.

[4]Cleanup level for total xylenes.

[5]Cleanup level refers to sum of naphthalenes.

[6]Cleanup level referenced to benzo (a) pyrene. If other carcinogenic PAHs are present, the cleanup level represents the total equivalent carcinogenic PAH concentration.

mg/kg = milligrams per kilogram; NT = not tested; NE = not established; EPA = Environmental Protection Agency

Table 4

Summary of Chemical Analytical Results - Groundwater[1]

Frenchies' Fill-N-Food
Moxee, Washington

	MTCA Method A Cleanup Levels[2]	Monitoring Well and Date Sampled			
		MW-1	MW-2	MW-3	MW-4
		10/19/12	10/19/12	10/19/12	10/19/12
Method EPA 8260C (µg/l)					
Gasoline-range petroleum hydrocarbons	1,000/800[3]	<90.0	1,030	5,640	<90.0
Methyl tert-butyl ether	20	<0.500	<0.500	<0.500	<0.500
Benzene	5	<0.200	1.07	71.6	<0.200
Toluene	1,000	<0.500	<0.500	<0.500	<0.500
Ethylbenzene	700	<0.500	1.28	2.88	<0.500
m,p-Xylene	1,000[4]	<0.500	<0.500	3.30	<0.500
o-Xylene	1,000[4]	<0.500	<0.500	0.680	<0.500
1,2-Dichloroethane (EDC)	5	<0.500	<0.500	4.07	1.78
Xylenes (total)	1,000[4]	<1.50	<1.50	3.98	<1.50
Hexane	NE	<1.00	<1.00	30.4	<1.00
Method EPA 8011 (µg/l)					
1,2-Dibromoethane (EDB)	0.01	<0.0100	<0.0100	<0.0100	<0.0100
Method EPA 8270 (µg/l)					
Naphthalene	160[5]	<0.219	0.397	<0.222	<0.222
2-Methylnaphthalene	160[5]	<0.219	<0.220	<0.222	<0.222
1-Methylnapthalene	160[5]	<0.219	0.364	3.30	<0.222
Method EPA 200.7 - Total Metals by EPA 200 Series Methods (mg/l)					
Lead	15	<0.0150	<0.0150	<0.0150	<0.0150
Method RSK-175 - Dissolved Gases (GC) (µg/l)					
Methane	NE	<0.005	0.00598	0.0136	0.00565
Method EPA 200.7 - Dissolved Metals by EPA 200 Series Methods (mg/l)					
Manganese	NE	0.881	2.61	0.933	6.04
Method EPA 300.0 - Anions by EPA Method 300.0 (mg/l)					
Nitrate-Nitrogen	NE	10.9	<0.200	<0.200	<0.200
Sulfate	NE	199	78.2	3.76	141

	MTCA Method A Cleanup Levels[2]	Monitoring Well and Date Sampled			
		MW-1	MW-2	MW-3	MW-4
		10/19/12	10/19/12	10/19/12	10/19/12
Method SM 2320B - Conventional Chemistry Parameters by APHA/EPA Methods (mg/l)					
Total Alkalinity	NE	695	785	1,140	1,000

Notes:

[1]Chemical analyses conducted by TestAmerica Laboratories, Inc. of Spokane, Washington.

[2]Washington State Model Toxics Control Act Method A cleanup levels for groundwater.

[3]Washington State Model Toxics Control Act (MTCA) Method A cleanup level for gasoline-range petroleum hydrocarbons is 1,000 µg/l, if benzene is not detected; otherwise the cleanup level is 800 µg/l.

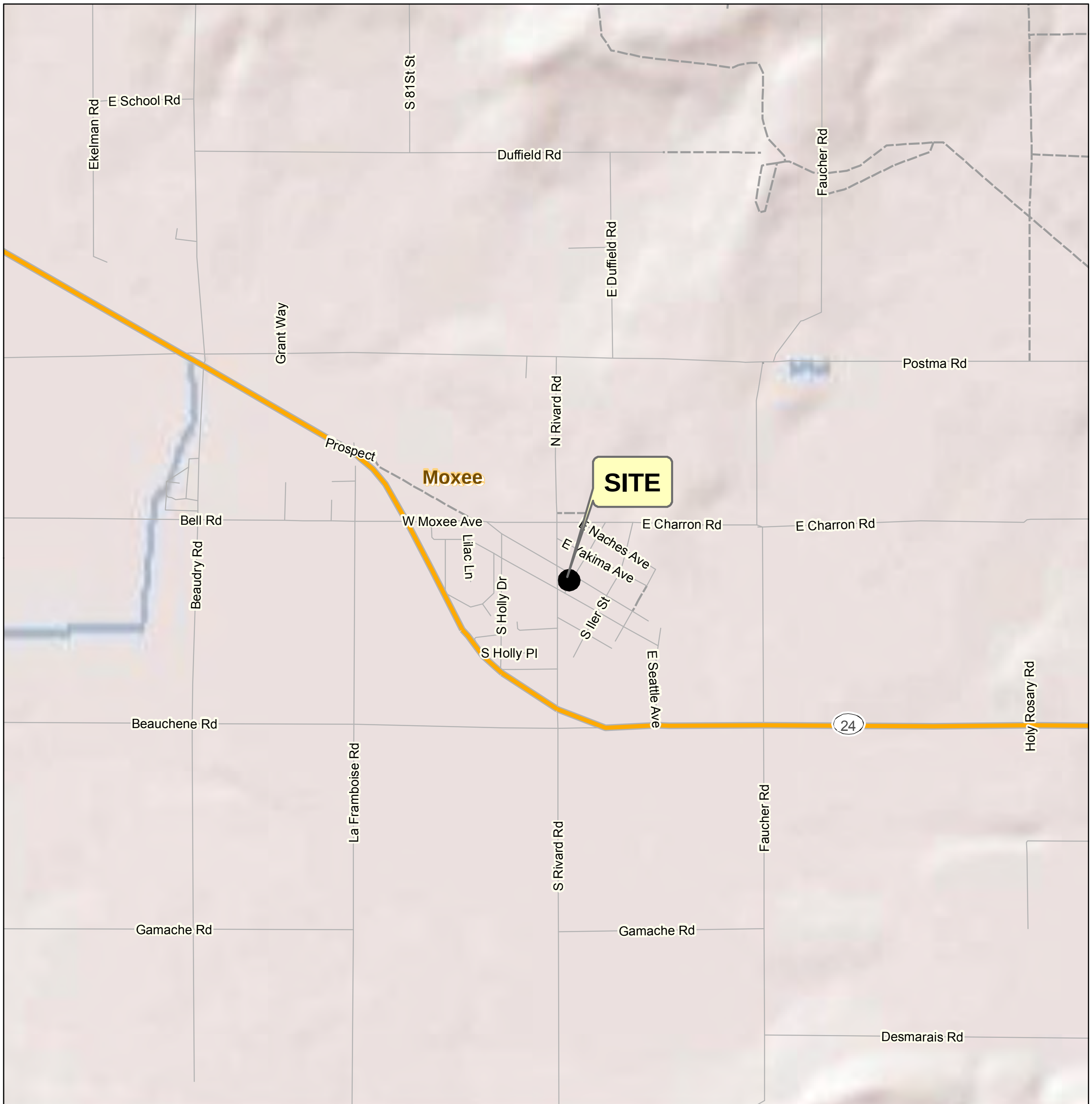
[4]Cleanup level for total xylenes.

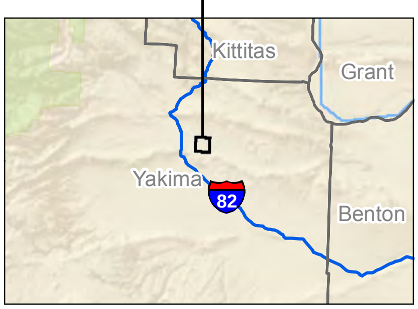
[5]Cleanup level refers to sum of naphthalenes.

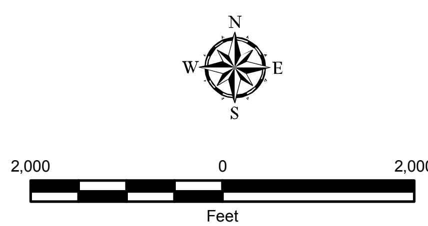
[6]Cleanup level referenced to benzo (a) pyrene. If other carcinogenic PAHs are present, the cleanup level represents the total equivalent carcinogenic PAH concentration.

NE = not established

FIGURES







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: ESRI Data & Maps, Street Maps 2008.
Projection: NAD 1983, UTM Zone 10 North.

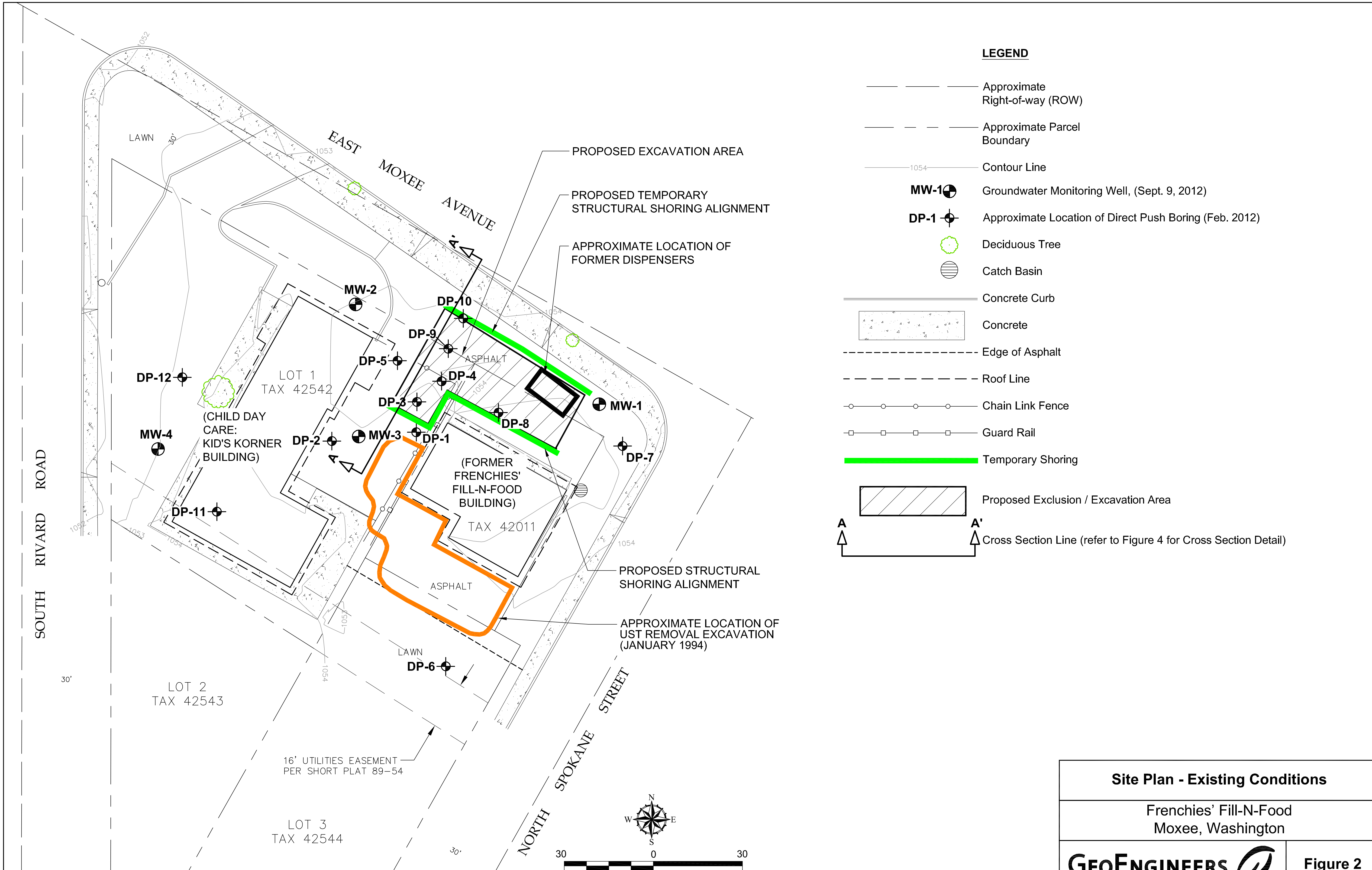
Vicinity Map

Frenchies' Fill-N-Food
Moxee, Washington

GeoEngineers

Figure 1

Office: SPO Path:W:\Spokane\Projects\0\0504075\GIS\00\050407500_F1_VicinityMap.mxd Map Revised: 12/14/2011 CRC



Reference: Base drawing adapted from survey provided by T,D & H Engineering Consultants, November 2012.

Site Plan - Existing Conditions

Frenchies' Fill-N-Food
Moxee, Washington

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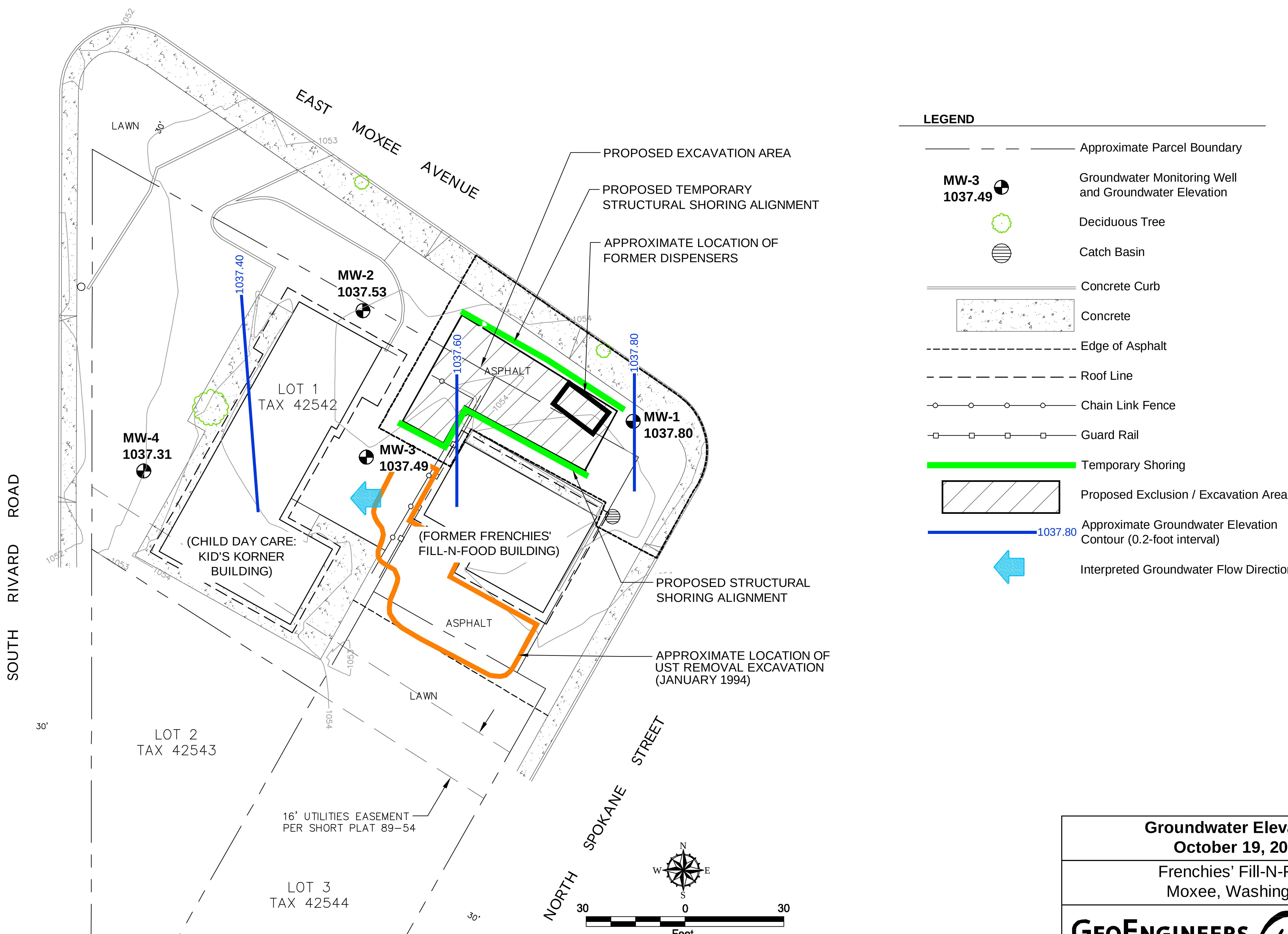
Figure 2

OFFICE: SPO Dwg name: W:\Spokane\Projects\0\0504075\00\CAD\050407500-F2_F3 Dec2012.dwg User: bmoore Plot time: Dec-20-12 @ 11:03am



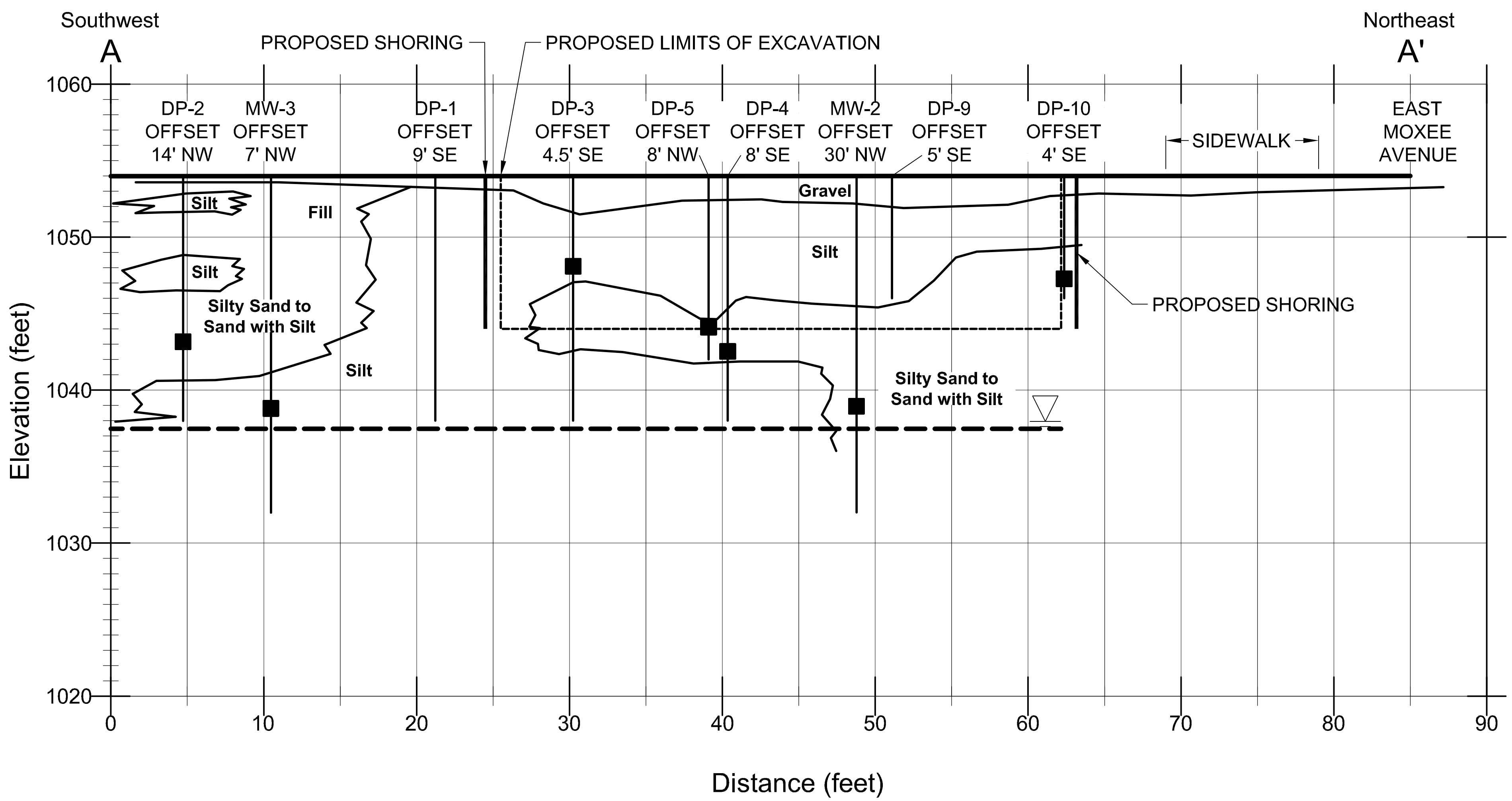
Groundwater Elevations
October 19, 2012

Frenchies' Fill-N-Food
Moxee, Washington

GEOENGINEERS

Figure 3

Reference: Base drawing adapted from survey provided by T,D & H Engineering Consultants, November 2012.



10 0 10
Feet

HORIZONTAL SCALE: 1"= 10'
VERTICAL SCALE: 1"= 10'
VERTICAL EXAGGERATION: 1X

LEGEND

- Static Water Table (October 2012)
- Lithologic Boundary
- Soil sample containing petroleum hydrocarbons at concentrations greater than MTCA method A cleanup levels

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.
3. Elevations are referred to North American Vertical Datum of 1988 (NAVD 88).
4. Water table elevations are based on measurement during groundwater sampling (October 19, 2012).

Reference: GeoEngineers employee sketch.

Cross Section A-A'

Frenchies' Fill-N-Food
Moxee, Washington

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Figure 4

APPENDICES

GeoEngineers

APPENDIX A
Shoring Memorandum

GeoEngineers

Technical Memorandum

1101 Fawcett Avenue, Suite 200, Tacoma, WA 98402, Telephone: 253.383.4940, Fax: 253.383.4923 www.geoengineers.com

To:	Norman Hepner, PE and Jennifer Lind, Washington State Department of Ecology
From:	Morgan McArthur, PE and Garry H. Squires, PE, LG, LHG
Date:	November 15, 2012
File:	0504-075-00
Subject:	Geotechnical Considerations for Remedial Excavation as Part of Interim Action

MORGAN MCARTHUR
STATE OF WASHINGTON
46390
REGISTERED
PROFESSIONAL ENGINEER
11/15/12

INTRODUCTION

The purpose of this memorandum is to summarize geotechnical considerations for design of a remedial excavation and shoring system for the former Frenchies' Fill-N-Food site located at 106 East Moxee Avenue in Moxee, Washington. Our services are provided in accordance with our agreement with Washington State Department of Ecology (Ecology), Work Assignment No. C110145M, Amendment 1.

We understand that Ecology intends to perform a remedial excavation to remove petroleum-contaminated soil as part of an interim action at this former fueling station. We understand that the anticipated depth of the excavation will be about 12 feet below existing ground surface (bgs). The extent of petroleum-contaminated soil is discussed in our Soil Assessment Report, dated May 21, 2012. Existing site features, known underground utilities and the location of the planned remedial excavation are shown on Figure C-3 in the project plans. We understand that the south side of the planned excavation will be located directly adjacent to the existing single story building and sidewalk. The north side of the excavation will approach an existing City of Moxee water main.

Current plans anticipate maintaining access to the sidewalk and building entrance on the south side of the excavation. The City of Moxee has stipulated that the north limit of the excavation must not be closer than 3 feet from the existing water main, and that damage or significant deflection of the pipe is not acceptable. We anticipate that temporary shoring will be required to complete the excavation and reduce the potential for damage to the building or deflection of the water main. The excavation will be backfilled and paved on completion of remediation.

SUBSURFACE CONDITIONS

Soil Conditions

As part of our soil assessment report and continued work at the site, we explored soil and groundwater conditions by advancing 13 direct-push probes on February 29, 2012, to depths between 8 and 16 feet bgs. We also drilled and installed 4 monitoring wells, each to a depth of 22 feet bgs, on September 25, 2012. In explorations located in the vicinity of the planned remedial excavation, we typically observed between 1 and 8 inches of asphalt concrete overlying either gravel fill or native soil. The gravel fill, where present, is typically 1 to 2 feet thick. The native soil typically comprises alternating zones of silt with sand, silty sand and sand with silt. The silt appears to be in a soft to medium stiff condition. The silty sand and sand with silt range in consistency from loose to very dense.

Groundwater Conditions

At the time of our push probe explorations, we typically observed wet soil at about 10 to 12 feet bgs, which we interpreted to be representative of the regional groundwater table. During installation of our monitoring wells, we measured groundwater at about 18 to 19 feet bgs in the vicinity of the planned excavation. We understand that groundwater levels in the area typically vary seasonally, and may be higher in the summer months due to crop irrigation.

TEMPORARY SLOPES AND EXCAVATION SUPPORT

Excavations deeper than 4 feet must be shored or laid back at a stable slope if workers are required to enter. Shoring and temporary slope inclinations must conform to the provisions of Title 296 Washington Administrative Code (WAC), Part N, "Excavation, Trenching and Shoring." Regardless of the soil type encountered in the excavation, shoring, trench boxes or sloped sidewalls will be required under Washington Industrial Safety and Health Act (WISHA). The contract documents must specify that the contractor is responsible for selecting excavation and dewatering methods, monitoring the excavations for safety and providing shoring, as required, to protect personnel and structures.

In general, based on our explorations, temporary cut slopes in on-site soils may be inclined no steeper than about 1-1/2H:1V. This guideline assumes that all surface loads are kept at a minimum distance of at least one-half the slope height away from the top of the slope and that significant seepage is not present on the slope face. Flatter slopes will be necessary where significant seepage occurs, where soils are disturbed or if voids are created during excavation. Sloughing and raveling of temporary cut slopes should be expected. Temporary covering with heavy plastic sheeting must be used to protect slopes during periods of wet weather.

TEMPORARY SHORING

Design Lateral Earth Pressures

Because the temporary shoring system must resist soil and surcharge loads with limited deflection recommend at-rest lateral earth pressures be used for design. Our recommended earth pressure criteria are presented on Figure 1. We provide two earth pressure diagrams, one that is appropriate for portions of the shoring system that will be adjacent to the existing building(s), and one that is appropriate for portions of the shoring system around the remaining portion of the excavation. These recommended earth pressures assume a level backfill condition, and are not appropriate for sloping backfill conditions or if fill stockpiles will be placed within 10 feet of the excavation.

We have assumed groundwater is present at a depth of 12 feet bgs. Below the water table, earth pressures include hydrostatic pressure. The recommended earth pressures also incorporate surcharge loading for typical building, sidewalk and traffic loading. These recommendations are not appropriate for excavations deeper than about 15 feet or for design of shoring systems with multiple rows of tiebacks.

Cantilevered shoring systems or braced/tied back systems may be considered. Tied back or braced shoring systems can be designed to reduce or prevent significant deflection. Cantilevered systems must yield in order to mobilize the soil resistance. Therefore, we recommend a performance based specification be used that establishes limits to the amount of deflection of the shoring system that will be allowed where it is adjacent to the existing improvements discussed above. The amount of deflection that can be tolerated will depend on the structure type and its horizontal and vertical location relative to the temporary shoring wall. We recommend that a structural engineer determine the maximum allowable deflections for the structures to be protected and that these criteria be included in the performance specification for the contractor's shoring design. The contractor's temporary shoring plan must also include contingency measures that will be implemented to limit further deflection should monitoring indicate movement that approaches the specified maximum allowable values.

Shoring Construction Considerations

Any excavation near existing structures involves risk of movement or damage to those structures. We recommend that the contractor be made responsible for monitoring movement of the shoring wall and adjacent structures or utilities to remain in place after excavation. We also recommend a pre-construction condition survey be performed for structures and utilities to remain in place, to develop a baseline from which to monitor movement and/or damage.

The project plans include the locations of known underground utilities entering the site. Other underground utilities may be present in the vicinity of the planned excavation. We recommend that the contractor be made responsible for locating underground utilities in the vicinity of the excavation and field-verifying the locations of utilities shown on the project plans. We also recommend that project plans include a contingency for protection and/or relocation of underground utilities that may be present within the limits of the excavation.

Our explorations encountered groundwater at depths ranging from about 10 to 19 feet bgs. Depending on the time of year, precipitation, irrigation and other factors, the groundwater level at the time of excavation could be shallower. We recommend the contractor be prepared to dewater the excavation if necessary. Dewatering from inside the excavation could increase the driving pressures on the shoring system. Accordingly, a contingency for this should be included in the contractor's design.

Based on our understanding of subsurface conditions, we anticipate the majority of dewatering could be accomplished with sumps and pumps inside the excavation or well points around the perimeter of the excavation. If the excavation extends below the groundwater table and the excavation is dewatered from the inside, the difference in hydrostatic pressure between the inside and outside of the excavation could result in soil heave or boiling at the base of the excavation. Methods to counteract these conditions include extending the shoring wall deeper below the base of the excavation if a sheet pile system is used or installing well points/dewatering wells around the perimeter of the excavation to lower the local water table in the vicinity of the excavation.

EXCAVATION BACKFILLING

Fill Materials

Excavation Backfill

Excavation backfill material must be free of debris, organic material and rock fragments larger than 6 inches. The workability of material used as backfill will depend on the gradation and moisture content of the soil. As the amount of fines increases, soil becomes increasingly sensitive to small changes in moisture content and adequate compaction may become difficult or impossible to achieve. We recommend that backfill material consist of "Select Borrow" as described in Section 9-03.14(2) of the 2012 Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction (Standard Specifications). If construction is performed during wet weather, we recommend modifying the "Select Borrow" specified gradation such that less than 5 percent of the material passes the No. 200 sieve, based on the minus ¾-inch fraction. We recommend any backfill that will be placed below groundwater consist of "Gravel Backfill for Drains" as described in Section 9-03.12(4) of the 2012 WSDOT Standard Specifications.

Quarry Spalls

We recommend that quarry spalls consist of 2- to 4-inch washed crushed stone that meets the quality requirements indicated in Section 9-13 of the WSDOT Standard Specifications. Alternative stone size ranges may be considered.

Subgrade Preparation

The base of the excavation must be in a firm and unyielding condition prior to placement of backfill material. We recommend that exposed subgrades be observed by a member of our staff prior to placement of any fill. Any soft, loose or otherwise unsuitable areas observed must be recompacted, if practical. If the subgrade cannot be readily compacted to a firm and unyielding condition, we recommend placement of a layer of quarry spalls to stabilize the base of the excavation. If quarry spalls are used, we recommend that the layer be placed about 1 to 2 feet thick and "seated" into the underlying subgrades using equipment such as a vibratory plate mounted on an excavator.

Backfill Placement and Compaction

We recommend backfill be compacted at a moisture content near optimum. The optimum moisture content varies with the soil gradation and should be evaluated during construction. Silty soil and other fine-grained soil can be difficult or impossible to compact during wet conditions.

Backfill material must be placed in uniform, horizontal lifts and uniformly densified with vibratory compaction equipment. The maximum lift thickness will vary depending on the material and compaction equipment used, but generally should not exceed 12 inches in loose thickness.

We recommend backfill placed more than 2 feet below subgrade in pavement areas be compacted to at least 90 percent of the maximum dry density (MDD) (ASTM D 1557). Backfill placed within 2 feet of subgrade in pavement areas must be compacted to at least 95 percent of the MDD (ASTM D 1557).

PAVEMENT DESIGN RECOMMENDATIONS

The pavement section recommended below is based on our experience, and is intended for automobile parking and driveway areas only. This pavement section may not be adequate for heavy truck traffic and/or heavy construction traffic loads. The recommended section assumes that stormwater or excess irrigation water from landscape areas does not infiltrate below the pavement section or pond on pavement surfaces.

Pavement subgrade (backfill material) must be prepared, placed and observed as previously described. Crushed rock base course must be moisture conditioned near optimum moisture content and compacted to at least 95 percent of MDD (ASTM D 1577).

Crushed rock base course must conform to applicable sections of 4-04 and 9-03.9(3) of the 2012 WSDOT Standard Specifications. Hot mix asphalt must conform to applicable sections of 5-04, 9-02 and 9-03 of the 2012 WSDOT Standard Specifications.

We recommend the following conventional asphalt concrete section for use in automobile driveway/parking areas:

STANDARD-DUTY ASPHALT CONCRETE PAVEMENT – AUTOMOBILE DRIVEWAYS AND PARKING AREAS

- 2 inches of hot mix asphalt, class ½ inch, PG 64-22.
- 4 inches of crushed surfacing base course.
- Backfill placed and compacted in accordance with the "Excavation Backfilling" section of this technical memorandum.

LIMITATIONS

We have prepared this technical memorandum for the exclusive use of the Washington State Department of Ecology and their authorized agents for Frenchies' Fill-N-Food site located at 106 East Moxee Avenue in Moxee, Washington.

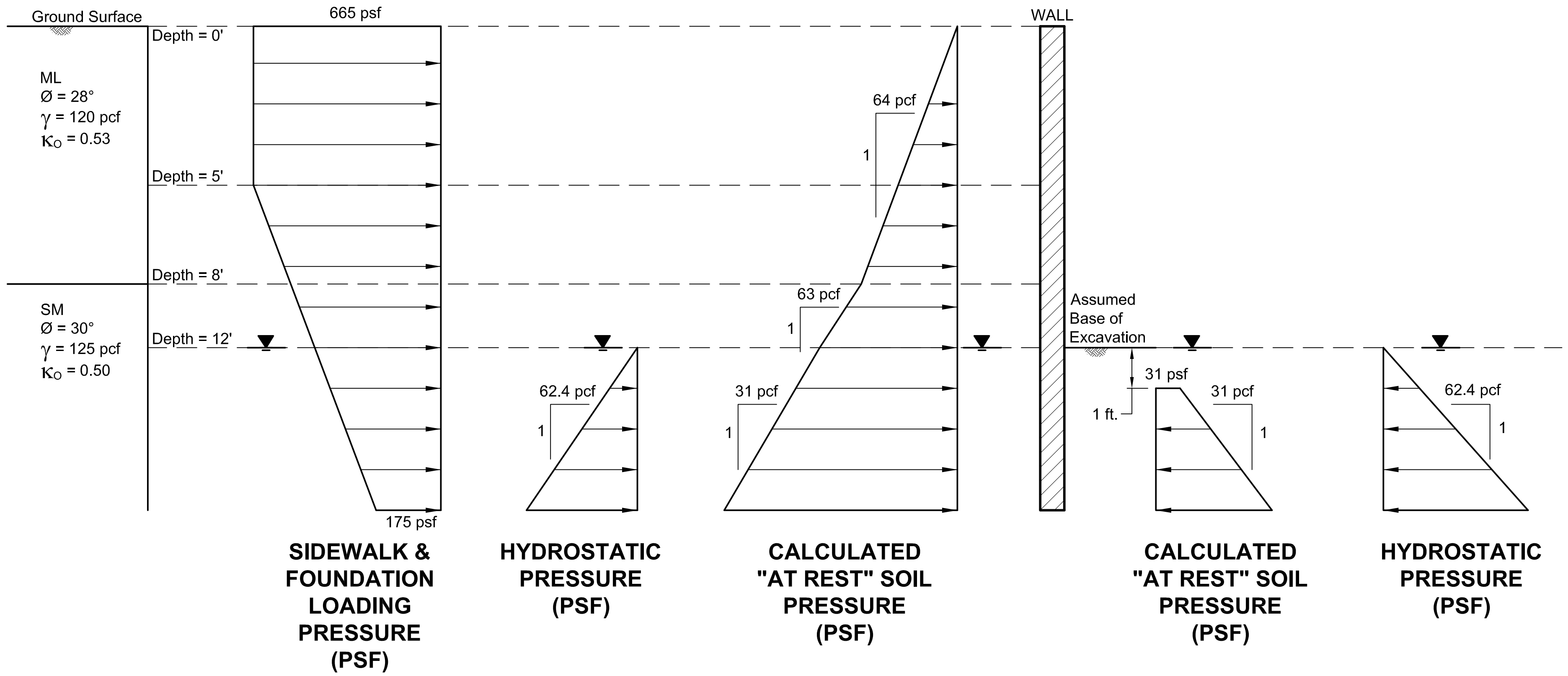
Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this technical memorandum was prepared. No warranty or other conditions, express or implied, should be understood.

MM:GHS:tt

Attachment:
Figure 1. Earth Pressure Diagrams

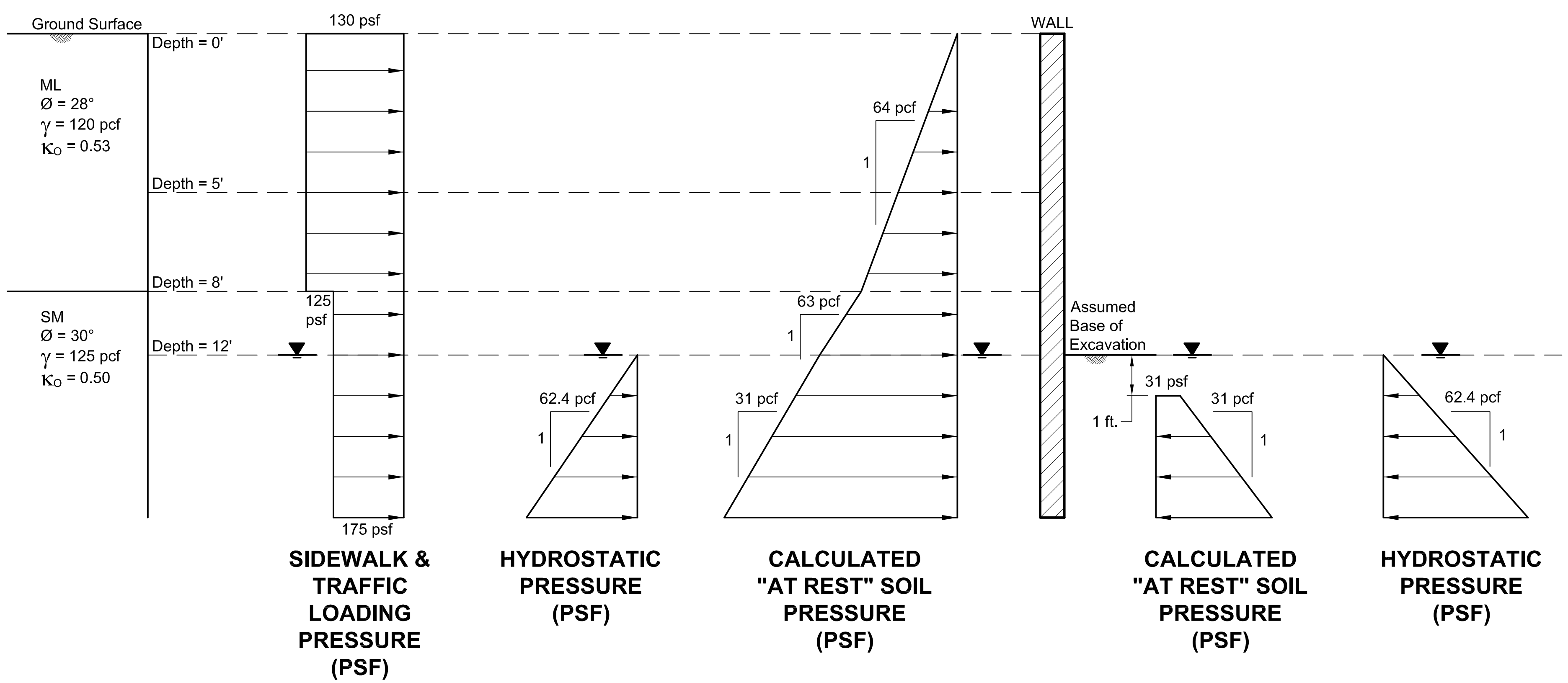
LATERAL EARTH PRESSURES FOR SHORING ADJACENT TO BUILDINGS

DRIVING PRESSURES / RESISTING PRESSURES



LATERAL EARTH PRESSURES FOR SHORING NOT ADJACENT TO BUILDINGS

DRIVING PRESSURES / RESISTING PRESSURES



NOT TO SCALE

Earth Pressure Diagrams	
Frenchies' Fill-N-Food Moxee, Washington	
GeoEngineers	Figure 1

APPENDIX B
Sampling and Analysis Plan

APPENDIX B
SAMPLING AND ANALYSIS PLAN

1.0 INTRODUCTION

This sampling and analysis plan (SAP) describes the field and laboratory methods that will be used for the planned soil and groundwater remedial excavation activities at the Frenchies' site located in Moxee, Washington (referred to as the "site"). The scope of the project includes monitoring remedial excavation activities and collecting soil and groundwater samples for laboratory analysis and evaluating laboratory data,

This SAP has been prepared as Appendix B of the Interim Action work plan. This SAP includes:

- Background and General Site Characterization Scope - **Section 2.0**
- General Remedial Excavation Procedures – **Section 3.0**
- Data Validation and Usability – **Section 4.0**

2.0 BACKGROUND AND GENERAL DATA GAP INVESTIGATION SCOPE

2.1. Background/Environmental Issues Definition

Petroleum-contaminated soil and groundwater have been detected on Frenchies' property during previous site assessment as described in **Section 3.2** of the Work Plan.

2.2. Project Description

The scope of services for the remedial excavation activities includes:

- Monitor remedial excavation activities at the site. The proposed limits of the remedial excavation are shown in Figure 2.
- Collect soil samples from the limits of the remedial excavation for field screening and chemical analysis of contaminants of potential concern (COPCs); refer to **Section 3.2** Field-screening Methods for details on field-screening methods.
- Submit soil samples from the limits of the excavation to a certified analytical laboratory for analysis of the COPCs, as described in the Work Plan.
- Review field and analytical data to assess if the site has been sufficiently characterized or if data gaps exist.
- Prepare a site characterization report that documents the field activities, presents the chemical analytical data, and provides an opinion about the potential risks that contaminants in soil and groundwater pose to human and ecological health.

2.3. Data Quality Objectives, Special Training/Certification, and Documentation

Data quality objectives, special training/certification, and documentation will conform to the requirements of the Quality Assurance Project Plan (QAPP), which is included in Appendix C.

3.0 GENERAL SITE CHARACTERIZATION PROCEDURES

This section describes standard procedures for field data collection that are anticipated during the remedial excavation activities, including:

- Collecting soil samples from the remedial excavation;
- Field-screening methods;
- Decontamination procedures; and
- Sample location control.

3.1. Collecting Soil Samples from Remedial Excavations

Remedial excavation activities will be conducted by a licensed excavator contractor. Soil samples will be collected from the limits of the excavation with the assistance of the contractor using the bucket of the excavator. Samples will be collected from the soil obtained with the bucket of the excavator and transferred into laboratory-prepared containers and soil will be placed in a bag to be field-screened according to the procedures outlined below

Remedial excavation activities will be continuously monitored by an engineer or geologist from our firm, who will observe and classify the soil encountered, and prepare a detailed field report and site plan. Soil encountered in the excavation will be classified in the field in general accordance with ASTM International (ASTM) D-2488, the Standard Practice for Classification of Soils, Visual-Manual Procedure. Samples will be collected from a maximum of 25-foot intervals along the limits of the excavation and placed in laboratory-supplied containers. Sample containers will be labeled and placed into an ice chest containing ice. Chain-of-custody procedures will be observed during transport of the soil samples.

Sampling equipment will be decontaminated after each sample is collected. Samples will be collected using either a decontaminated soil scoop or new, clean nitrile gloves.

3.2. Field-screening Methods

A GeoEngineers field engineer or geologist will perform field-screening tests on selected soil samples. Field-screening results will be used to aid in the selection of soil samples for chemical analysis. Screening methods will include (1) visual examination; (2) water sheen screening; and (3) headspace vapor screening using a photo-ionization detector (PID). Visual screening consists of inspecting the soil for discoloration indicative of the presence of petroleum material in the sample. Water sheen screening involves placing soil in water and observing the water surface for signs of sheen. Sheen classifications are as follow:

No Sheen (NS)	No visible sheen on the water surface;
Slight Sheen (SS)	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly. Natural organic matter in the soil might produce a slight sheen;
Moderate Sheen (MS)	Light to heavy sheen; might have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on water surface; and
Heavy Sheen (HS)	Heavy sheen with color/iridescence; spread is rapid; entire water surface might be covered with sheen.

Headspace vapor screening involves placing a soil sample in a plastic bag. Air is captured in the sealed bag, and the bag is shaken to expose the soil to the air trapped in the bag. The probe of a PID is inserted into the bag, and the PID measures VOC vapor concentrations in ppm. The PID is calibrated to isobutylene. The PID is designed to quantify VOC vapor concentrations in the range between 1 ppm and 2,000 ppm with an accuracy of 10 percent of the reading, and between 2,000 ppm and 10,000 ppm with an accuracy of 20 percent of the reading.

Soil samples will be field-screened using the methods described above during exploration activities. Samples obtained from the borings which indicate petroleum contamination will be submitted for laboratory testing in consultation with Ecology.

Field-screening results are site specific. The results vary with temperature, soil type, type of contaminant, and soil moisture content. Water sheen testing equipment will be disposable or decontaminated before field-screening each sample using a Liquinox soap solution with a water rinse. Decontamination water will be stored on-site in a labeled DOT-approved drum pending disposal with IDW.

3.3. Sample Location Control

Vertical and horizontal sample control will be maintained throughout the project. Benchmarks will be identified to established vertical survey control, if possible, using permanent benchmarks, with a known elevation. If benchmarks with a known elevation are not available, then one or more permanent site features will be designated as benchmarks, and a relative survey will be completed. Horizontal and vertical control for monitoring wells and direct-push borings will be established and tied to datums that are acceptable to Ecology's Environmental Information Management (EIM) System. Once the benchmarks are established, the elevations of monitoring wells will be surveyed by a licensed surveyor. Ground elevations of direct-push explorations also will be surveyed by a licensed surveyor, if scheduling permits. Alternatively, ground elevations of direct-push borings will be surveyed by GeoEngineers field staff using either an optical or laser level, or will be interpolated from a topographic site plan developed for the project by a licensed surveyor.

Horizontal control will be established either by GeoEngineers using measuring tapes or hand-held Global Positioning System (GPS) meter, or by a licensed surveyor. The GPS system is normally accurate to approximately 3 lateral feet. To achieve optimum accuracy, several epoch cycles will be used to obtain each coordinate.

3.4. Sampling And Analytical Methods

Field sampling methods, including quality control (QC) and maintenance of field instrumentation, for soil and groundwater sampling will be conducted in accordance with the QAPP.

Analytical tests will be conducted in accordance with the QAPP. During laboratory procurement, analytical method reporting limits for each proposed analysis will be compared to the reporting limits listed in the QAPP to ensure that data generated will be sufficient for assessment purposes, to the extent possible.

3.5. Sample Handling And Custody Requirements

Samples will be handled in accordance with the QAPP. A complete discussion of the sample identification and custody procedures is provided in the QAPP.

3.6. Field Measurements And Observations Documentation

Field measurements and observations will be recorded in project logs. Daily logs will be dated, and pages will be consecutively numbered. Entries will be recorded directly and legibly in the daily log and signed and dated by the person conducting the work. If changes are made, the changes will not obscure the previous entry, and the changes will be signed and dated. At a minimum, the following data will be recorded in the log book:

- Purpose of activity;
- Location of activity (referenced to the Frenchies' site);
- Description of sampling reference point(s);
- Date, time and duration of each activity;
- Sample number identification;
- Sample number and volume;
- Sample transporting procedures;
- Field measurements made;
- Calibration records for field instruments;
- Visitors to site;
- Relevant comments regarding field activities; and
- Signatures of responsible personnel.

Sufficient information will be recorded in the log book so that field activities can be reconstructed without reliance on personnel memory.

3.7. Data Management And Documentation

Data logs and data report packages will be located in the project file system in GeoEngineers' Spokane, Washington office. Data reports will be available in both hard copy and electronic formats. Laboratory data reports will include internal laboratory QC checks and sample results. Data logs and packages that are anticipated to be generated during the investigation include laboratory data report packages, boring logs, field sampling data sheets, and chain-of-custody forms.

Analytical data will be supplied to GeoEngineers in both Electronic Data Deliverable (EDD) format and hard copy format. The hard copy will serve as the official record of laboratory results. The EDD will be compatible with Earthsoft EQUIS environmental data management software, and will include the following minimum data requirements in unique cells within the EDD:

- Sample identification;
- The reported concentration;
- The method reporting limit;
- Any flags assigned by the laboratory;
- The sampling date and time; and
- The Chemical Abstracts Service (CAS) registry number.

Upon receipt of the analytical data, the EDD will be uploaded to an EQUIS database and reduced into summary tables for each group of analytes and media. Upon completion of the summary tables, the accuracy of the data reduction will be verified using the hard copy of the data received from the laboratory. Any exceptions will be noted and corrections will be made. The EDD data will be submitted to Ecology's EIM system.

4.0 DATA VALIDATION AND USABILITY

Upon receipt of the sample data from the laboratory, the data will be validated and evaluated for usability in accordance with the QAPP.

5.0 REFERENCES

U.S. Environmental Protection Agency (EPA). 1998. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). Revision 5. April.

Washington State Department of Ecology (Ecology), 2004. Collecting and Preparing Soil Samples for VOC Analysis

APPENDIX C
Quality Assurance Project Plan

APPENDIX C
QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan (QAPP) was developed for the proposed data gap investigation activities at Frenchies Fill-N-Food property in Moxee, Washington. The remedial excavation activities are being conducted to assist Ecology in removing the highest concentrations of petroleum-impacted soil from the site, thus reducing the source for the groundwater at the site. Objectives of the remedial excavation is discussed in the Work Plan. Sampling procedures are outlined in the Sampling and Analysis Plan (SAP), included as Appendix B of the Work Plan. The QAPP serves as the primary guide for the integration of QA and QC functions into site characterization activities. The QAPP presents the objectives, procedures, organization, functional activities, and specific quality assurance (QA) and quality control (QC) activities designed to achieve data quality goals that have been established for the project. This QAPP is based on guidelines specified in WAC 173, Chapter 173-340-820 and the EPA Requirements for Quality Assurance Project Plans (EPA, 2004b).

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.

1.0 PROJECT ORGANIZATION AND RESPONSIBILITY

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

1.1. Project Leadership and Management

The Project Manager's (PM) 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. Jon Rudders, LHG is the PM for activities at the sites. The Principal–in-Charge is responsible to Ecology for fulfilling contractual and administrative control of the project. Bruce Williams is the Principal-in Charge.

1.2. Field Coordinator

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

- Provides technical direction to the field staff.
- Develops schedules and allocates resources for field tasks.
- Coordinates data collection activities to be consistent with information requirements.

- Supervises the compilation of field data and laboratory analytical results.
- Assures that data are correctly and completely reported.
- Implements and oversees field sampling in accordance with project plans.
- Supervises field personnel.
- Coordinates work with on-site subcontractors.
- Schedules sample shipment with the analytical laboratory.
- Monitors that appropriate sampling, testing, and measurement procedures are followed.
- Coordinates the transfer of field data, sample tracking forms, and log books to the PM for data reduction and validation.
- Participates in QA corrective actions as required.

The Field Coordinators for site characterization exploration activities at the site are Katie Hall and/or Scott Lathen.

1.3. QA Leader

The GeoEngineers project QA Leader is under the direction of Jon Rudders and Bruce Williams, who are 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. Mark Lybeer is the QA Leader. 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 QC checks are implemented.
- Monitors subcontractor compliance with data quality requirements.

1.4. Laboratory Management

The subcontracted analytical laboratory that is conducting chemical analyses for this project is required to obtain approval from the QA Leader before the initiation of sample analysis to assure that the laboratory QA plan complies with the project QA objectives. The Laboratory's QA Coordinator administers the Laboratory QA Plan and is responsible for QC. Specific responsibilities of this position include:

- Ensure implementation of the QA Plan.
- Serve as the laboratory point of contact.
- Activate corrective action for out-of-control events.
- Issue the final QA/QC report.
- Administer QA sample analysis.
- Comply with the specifications established in the project plans as related to laboratory services.
- Participate in QA audits and compliance inspections.

The chemical analytical laboratory QA Coordinator will be determined by the laboratory.

1.5. Health and Safety

A site-specific health and safety plan (HASP) will be used during the site characterization field activities and is presented in Appendix D. The Field Coordinator will be responsible for implementing the HASP during sampling activities. The PM will discuss health and safety issues with the Field Coordinator on a routine basis during the completion of field activities.

The Field Coordinator will conduct a tailgate safety meeting each morning before beginning field activities. The Field Coordinator will terminate any work activities that do not comply with the HASP. Companies providing services for this project on a subcontracted basis will be responsible for developing and implementing their own HASP.

2.0 DATA QUALITY OBJECTIVES

The QA objective for technical data is to collect environmental monitoring data of known, acceptable, and documentable 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 precision, accuracy, representativeness, completeness, and comparability, 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 Measurement Quality Objectives, Table C-1 and are discussed below.

2.1. Analytes and Matrices of Concern

Samples of soil and groundwater will be collected during site characterization activities. Methods of Analysis and Practical Quanitation Limits (Soil), Table C-2 and Methods of Analysis and Target Reporting Limits (Groundwater), Table C-3 in the QAPP summarize the analyses to be performed at the site for soil and groundwater, respectively.

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, QA dictates that analytical methods achieve a consistently reliable level of detection known as the practical quantitation limit (PQL). The contract laboratory will provide numerical results for all analytes and report them as detected above the PQL or undetected at the PQL.

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. The PQL for site COPCs are presented in Tables C-2 and C-3 for soil and groundwater, respectively. These reporting limits were obtained from an Ecology-certified laboratory (TestAmerica Laboratories, Spokane, Washington). Other criteria include State of Washington Model Toxics Control Act (MTCA) Methods A/B cleanup levels (WAC 173-201) and federal Ambient Water Quality Criteria (AWQC). The analytical methods and processes selected will provide PQLs less than the TRLs under ideal conditions. However, the reporting limits in Tables C-2 and C-3 are considered targets because several factors may influence final detection limits. First, moisture and other physical conditions of soil affect detection limits. Second, analytical procedures may require sample dilutions or other practices to accurately quantify a particular analyte at concentrations above the range of the instrument. The effect is that other analytes could be reported as undetected but at a value much higher than a specified TRL. Data users must be aware that high non-detect values, although correctly reported, can bias statistical summaries and careful interpretation is required to correctly characterize site conditions.

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). 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 of various matrices and field duplicate comparisons for water samples. This value is calculated by:

$$RPD(\%) = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} \ X\ 100,$$

Where

D_1 = Concentration of analyte in sample.

D_2 = Concentration of analyte in duplicate sample.

The calculation applies to split samples, replicate analyses, duplicate spiked environmental samples (matrix spike duplicates), and laboratory control duplicates. The RPD will be calculated for samples 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 (EPA October 1999; EPA October 2004a) that address criteria exceedances and courses of action. Relative percent difference goals for this effort is 30 percent in groundwater and 40 percent in soil for all analyses, unless the duplicate sample values are within 5 times the reporting limit.

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 (MS) result, or from a standard reference material where:

$$Recovery\,(\%) = \frac{Sample\ Result}{Spike\ Amount}\ X\ 100$$

Persons performing the evaluation must review one or more pertinent documents (EPA October 1999; EPA October 2004a) that address criteria exceedances and courses of action. Accuracy criteria for surrogate spikes, MS, and laboratory control spikes (LCS) are found in Table C-1 of this QAPP.

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 the SAP and this QAPP.
- Comparing analytical results of field duplicates to determine the variations in the analytical results.
- Invalidating non-representative 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.

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. For many methods, holding times may be extended by sample preservation techniques in the field. If a sample exceeds a holding time, then the results may be biased low. For example, if the extraction holding time for volatile analysis of soil sample is exceeded, then the possibility exists that some of the organic constituents have volatilized from the sample or degraded. Results for that analysis will be qualified as estimated to indicate that the reported results may be lower than actual site conditions. Holding times are presented in Test Methods, Sample Containers, Preservation and Holding Time, Table C-4.

2.7. Blanks

According to the *National Functional Guidelines for Organic Data Review* (EPA 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.

3.0 SAMPLE COLLECTION, HANDLING AND CUSTODY

3.1. Sampling Equipment Decontamination

The objective of the decontamination procedure is to minimize the potential for cross-contamination between sample locations.

A designated decontamination area will be established for decontamination of drilling equipment and reusable sampling equipment. Drilling equipment will be cleaned using high-pressure/low-volume cleaning equipment.

Sampling equipment will be decontaminated in accordance with the following procedures before each sampling attempt or measurement:

1. Brush equipment with a nylon brush to remove large particulate matter.
2. Rinse with potable tap water.
3. Wash with non-phosphate detergent solution (Simple Green or Liquinox® and potable tap water).
4. Rinse with potable tap water.
5. Rinse with distilled water.

3.2. Sample Containers and Labeling

The Field Coordinator will establish field protocol to manage field sample collection, handling, and documentation. Soil and groundwater samples obtained during this study will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Table C-4.

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

- Project name and number,
- Sample name, which will include a reference to depth if appropriate, and
- Date and time of collection.

The sample collection activities will be noted in the field log books. The Field Coordinator will monitor consistency between the SAP, sample containers/labels, field log books, and the chain of custody (COC) form.

3.3. Sample Storage

Samples will be placed in a cooler with "blue ice" or double-bagged "wet ice" immediately after they are collected. The objective of the cold storage will be to attain a sample temperature of 4 degrees Celsius. Holding times will be observed during sample storage. Holding times for the project analyses are summarized in Table C-4.

3.4. Sample Shipment

The samples will be transported and delivered to the analytical laboratory in the coolers. Field personnel will transport and hand-deliver samples that are being submitted to a local laboratory for analysis. Samples that are being submitted to an out-of-town laboratory for analysis will be transported by a commercial express mailing service on an overnight basis. The Field Coordinator will monitor that the shipping container (cooler) has been properly secured using clear plastic tape and custody seals.

Measures will be implemented to minimize the potential for sample breakage, which includes packaging materials and placing sample bottles in the cooler in a manner intended to minimize damage. Sample bottles will be appropriately wrapped with bubble wrap or other protective material before being place in coolers. Trip blanks will be included in coolers with groundwater samples.

3.5. COC Records

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

- Project name and number;
- Sample identification number;
- Date and time of sampling;
- Sample matrix (soil, water, etc.) and number of containers from each sampling point, including preservatives used;
- Depth of subsurface soil sample;
- Analyses to be performed;
- Names of sampling personnel and transfer of custody acknowledgment spaces; and
- Shipping information including shipping container number.

The original COC record will be signed by a member of the field team 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 shipment. This record will accompany the samples during transit by carrier to the laboratory.

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, time, and date.

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 or in a bound logbook. Entries in the field logs and associated sample documentation forms will be made in waterproof ink, and corrections will consist of line-out deletions that are initialed and dated. Individual logbooks will become part of the project files at the conclusion of the site characterization field explorations.

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

- Sample location and description;
- Site or sampling area sketch showing sample location and measured distances;
- Sampler's name(s);
- Date and time of sample collection;
- Designation of sample as composite or discrete;
- Type of sample (soil or water);
- Type of sampling equipment used;
- Field instrument readings;
- 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, sample disturbance, etc);
- Preliminary sample descriptions (e.g., lithologies, noticeable odors, colors, field-screening results);
- Sample preservation;
- Shipping arrangements (overnight air bill number); and
- Name of recipient laboratory.

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

- Team members and their responsibilities;
- Time of arrival/entry on site and time of site departure;
- Other personnel present at the site;
- Summary of pertinent meetings or discussions with regulatory agency or contractor personnel;
- Deviations from sampling plans, site safety plans, and QAPP procedures;
- Changes in personnel and responsibilities with reasons for the changes;
- Levels of safety protection; and

- Calibration readings for any equipment used and equipment model and serial number.

The handling, use, and maintenance of field log books are the Field Coordinator's responsibilities.

4.0 CALIBRATION PROCEDURES

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.

The PID or flame-ionization detector (FID) used for vapor measurements will be calibrated daily, if required (based on the model used), for site safety monitoring purposes in general accordance with the manufacturer's specifications. If daily calibration is not required for a specific PID model, calibration of the PID will be checked to make sure it is up to date. The calibration results will be recorded in the field logbook.

The Horiba U-22 water quality measuring system will be calibrated prior to each monitoring event in general accordance with the manufacturer's specifications. The calibration results will be recorded in the field report.

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.

5.0 DATA REPORTING AND LABORATORY DELIVERABLES

Laboratories 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 (PQL only). Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues. Laboratory EDD will be established by GeoEngineers, Inc., with the contract laboratory. Final results will be sent to the PM.

Chromatograms will be provided for samples analyzed by Northwest Methods NWTPH-Dx and NWTPH-Gx. The laboratory will assure that the full heights of all peaks appear on the chromatograms and that the same horizontal time scale is used to allow for comparisons to other chromatograms.

6.0 INTERNAL QC

Quality Control Samples Type and Frequency, Table C-5 summarizes the types and frequency of QC samples to be collected during the site characterization, including both field QC and Laboratory QC samples.

6.1. Field QC

Field QC samples serve as a control and check mechanism to monitor the consistency of sampling methods and the influence of off-site factors on environmental samples. Off-site factors include airborne volatile organic compounds and potable water used in drilling activities.

6.1.1. Field Duplicates

In addition to replicate analyses performed in the laboratory, field duplicates also serve as measures for precision. Under ideal field conditions, field duplicates (referred to as splits), are created when a volume of the sample matrix is thoroughly mixed, placed in separate containers, and identified as different samples. This tests both the precision and consistency of laboratory analytical procedures and methods, and the consistency of the sampling techniques used by field personnel.

One field duplicate will be collected for every twenty soil samples. Duplicate soil samples will be analyzed for the COPCs specified for the given sample location. A field duplicate water sample will be collected from one of the monitoring wells and analyzed for the suite of COPCs that is specified for that well.

6.1.2. Trip Blanks

Trip blanks accompany groundwater sample containers used for VOC analyses during shipment and sampling periods. Trip blanks will be analyzed for VOCs on a one per cooler basis.

6.2. Laboratory QC

Laboratory QC 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;
- MS/matrix spike duplicates MSD);
- LCS/laboratory control spike duplicates (LCSD);
- Laboratory replicates or duplicates; and
- Surrogate spikes.

6.2.1. 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 high performance liquid chromatography (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 took place 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, the 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."

6.2.2. 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.

6.2.3. MS/MSD

MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. For example, extreme pH affects the results of semivolatile organic compounds (SVOCs). Or, the presence of a particular compound may interfere with accurate quantitation of another analyte. MS/MSD data are 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 MS 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 boring or 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.

6.2.4. LCS/LCSD

Also known as blanks spikes, LCSs are similar to MSs 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 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.

6.2.5. 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.

6.2.6. 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.

7.0 DATA REDUCTION AND ASSESSMENT PROCEDURES

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 PM.

7.2. Field Measurement Evaluation

Field data will be reviewed at the end of each day by following the QC checks outlined below and procedures in the SAP. 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 COC protocols; and
- Sample shipment.

Cooler receipt forms and sample condition forms provided by the laboratory will be reviewed for out-of-control incidents. The final report will contain what effects, if any, an incident has on data quality. Sample collection information will be reviewed for correctness before inclusion in a final report.

7.3. Field QC Evaluation

A field QC evaluation will be conducted by reviewing field log books 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.

Precision for field duplicate soil samples will not be evaluated because even a well mixed sample is not entirely homogenous due to sampling procedures, soil conditions, and contaminant transport mechanisms.

7.4. Laboratory Data QC Evaluation

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

- Holding times;
- Method blanks;
- MS/MSD;
- LCS/LCSD;
- Surrogate spikes; and
- 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.

8.0 REFERENCES

U.S. Environmental Protection Agency (EPA). 1998. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). Revision 5. April.

U.S. Environmental Protection Agency (EPA). 1999. Contract Laboratory Program National Functional Guidelines for Organic Data Review. 540/R-99/008.

U.S. Environmental Protection Agency (EPA). 2004a. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. 540/R-04/004.

U.S. Environmental Protection Agency (EPA). 2004b. EPA Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. EPA 04-03-030.

Washington State Department of Ecology (Ecology), 1997. Analytical Methods for Petroleum Hydrocarbons. Publication No. ECY 97-602. June.

Table C-1

Measurement Quality Objectives

Frenchies' Fill-N-Food

Moxee, Washington

		Check Standard (LCS) %R Limits[2,3]		Matrix Spike (MS) %R Limits[3]		Surrogate Standards (SS) %R Limits [1,2,3]	MS Duplicate Samples or Lab Duplicate RPD Limits[4]		Field Duplicate Samples RPD Limits[4]	
Laboratory Analysis	**Reference Method**	**Soil**	**Water**	**Soil**	**Water**	**Soil/Water**	**Soil**	**Water**	**Soil**	**Water**
Gasoline-range Petroleum Hydrocarbons	Ecology NWTPH-Gx	74.4-124	80-120	50-133	55.6-126	68.7-141 Water 41.5-162 Soil	20%	20%	32%	35%
Volatile Organic Compounds (VOC)	EPA 8260C	50%-150%	47.1%-150%	50%-150%	44.3%-150%	66.5%-145% (water) 57.7%-149% (soil)	≤29.8% (MS) ≤20% (Dup)	≤15.7% (MS) ≤20% (Dup)	No Data	No Data
Semi-Volatile Organic Compounds (SVOC)	EPA 8270C SIM	42%-147&	40%-125%	42%-147%	40%-125%	36%-145% (soil) 40%-125% (water)	≤60%	≤30%	No Data	No Data

Notes:

Method numbers refer to EPA SW-846 Analytical Methods or Washington State Department of Ecology (Ecology) recommended analytical methods.

[1] Individual surrogate recoveries are compound specific.

[2] Recovery Ranges are estimates. Actual ranges will be provided by the laboratory when contracted.

[3] Percent Recovery Limits are expressed as ranges based on laboratory control limits. Limits will vary for individual analytes.

[4] RPD control limits are only applicable if the concentration 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 2X the MRL for soils and 1X the MRL for waters.

VOCs = Volatile Organic Compounds

BTEX = benzene, toluene, ethylbenzene, xylenes

LCS = Laboratory Control Sample

MS/MSD = Matrix Spike/Matrix Spike Duplicate

RPD = Relative Percent Difference

Table C-2

Methods of Analysis and Practical Quantitation Limits (Soil)

Frenchies' Fill-N-Food
Moxee, Washington

Analyte	Analytical Method	Practical Quantitation Limit (mg/kg)	MTCA Method A Cleanup Level (mg/kg)
Total Petroleum Hydrocarbons (TPH)			
TPH-Gasoline Range	NWTPH-Gx	5	100/30[1]
Volatile Organic Compounds (VOCS)			
Benzene	EPA 8260B	0.005	0.03
Toluene	EPA 8260B	0.100	7
Ethylbenzene	EPA 8260B	0.100	6
M+P Xylene	EPA 8260B	0.400	9[2]
O-Xylene	EPA 8260B	0.200	9[2]
Methyl T-Butyl Ether (MTBE)	EPA 8260B	0.006	0.1
Semi-Volatile Organic Compounds (SVOCs)			
napthalene	EPA 8270C	0.010	5
1-methylnapthalene	EPA 8270C	0.010	5
2-methylnapthalene	EPA 8270C	0.010	5

Notes:

[1] MTCA Method A cleanup level for gasoline-range hydrocarbons is 100 mg/kg if benzene is not detected and the total concentration of ethylenzene, toluene and xylenes are less than 1 percent of the gasoline mixture; otherwise the cleanup level is 30 mg/kg.

[2] Cleanup level for total xylenes

MTCA = Washington State Model Toxics Control Act
EPA = Environmental Protection Agency
mg/kg = milligrams per kilogram

Table C-3

Methods of Analysis and Target Reporting Limits (Groundwater)

Frenchies' Fill-N-Food

Moxee, Washington

Analyte	Analytical Method	Practical Quantitation Limit (µg/l)	MTCA Method A Cleanup Levels (µg/l)
Total Petroleum Hydrocarbons (TPH)			
TPH-Gasoline Range	NWTPH-Gx	90	1,000/800[1]
Volatile Organic Compounds (VOC)			
Benzene	EPA 8260C	0.2	5
Toluene	EPA 8260C	0.5	1,000
Ethylbenzene	EPA 8260C	0.5	700
M+P Xylene	EPA 8260C	0.5	1,000[2]
O-Xylene	EPA 8260C	0.5	1,000[2]
Methyl T-Butyl Ether (MTBE)	EPA 8260C	0.5	20
Semi-Volatile Organic Compounds (SVOCs)			
napthalene	EPA 8270C	0.100	5
1-methylnapthalene	EPA 8270C	0.100	5
2-methylnapthalene	EPA 8270C	0.100	5

Notes:

[1]MTCA Method A cleanup level for gasoline-range petroleum hydrocarbons is 1,000 µg/l if benzene is not detected and the total concentrations of ethylbenzene, toluene and xylenes are less than 1 percent of the gasoline mixture; otherwise the cleanup level is 800 µg/l.

[2]Cleanup level for total xylenes

[3]Practical quantitation limit (PQL) based on information provided by TestAmericaLaboratories.

MTCA = Washington State Model Toxics Control Act

EPA = Environmental Protection Agency

µg/l = micrograms per liter

Table C-4

Test Methods, Sample Containers, Preservation and Holding Time

Frenchies' Fill-N-Food
Moxee, Washington

Analysis	Method	Soil				Groundwater			
		Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times
Gasoline-Range Hydrocarbons	NWTPH-Gx	30 g	2 pre-weighed 40 ml voa vials preserved with MeOH; 4 oz jar (for dry-weight correction)	MeOH; Cool 4°C	14 days from collection to analysis	80 mL	2 - 40 mL VOA Vials	Cool 4 C, HCl to pH < 2	14 days preserved 7 days unpreserved
VOCs	EPA 8260B	30 g	2 pre-weighed 40 ml voa vials preserved with MeOH; 4 oz jar (for dry-weight correction)	MeOH; Cool 4°C	14 days from collection to analysis	80 mL	2 - 40 mL VOA Vials	Cool 4 C, HCl to pH < 2	14 days preserved 7 days unpreserved
SVOCs	EPA 8270C	100 g	4 or 8 oz glass wide-mouth with Teflon-lined lid	Cool 4°C	14 days to extraction, 40 days from extraction to analysis	1 L	2 - 1 liter amber glass with Teflon-lined lid	Cool 4°C	7 days to extraction, 40 days from extraction to analysis

Notes:

Holding Times are based on elapsed time from date of collection

* For both soil and water the Gx and BTEX can be combined and do not require separate containers

VOCs = Volatile Organic Compounds including naphthalene, ethylene dibromide (EDB), 1,2-dichloroethane (EDC), and methyl tert butyl ether (MTBE).

SVOCs = Semi-Volatile Organic Compounds

PCBs = Polychlorinated Biphenyls

HCl = Hydrochloric Acid

HNO_3 = Nitric Acid

VOA = Volatile organic analyte.

EPA = Environmental Protection Agency

oz = ounce; mL = milliliter; L = liter; g = gram

Table C-5

Quality Control Samples Type and Frequency

Frenchies' Fill-N-Food

Moxee, Washington

Parameter	Field QC		Laboratory QC			
	Field Duplicates	Trip Blanks	Method Blanks	LCS	MS / MSD	Lab Duplicates
Gasoline Range Hydrocarbons	1/20 groundwater samples and 1/20 for soil samples	NA	1/batch	1/batch	1/batch	1/batch
VOCs	1/20 groundwater samples	1/cooler	1/batch	1/batch	1 set/batch	NA
SVOCs	1/20 groundwater samples	NA	1/batch	1/batch	1/batch	NA

Note:

An analytical lot or 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

SVOCs = Semi-volatile organic compounds

PCBs = Polychlorinated biphenyls

APPENDIX D
Health and Safety Plan

Site Health and Safety Plan
Frenchies' Fill-N-Food, Interim Action

Moxee, Washington

December 21, 2012

GeoEngineers

523 East Second Avenue
Spokane, Washington 99202
509.363.3125

Table of Contents

GEOENGINEERS, INC.
SITE HEALTH AND SAFETY PLAN
Frenchies' Fill-N-Food Site, Interim Action
File No. 0504-075-00

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:	Interim Action-Frenchies' Fill-N-Food, Moxee, WA
Project Numbers:	0504-075-00
Type of Project:	Interim Remedial Action
Start/Completion:	January – March 2013
Subcontractors:	TBD

2.0 WORK PLAN

The proposed scope of work is summarized below:

- Collect pre-remediation groundwater samples;
- Observe and document remedial excavation of petroleum contaminated soils at Frenchies' Fill-N-Food;
- Collect Confirmation soil samples from the excavation;
- Construct and install infiltration galleries;
- Observe and document backfill and paving activities and practices at the property;

2.1 Project Goals

Implement an interim remedial action to reduce risk to human health and the environment.

2.2 Site History

During January 1994, four USTs located south of the building were removed from the property. Approximately 1,800 cubic yards of petroleum-impacted soil were excavated from the UST area. Soil and groundwater samples obtained from various locations at the site indicated GRPH concentrations greater than MTCA Method A cleanup criterial. GeoEngineers conducted a soil assessment and groundwater monitoring for Ecology at the Site in 2012. Soil assessment results indicate vadose zone soils are contaminated with GRPH and volatile organic compounds (VOCs). Ground water monitoring results indicate groundwater in two of the monitoring wells (MW-2 and MW-3) installed at the site and adjacent to the site is contaminated with GRPH and VOCs. Groundwater was encountered at depths between about 15.3 feet to 16.11 feet below ground surface (bgs) during the groundwater monitoring activities in October 2012.

2.3 List of Field Activities

Check the activities to be completed during the project:

X	Site reconnaissance	X	Field Screening of Soil Samples
	Exploratory Borings	X	Vapor Measurements
X	Excavation Monitoring	X	Groundwater Sampling
X	Surveying	X	Groundwater Depth and Free Product Measurement
	Test Pit Exploration		Product Sample Collection
	Monitoring Well Installation	X	Soil Stockpile Testing
X	Monitoring Well Development	X	Remedial Excavation

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
Katie Hall	40 hour	2/20/12				
Scott Lathen	40 hour	2/20/12				

Chain of Command	Title	Name	Telephone Numbers
1	Project Manager	Jon Rudders	509.363.3125
2	HAZWOPER Supervisor	Bruce Williams	509.363.3125
3	Field Engineer/Geologist	Katie Hall	509.768.3579
		Scott Lathen	509-251-5239
4	Site Safety and Health Supervisor*	Bruce Williams	509.363.3125
5	Client Assigned Site Supervisor		
6	Health and Safety Program Manager	Wayne Adams	253.383.4940
N/A	Subcontractor(s)	TBD	
	Current Owner		

* 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: Yakima Valley Memorial Hospital
2811 Tieton Drive
Yakima, Washington 98902

Phone Numbers (Hospital ER): Phone: (509) 575-8000

Distance:

Route to Hospital:

Head SOUTH on GRANT WAY toward POSTMA RD.

Turn RIGHT on POSTMA RD.

Turn LEFT onto Beaudry RD.

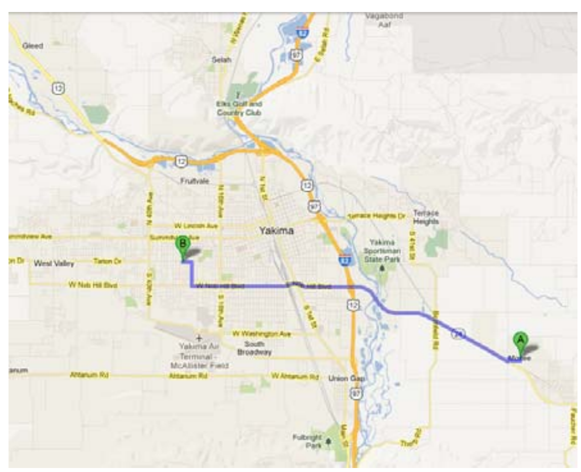
Take 1st right onto WA-24 WEST.

Continue onto E. Nob Hill BLVD.

Turn RIGHT onto S 26th AVE.

Take 3rd LEFT onto W. TIETON DR.

Hospital is on the RIGHT.



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); and
- 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; and
- 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; and
- Keep GeoEngineers manager apprised of situation and notify Human Resources Manager of situation.

5.0 HAZARD ANALYSIS

5.1 Physical Hazards

	Drill rigs
X	Backhoe
X	Trackhoe
	Crane
X	Front End Loader
X	Excavations/trenching (2:1 slopes for east and west slopes)
X	Shored/braced excavation if greater than 4 feet of depth
X	Overhead hazards/power lines
X	Tripping/puncture hazards (debris on-site, steep slopes or pits)
X	Unusual traffic hazard – Street traffic
X	Heat/Cold, Humidity
X	Utilities/ utility locate

- Utility checklist will be completed as required for the location to preventing drilling or digging into utilities. A private utility locate will be completed before drilling activities commence.
- Work areas will be fenced or marked with reflective cones, barricades and/or caution tape. High-visibility vests will be worn by on-site personnel to ensure they can be seen by vehicle and equipment operators.

- Field personnel will be aware at all times 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. Note: If it is later determined that overhead lines are a hazard on this job site a copy the overhead lines safety section from the HASP Supplemental document will be attached.
- Personnel entry into unshored or unsloped excavations deeper than 4 feet is not allowed. Any trenching and shoring requirements will follow guidelines established in WAC 296-155, the Washington State Construction Standards or OSHA 1926.651 Excavation Requirements. In the event that a worker is required to enter an excavation deeper than 4 feet, a trench box or other acceptable shoring will be employed or the side walls of the excavation will be sloped according to the soil type and guidelines as outlined in DOSH/OSHA regulations. If the shoring/sloping deviates from that outlined in the WAC, it will be designed and stamped by a PE. Prior to entry, personnel will conduct air monitoring as described later in this plan. All hazardous encumbrances and excavated material will be stockpiled at least 2 feet from the edge of a trench or open pit. If concentrations of volatile gases accumulate within an open trench or excavation, the means of entering shall adhere to confined space entry and air monitoring procedures outlined under the air monitoring recommendations in this Plan and/or the GeoEngineers Health and Safety Program.
- Personnel will avoid tripping hazards, steep slopes, pits and other hazardous encumbrances. If it becomes necessary to work within 6 feet of the edge of a pit, slope or other potentially hazardous area, appropriate fall protection measures will be implemented by the Site Safety and Health Supervisor in accordance with OSHA/DOSH regulations and the GeoEngineers Health and Safety Program.
- Heat and cold stress control measures required for this site will be implemented according to GeoEngineers Health and Safety Program.

5.2 Engineering Controls

__X__ Trench shoring (2:1 slope for east and west sides of excavation)
__X__ Location work spaces upwind/wind direction monitoring
__X__ Other soil covers (as needed)
_____ Other (specify) ____________________

5.3 Chemical Hazards

Substance	Pathways
Aromatic hydrocarbons (benzene, ethylbenzene, toluene, xylenes [BETX])	Air
Gasoline	Air

Specific Chemical Hazards and Exposures (Potentially Present at Site)

Compound/ Description	Exposure Limits/IDLH	Exposure Routes	symptoms/health effects
Benzene	OSHA PEL 1 ppm Short term: 5 ppm ACGIH PEL 0.5 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritated eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]
Gasoline (Unleaded) — clear liquid with a characteristic odor	PEL 300 ppm TLV 300 ppm STEL 500 ppm	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; headache; dermatitis

Notes:

OSHA = Occupational Safety and Health Administration
PEL = permissible exposure limit
TLV = threshold limit value (over 10 hrs)
STEL = short-term exposure limit (15 min)
ppm = parts per million

5.4 BIOLOGICAL HAZARDS AND PROCEDURES

Y/N	Hazard	Procedures
N	Poison Ivy or other vegetation	
Y	Insects or snakes	Work gloves and long sleeve shirt
Y	Used hypodermic needs or other infectious hazards	Do not pick up or contact
N	Other	

5.5 Additional Hazards

Update in Daily Report. Include evaluation of:

- *Physical Hazards* (excavations and shoring, equipment, traffic, tripping, heat stress, cold stress and others);
- *Chemical Hazards* (odors, spills, free product, airborne particulates and others present); and *Biological Hazards* (snakes, spiders, other animals, discarded needles, poison ivy, pollen, bees/wasps and others present).

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):

X 15 minutes - Continuous during soil disturbance activities or handling samples

______ 15 minutes

______ 30 minutes

______ X Hourly (in breathing zone during excavations, drilling, sampling) if 15 minute monitoring is safe

______

Additional personal air monitoring for specific chemical exposure:

Action levels:

- The workspace will be monitored using a photoionization detector (PID). The PID 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 non-contaminated 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; prior to excavation entry; every 30 to 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; prior to excavation entry; every 30 to 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; prior to excavation entry; every 30 to 60 minutes	> 25 ppm in breathing zone	Stop work and evacuate the area. Contact Health and Safety Manager for guidance.
Combustible Atmosphere	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes	>10% LEL or >1,000 ppm	Depends on contaminant. The PEL is usually exceeded before the lower explosive limit (LEL).
Combustible Atmosphere	Environmental Remedial Actions	PID or 4-gas meter	Start of shift; prior to excavation entry; every 30 to 60 minutes	>10% LEL or >1,000 ppm	Stop work and evacuate the site. Contact Health and Safety Manager for guidance.
Oxygen Deficient/ Enriched Atmosphere	Environmental Remedial Actions Confined Spaces	Oxygen meter or 4-gas meter	Start of shift; prior to excavation entry; every 30 to 60 minutes	<19.5>23.5%	Continue work if inside range. If outside range, evacuate area and contact Health and Safety Manager.

7.0 SITE CONTROL PLAN

A contamination reduction zone should be established for personnel before leaving the site or before breaking for lunches etc. The zone should consist of garbage bags into which used PPE should be disposed. Personnel should wash hands at the site before eating or leaving the site.

7.1 Traffic or Vehicle Access Control Plans

A traffic control plan will be developed if remediation activities will be within traveled rights-of-way.

7.2 Site Work Zones

Site work zones are shown in the project work plan.

Hot zone/exclusion zone: *Within fenced construction area*

	Method of delineation/ excluding non-site personnel
X	Fence
	Survey Tape
X	Traffic Cones
	Other

Contamination reduction zone: to be determined in the field.

Decontamination Zone – to be determined in the field.

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 garments 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 in on-site drums pending characterization and disposal.

Excavated soil disposal or storage:

X On-site, pending analysis and further action (on Frenchies' property within fenced area)

______ Secured (list method) __________________________________

X Other (describe destination, responsible parties): Soil will be disposed of at____________ ____________________

8.0 PERSONAL PROTECTIVE EQUIPMENT

After the initial and/or daily hazard assessment has been completed the appropriate protective personal protective equipment (PPE) will be selected to ensure 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. Task-specific levels of PPE shall be reviewed with field personnel during the pre-work briefing conducted prior to the start of site operations.

Site activities include handling and sampling solid subsurface material (material may potentially be saturated with groundwater). Depth-to-groundwater measurements will be performed as well. Site hazards include potential exposure to hazardous materials, and physical hazards such as trips/falls, heavy equipment, and exposure.

Air monitoring will be conducted to determine 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 unless a higher level of protection is required 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.

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
_____ Other (specify) ____________________

Protective clothing:

_____ Tyvek (if dry conditions are encountered, Tyvek is sufficient)
_____ 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
_____ Level C (respirators with organic vapor/HEPA or P100 filters)

8.1 PERSONAL PROTECTIVE EQUIPMENT INSPECTIONS

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.

9.0 ADDITIONAL ELEMENTS

9.1 Heat Stress Prevention

Field personnel will follow the following procedures for preventing heat stress:

1. Drink water frequently;
2. Take breaks in shade; and
3. Do heavy work in early morning hours.

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
Non-breathing 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 MISCELLANEOUS

10.1 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:

4. 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;
5. All employees who wear a respirator for 30 days or more a year or as required by state and federal regulations;
6. 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
7. Members of HAZMAT teams.

10.2 Sampling, Managing and Handling Drums and Containers

If needed, drums and containers used during the cleanup shall 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. Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. 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. Where major spills may occur, a spill containment program shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred. Fire extinguishing equipment shall be on hand and ready for use to control incipient fires.

10.3 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:

8. 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;
9. All employees who wear a respirator for 30 days or more a year or as required by state and federal regulations;
10. 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
11. Members of HAZMAT teams.

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); and
- Conditional forms available at GeoEngineers office: Accident Report.

The Field Log will 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

The Field Log will contain the following information:

- Updates on hazard assessments, field decisions, conversations with subs, client or other parties;
- Actions taken;
- Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.); and
- Required forms:
    - FORM D-1 Health & Safety Meeting;

- FORM D-2 SITE SAFETY PLAN – GEOENGINEERS' EMPLOYEE ACKNOWLEDGMENT; and
- FORM D-3 SUBCONTRACTOR AND SITE VISITOR SITE SAFETY FORM.

13.0 APPROVALS

1. Plan Prepared	Signature	Date
2. Plan Approval	PM Signature	Date
3. Health & Safety Officer	Wayne Adams Health & Safety Program Manager	Date

FORM D-1
HEALTH AND SAFETY PRE-ENTRY BRIEFING
FRENCHIES' FILL-N-FOOD SITE, INTERIM ACTION
FILE NO. 0504-075-00

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 D-2
SITE SAFETY PLAN – GEOENGINEERS' EMPLOYEE ACKNOWLEDGMENT
FRENCHIES' FILL-N-FOOD SITE
FILE NO. 0504-075-00

(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 D-3
SUBCONTRACTOR AND SITE VISITOR SITE SAFETY FORM
FRENCHIES' FILL-N-FOOD SITE
FILE NO. 0504-075-00

I verify that a copy of the current Site Safety Plan has been provided by GeoEngineers, Inc. to inform me of the hazardous substances onsite 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

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Please let us know by visiting **www. geoengineers.com/feedback**.

GeoEngineers