Work Plan
Interim Action (Data Gap Investigation)

Roby's Project
Buena, Washington

for
Washington State Department of Ecology

November 23, 2011

GeoEngineers
Earth Science + Technology

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File No. 0504-060-02

November 23, 2011

Prepared for:

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1.0 INTRODUCTION

This Work Plan is submitted pursuant to the Scope of Work and Fee Estimate submitted to Washington State Department of Ecology (Ecology) by GeoEngineers, Inc. (GeoEngineers) to conduct an Interim Action at Roby's property in Buena, Washington (herein referred to as "the site"). The location of the site is shown with respect to surrounding physical features on the Vicinity Map, Figure 1. The intent of this initial data gap investigation is to evaluate soil and groundwater conditions and delineate the constituents and extent of vadose-zone soil contamination and groundwater contamination at the site. Following completion of the initial (direct-push boring) phase of the data gap investigation, a report will be prepared in accordance with Washington Administrative Code (WAC) 173-340-430, which will outline the proposed interim remedial actions. The intent of the remedial actions is to remove the source of contamination and to initiate groundwater treatment activities in an expeditious manner at the site. This Work Plan will be amended as necessary to include subsequent interim (remedial actions).

The activities described in this work plan will be conducted to characterize the nature and extent of petroleum contamination of soil and groundwater at the site. This work plan describes: 1) the proposed field investigation; 2) the data analysis program, 3) the anticipated schedule, and 4) the reporting format. The project Sampling and Analysis Plan (SAP) is presented as Appendix A of this work plan. The project Quality Assurance Project Plan (QAPP) is presented as Appendix B. GeoEngineers' site-specific Health and Safety Plan (HASP) for the project is presented as Appendix C.

2.0 BACKGROUND INFORMATION

This section presents background information for the site, including soil and groundwater conditions; historical and current site uses; previous environmental investigations; and contaminants of potential concern (COPCs).

2.1. Property Description

The site is located near the intersection of Buena Road and Burr Street. The Roby's property measures about 0.47 acres, and is bounded on the north by Buena Road and a low income housing complex, on the south by a fire station, on the west by the post office, and on the east by Burr Street. The north portions of the site are paved with asphalt concrete. The remainder of the site is covered with grass and trees, with the exception of the central portions of the site, where the remnants of a mobile home site pad remain. There also is evidence of man-made debris and fill on the site. The gas station building was demolished and removed from the site in October 2011. The site is relatively level, with a slight topographic depression near the south portions of the site.

2.2. Site History

Petroleum-contaminated soil and groundwater have been detected on and downgradient of the Roby's property during previous site remedial and investigation activities. Specifically:

- Petroleum contamination was identified in 1993 at several sites within the town of Buena, including the Roby's Station site, during installation of underground sewer lines.

- Site assessment activities conducted by Ecology between 1997 and 1999 including installing twelve monitoring wells (MW-1 through MW-12) in the town of Buena. Four of the monitoring wells (MW-5 through MW-8) are located near Roby's site. Results of groundwater monitoring events indicate groundwater beneath the site is relatively shallow, between about 4 and 7½ feet below ground surface.
- Petroleum-contaminated soil was identified during removal of five underground storage tanks (USTs) and product lines between the USTs and fuel dispensers on Roby's property in 2001. Results of laboratory analytical testing indicated that site soil near the USTs was contaminated with gasoline-range petroleum hydrocarbons (GRPH), diesel-range petroleum hydrocarbons (DRPH), and benzene, toluene, ethylbenzene and xylene (BTEX) compounds greater than Model Toxics Control Act (MTCA) Method A cleanup levels. The contaminated soil was placed back within the excavation following removal of the USTs.
- GeoEngineers completed site characterization activities at the site in 2010, including installing a groundwater monitoring well (MW-15) near Roby's property. Results of laboratory analytical testing of groundwater samples obtained from monitoring well MW-15, installed south (downgradient) of the property, indicate groundwater is contaminated with DRPH at concentrations greater than MTCA Method A cleanup levels. Results of analytical testing of groundwater samples collected from MW-15 during subsequent groundwater sampling events completed by Ecology in December 2010, March 2011 and June 2011 also indicate that groundwater underlying Roby's site is contaminated with GRPH and benzene at concentrations greater than MTCA Method A cleanup levels. DRPH and oil-range petroleum hydrocarbons (ORPH) also have been detected in groundwater samples from MW-15. Based on the groundwater sampling event in July 2010, groundwater flow direction appeared to be in a generally south-southeast direction under a gradient of about 0.005 feet per foot (ft/ft).
- The existing gas station structure on Roby's property was demolished in October 2011. As part of demolition activities, an on-site domestic water well also was abandoned. Additionally, an underground waste oil tank (approximately 300 gallons) was located on the property. The contents of the waste oil tank were removed and properly disposed off-site during demolition activities. Screening of the waste oil tank contents by Ecology indicated the tank contained polychlorinated biphenyl's (PCBs) and leachable lead. Qualitative field screening conducted by Ecology also indicated the waste oil tank contents contained chlorinated compounds. Decommissioning of the waste oil tank and removal of accessible contaminated soil (if any) associated with the waste oil tank will be included as part of the Interim Action activities. A drywell formerly was located within the structure. Ecology had the contents of the drywell vacuumed on previous occasions. However, the drywell refilled with apparent petroleum-contaminated water and debris after each cleaning attempt. The drywell was removed as part of demolition activities. Removal of concrete floor slabs during demolition revealed stained soil. A hydraulic lift was also removed as part of the building demolition activities.

The approximate locations of site features including the former site USTs, the previous excavation and previous explorations are shown on the Site Plan, Figure 2.

2.3. Geologic and Soil Conditions

The Washington Department of Natural Resources, "Geologic Map of the East Half of the Toppenish 1:100,000 Quadrangle, Washington" indicates that three geologic units are mapped near the site including: Quaternary Age Alluvium (Qa), Quaternary Age Terrace deposits (Qt) and Quaternary Age Outburst flood deposits, silt and sand (Qfs). Alluvium and Terrace deposits consist of silt, sand and gravel, deposited directly by the Yakima River. Alluvium is mapped in valley bottoms, while Terrace deposits are mapped along the margins of the valley bottom, extending about 15 to 30 feet above the current Yakima River flood plain. Outburst flood deposits consist of rhythmically bedded and graded slackwater (low-energy) deposits of silt, minor sand and gravel, deposited during outburst floods from glacial Lake Missoula.

Review of available water well reports on the Washington Department of Ecology on-line database indicates that deposits of gravel, sand, silt and clay with cobbles extend to depths of at least 40 to 90 feet below ground surface near the site. Several well reports indicate that sandstone is present beneath the overburden soil deposits at depths in the range of about 50 to 90 feet below ground surface (bgs).

Soil boring logs from the installation of monitoring wells MW-1 through MW-18 located near the site indicate that gravel with sand and silt are present between the surface and approximately 15 feet bgs. Some clay was also observed in the borings.

2.4. Groundwater Conditions

Based on review of available water well reports, a shallow aquifer is present below the site. Groundwater was observed in MW-1 through MW-11, between 4 and 7½ feet bgs, and at 10 feet bgs in MW-12. Results of groundwater monitoring and slug testing indicate that the shallow unconfined aquifer underlying the silt has a gradient of approximately 0.005 ft/ft with flow towards the south-southeast. The saturated hydraulic conductivity values calculated from the slug tests range between about 0.03 cm/s and 0.4 cm/s. Groundwater elevations and flow directions may vary seasonally and could be affected by seasonal irrigation.

2.5. Site Contaminants of Potential Concern

COPCs for soil and groundwater at the site include contaminants previously detected at levels exceeding MTCA Method A cleanup levels and contaminants associated with historic storage and distribution of petroleum products. COPCs for the site include the following constituents:

- GRPH, DRPH, and ORPH;
- PCBs;
- VOCs, including BTEX, methyl tert-butyl ether (MTBE), ethylene dibromide (EDB), 1,2-dichloroethane (EDC) and naphthalene;
- Semi-volatile organic compounds (SVOCs) including carcinogenic polycyclic aromatic hydrocarbons (PAHs); and
- Lead

3.0 DATA GAP INVESTIGATIONS

The purpose of the work for this phase of the Interim Action proposed herein is to collect soil and groundwater samples to evaluate the current conditions at the site. Proposed new monitoring wells also will serve to evaluate effectiveness of planned interim action cleanup activities. Based on review of existing information, we anticipate that interim remedial actions will include excavation, removal and off-site disposal of contaminated soil, decommissioning of the existing waste oil tank, followed by treatment of contaminated groundwater. Further, based on preliminary evaluation of potentially suitable groundwater treatment alternatives, in-situ chemical oxidation (ISCO) appears to be feasible from a standpoint of meeting cleanup standards within an expeditious time-frame. Data gap investigation field activities are described below.

3.1. General

Based on preliminary review of available information, it appears the lateral extent of soil and groundwater contamination by petroleum products related to the former USTs has not been delineated. Additionally, subsurface explorations near the waste oil tank and within and near the building footprint are warranted to evaluate the potential for soil and groundwater contamination by petroleum hydrocarbons, chlorinated solvents and PCBs. Our activities as a part of the data gap investigation will include:

- Obtain permits, as necessary, for explorations located within state or county rights-of-way.
- Subcontract traffic control services for explorations located within county or state rights-of-way, if necessary.
- Notify the Call-Before-You-Dig utility notification service before beginning drilling.
- Subcontract a private utility locator to clear explorations located on private property before drilling.
- Complete supplemental explorations and sampling including direct-push borings and groundwater monitoring wells.

3.2. Direct-Push Borings

- Drill borings using direct-push (e.g. Geoprobe®) techniques using a subcontracted licensed driller. We anticipate that borings will be advanced to depths in the range of about 10 to 15 feet below current site grades, and that about 12 to 16 borings will be completed. The purpose of the borings will be to:
  - Investigate the area surrounding the waste oil tank and former structure footprint.
  - Further delineate the extent of soil contamination near the former USTs and fuel dispenser locations.
  - Investigate areas downgradient of the source area on Roby's property and within public rights-of-way to aid in delineating the petroleum contaminated plume. We anticipate that downgradient explorations will be located near underground utility corridors. The approximate locations of the proposed direct-push borings are shown on Figure 2.
- Collect continuous soil samples from each direct push boring. Samples of soil recovered from the borings will be field screened using water sheen and headspace vapor measurements to assess possible presence of petroleum-related contaminants. Borings will be backfilled in accordance with applicable state regulations.
- Submit soil samples to a qualified local analytical laboratory for analysis of GRPH using NWTPH-Gx methods, DRPH and ORPH using NWTPH-Dx methods, VOCs including EDC, MTBE

and naphthalene using EPA 8260 methods. Selected soil samples will be analyzed for EDB using EPA 8260 methods of EPA 8011 methods. Soil samples obtained from explorations near the waste oil tank and building footprint, and possibly samples collected from borings downgradient of the waste oil tank and building footprint, will be analyzed for SVOCs using EPA 8270 methods and PCBs using EPA 8082 methods. Selected samples (those that appear to have the highest petroleum contamination based on field-screening and/or analytical results for GRPH, DRPH and/or ORPH will be analyzed for extractable petroleum hydrocarbon (EPH) fractions, volatile petroleum hydrocarbon (VPH) fractions. Selected samples also will be submitted for analysis of total lead using EPA 6000 series methods. For budget estimating purposes, we assume that 16 soil samples will be submitted for analysis of GRPH, DRPH, ORPH, VOCs and lead and 4 to 6 soil samples will be analyzed for SVOCs and PCBs, and one sample will be analyzed for VPH and EPH.

- If possible, groundwater samples also might be collected from direct push explorations and submitted to an analytical laboratory for analyses of GRPH using NWTPH-Gx methods, DRPH and ORPH using NWTPH-Dx methods or hydrocarbon identification (HCID) using NWTPH-HCID methods and VOCs using EPA 8260 methods. Selected samples (those that appear to have the highest petroleum contamination based on field-screening and/or analytical results for GRPH, DRPH and/or ORPH will be analyzed for EPH fractions and VPH fractions using GC/FID/PID Ecology methods. Selected samples also will be submitted for analysis of total lead using EPA 200 series methods. Ecology and GeoEngineers will select methodology based on field indicators. Groundwater samples collected also might be analyzed for SVOCs using EPA 8270 methods and PCBs using EPA 8082 methods. For budget estimating purposes, we assume that 8 samples will be submitted for analysis using NWTPH-Gx and NWTPH-Dx methods, 4 to 6 samples will be submitted for analysis of SVOCs and PCBs, one sample will be submitted for analysis of lead, and one sample will be submitted for analysis of VPH and EPH.

3.3. Evaluation of Other Potential Site Sources

- Collect samples of sediment and water (if possible) from the existing drywell located within the building footprint and submit to a qualified analytical laboratory for analysis of GRPH using NWTPH-GX methods, DRPH and ORPH using NWTPH-Dx methods, VOCs using EPA 8260 methods, semi-volatile organic compounds (SVOCs) using EPA 8270 methods and poly-chlorinated biphenyls (PCBs) using EPA 8082 methods. For budget estimating purposes, we assume that two samples will be obtained from the drywell location. Alternatively, a direct-push boring may be drilled near the location of the drywell.

3.4. New Groundwater Monitoring Wells

Following the initial data gap investigation, UST decommissioning and source removal, subcontract a licensed driller to drill borings to depths on the order of about 15 feet below site grade. Soil samples will be obtained using standard penetration test (SPT) samplers. Soil samples will be field screened using water sheen and headspace vapor measurements to assess possible presence of petroleum-related contaminants. Approximately four borings will be drilled downgradient of the proposed groundwater treatment area primarily to evaluate effectiveness of anticipated initial groundwater remedial activities, but also to aid in delineating the petroleum contaminated plume. Wells will be placed either on Roby's property, or in public rights-of-way, provided permits can be obtained from applicable public agencies. Well locations will be determined in the field by Ecology and GeoEngineers. The tentative locations of proposed monitoring wells are shown in Figure 2.

- Install and develop 2-inch-diameter monitoring wells in the borings.
- Submit soil samples to a qualified local analytical laboratory for analysis of GRPH using NWTPH-GX methods, DRPH and ORPH using NWTPH-Dx methods, and VOCs including EDC, MTBE and naphthalene using EPA 8260 methods, EDB using EPA 8260/8011 methods and lead using EPA 200/6000 Series methods. Samples also might be analyzed for PCBs using EPA 8082 methods. For budget estimating purposes, we assume that four soil samples will be submitted for analysis.
- Subcontract a licensed surveyor to record elevations and locations of the borings and wells.
- Subcontract a licensed contractor to remove and dispose drill cuttings at a suitable disposal facility.

3.5. Task 3: Reporting

- Provide draft results of field work and analytical laboratory testing to Ecology for review. Following the initial data gap investigation phase, GeoEngineers will prepare a supplemental Draft and Final Work Plan and Report for Ecology review. The supplemental Work Plan will provide details on activities subsequent to the data gap investigation phase, including source removal and groundwater treatment. GeoEngineers will submit a draft and final report before commencing with cleanup activities in accordance with WAC 173-340-430, which also will include a conceptual site model. All data will be submitted to Ecology in electronic format for EIM inclusion.

4.0 SCHEDULE AND REPORTING

Direct-push drilling is scheduled for November 14, 2011 through November 16, 2011. Source removal is anticipated for early 2012. Monitoring wells will be installed in early 2012 (February). Well surveying activities will be conducted at the same time as the groundwater sampling event of the new wells. ISCO injection and monitoring activities will be conducted after the installation of the monitoring wells. Following completion of field activities and receipt of analytical data, we will prepare a draft report for review.

PROJECT MILESTONES	SCHEDULE
Draft Work Plan(Data Gap Investigation phase)	November 9, 2011
Final Work Plan(Data Gap Investigation phase)	November 11, 2011
Direct-Push Boring Field Work	November 14-16, 2011
Draft Interim Action Report (WAC 173-340-400)	January 2012
Final Interim Action Report (WAC 173-340-400)	January 2012
Draft Work Plan (UST and Source Removal)	January 2012
Final Work Plan (UST and Source Removal)	January 2012
UST and Source Removal Field Work	January/February 2012
Monitoring Well Installation	February 2012
Draft Work Plan (ISCO Injection and Monitoring)	February 2012

PROJECT MILESTONES	SCHEDULE
Final Work Plan (ISCO Injection and Monitoring)	February 2012
ISCO Injection and Monitoring	March 2012
Draft Final Report	April 2012
Final Report	May 2012

5.0 ACRONYMS

%D – percent difference
ACGIH – American Conference of Governmental Industrial Hygienists
ASTM – ASTM International
AWQC – ambient water quality criteria
BTEX – benzene, toluene, ethylbenzene and xylenes
CAS – Chemical Abstracts Service
COC – chain-of-custody
COPCs – contaminants of potential concern
CPR – cardiopulmonary resuscitation
DOSH – Division of Occupational Safety and Health
DOT – Department of Transportation
DRPH – diesel-range petroleum hydrocarbons
Ecology – Washington State Department of Ecology
EDD – electronic data deliverable
EIM – Environmental Information Management
EPA – Environmental Protection Agency
FID – flame-ionization detector
GeoEngineers – GeoEngineers, Inc.
GPS – global positioning system
GRPH – gasoline-range petroleum hydrocarbons
HASP – Health and Safety Plan
HAZWOPER – Hazardous Waste Operations and Emergency Response Standard
HEPA – high-efficiency particulate air
HPLC – high performance liquid chromatography
IDL – instrument detection limit
IDLH – immediately dangerous to life or health
IDW – investigation derived waste
IP – ionization potential
LCS – laboratory control spike
LCSD – laboratory control spike duplicate
MDL – method detection limit
mg/m^3 - milligrams per cubic meter
MQO – measurement quality objectives
MS – matrix spike
MSD – matrix spike duplicate
MTBE = methyl tert-butyl ether
MTCA – Model Toxics Control Act

NA = not available
ND = not detected
NIOSH – National Institute for Occupational Health and Safety
NRCS – Natural Resources Soil Conservation Service
NT = not tested
OSHA – Occupational Safety and Health Administration
PAH – Polycyclic aromatic hydrocarbons
PARCC – precision, accuracy, representativeness, completeness and comparability
PCB – polychlorinated biphenyls
PEL - permissible exposure limits
PID – photo-ionization detector
PM = project manager
ppb – parts per billion
PPE – personal protective equipment
ppm – parts per million
PQL – practical quantitation limit
PVC – polyvinyl chloride
QA – quality assurance
QAPP – Quality Assurance Project Plan
QC – quality control
Qfs – catastrophic flood slack-water sediments
RCRA – Resource Conservation and Recovery Act
RPD – relative percent difference
SAIC – Science Applications International Corporation
SAP – Sampling and Analysis Plan
Sites – Roby's property, Fred Dill Property and Gold Nugget property
SPT – standard penetration test
STEL – short-term exposure limit
SVOC – semivolatile organic compound
TLV – threshold limit value
TPH – total petroleum hydrocarbons
TRL – target reporting limit
TWA – time-weighted average
USDA – United States Department of Agriculture
USTs – underground storage tanks
VOCs – volatile organic compounds
WAC – Washington Administrative Code

FIGURES

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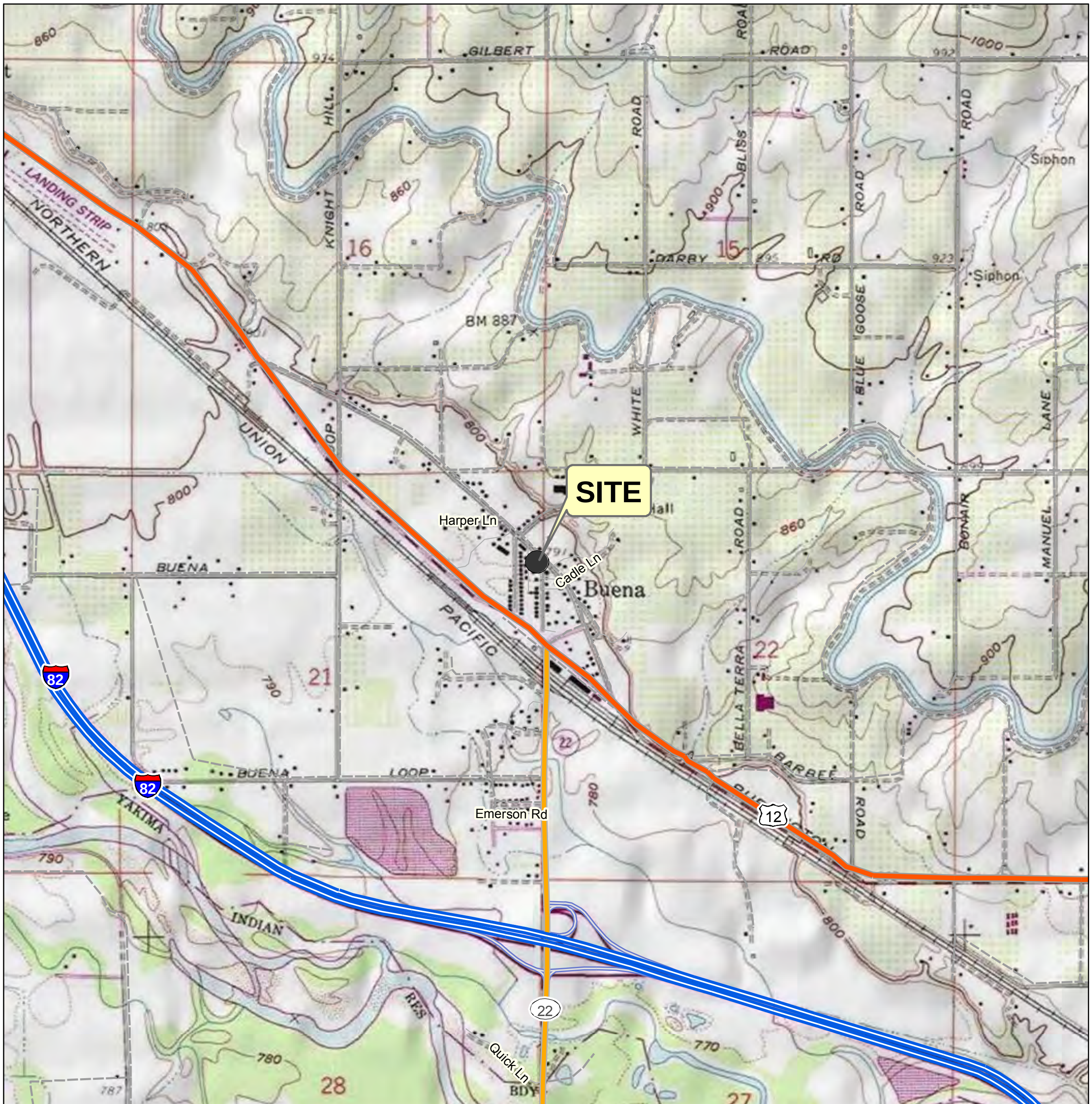

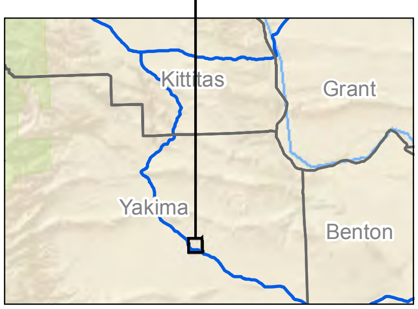

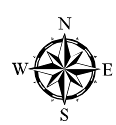

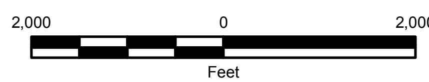

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
Data Sources: ESRI Data & Maps, Street Maps 2008.
Projection: NAD 1983, WA State Plane South, feet.

Vicinity Map

Roby's Station Interim Action
Buena, Washington

GeoEngineers

Figure 1

Map Revised: 11/09/2011 CRC
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Office: SPO

MW-5 Existing Monitoring Well Number and Approximate Location

Proposed Direct-Push Boring (location subject to change depending on results of investigation)

Proposed Monitoring Well (location subject to change depending on results of investigation)

F Location of Former Fuel Dispensers

Approximate Location of Existing Waste Oil Tank

Approximate Location of Former USTs

N W E S

0 50 Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. 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: Bing Maps Aerial from ESRI Data Online
Projection: NAD 1983, UTM Zone 11 North.

Site Plan

Roby's Station Interim Action
Buena, Washington

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Figure 2

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APPENDICES

APPENDIX A
Sampling and Analysis Plan

APPENDIX A
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 characterization activities at the Roby's property located in Buena, Washington (referred to as the "site"). The scope of the project includes completing about 12 to 16 direct-push borings, installing four groundwater monitoring wells, collecting soil and groundwater samples for laboratory analysis and evaluating laboratory data,

This SAP has been prepared as Appendix A of the site characterization work plan. This SAP includes:

- Background and General Site Characterization Scope - Section 2.0
- General Remedial Investigation 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 the Roby's property during previous site assessment and remedial activities as described in Section 2.2 of the Work Plan. Additionally, a waste oil tank currently remains on the site, and will be decommissioned as part of interim action remedial activities.

2.2. Project Description

The scope of services for the soil and groundwater investigation includes:

- Complete a One Call utility locate and retain a private utility locator to clear the proposed exploration areas
- Complete 12 to 16 direct-push soil borings to depths ranging from 10 to 15 feet below ground surface (bgs). Temporary wells might be installed in the borings to facilitate the collection of a groundwater sample from selected borings.
- Use a drill rig to install four 2-inch-diameter groundwater monitoring wells to depths of approximately 15 feet bgs. The tentative locations of the proposed monitoring wells are shown in Figure 2, although final locations will be selected based on data obtained from direct-push borings, field-screening data during installation of the wells, and site access constraints. The wells will be drilled using hollow-stem auger techniques. Develop the newly installed wells.
- Collect soil sub-samples from areas potentially impacted with contaminants of potential concern (COPCs) based on field-screening results; refer to Section 3.2 Field-screening Methods for details on field-screening methods.

- Submit soil samples from the direct-push explorations and the monitoring well borings to a certified analytical laboratory for analysis of the COPCs, as described in the Work Plan.
- Retain a licensed surveyor to determine the horizontal and vertical locations of each groundwater monitoring well.
- Survey the location of each direct-push exploration using a mapping-grade global positioning system (GPS) unit with sub-meter accuracy, or by the subcontracted surveyor, if scheduling permits. Use global datum for survey to within 0.01 feet top of casing, 0.1 feet laterally.
- Measure and record VOCs in the well headspace using a PID by inserting the PID probe into the well casing immediately after removing the well cap. Measure free product in wells using either small disposable bailers or an oil-water-interface probe.
- Measure the depth to water at newly installed wells with an electronic level indicator to calculate groundwater elevations and the inferred groundwater flow direction.
- Collect groundwater samples from newly installed wells using low-flow sampling techniques.
- Submit the groundwater samples to certified analytical laboratory for analysis of the COPCs, as described in the work plan.
- Containerize, label, and store investigation derived waste (IDW) in a secure location onsite pending waste characterization and disposal. IDW will be stored in 55-gallon Department of Transportation (DOT) -approved drums.
- 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 B.

3.0 GENERAL SITE CHARACTERIZATION PROCEDURES

This section describes standard procedures for field data collection that are anticipated during the site characterization, including:

- Collecting soil samples from explorations;
- Field-screening methods;
- Monitoring well construction, development, and surveying;
- Groundwater elevations;
- Groundwater sampling;
- Decontamination procedures;

- Handling of investigation-derived waste (IDW); and
- Sample location control.

3.1. Collecting Soil Samples from Soil Explorations

Soil explorations will be advanced by a licensed driller using hollow-stem auger and direct-push drilling techniques.

For hollow-stem auger methods, soil samples will be collected at approximate 2½- to 5-foot depth intervals using either a 2-inch outside-diameter, split spoon sampler or a 2½-inch inside-diameter California-style split barrel sampler driven into the relatively undisturbed soil using a 140 pound-hammer free falling approximately 30 inches. Hollow-stem auger drilling uses a rotating auger and center drag bit to transport cuttings to the ground surface.

Direct-push drilling is useful for shallow subsurface explorations. Continuous soil samples are collected using 4-foot-long, 1-inch-diameter acrylic sleeves. Samples will be collected from the sleeves, field-screened according to the procedures outlined below, and transferred into laboratory-prepared containers.

Each boring will be continuously monitored by an engineer or geologist from our firm, who will observe and classify the soil encountered, and prepare a detailed log of each boring. Soil encountered in the borings 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 selected intervals 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 between each sampling attempt. Samples will be collected using either a decontaminated soil knife 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. Monitoring Well Construction, Development, and Surveying

Monitoring wells will be constructed in accordance with Washington Administrative Code (WAC) 173-160, Section 400, Washington State Resource Protection Well Construction Standards. All monitoring well records will be submitted in accordance with Washington monitoring well construction standards. Monitoring well installation will be observed by a GeoEngineers field engineer or geologist, who will maintain a detailed log of the materials and depths of the well. Well construction details, including the depths of the well screen and filter packs, will be recorded on the monitoring well construction record.

Each monitoring well will be constructed using 2-inch-diameter polyvinyl chloride (PVC) well casing. The annular space in each well will be sealed between the top of the filter pack and the ground surface with bentonite to prevent infiltration of groundwater into the well bore from shallower zones. A lockable compression-type cap will be installed in the top of the PVC well casing. A concrete surface seal will be placed around the monument at the ground surface to divert surface water away from the well location.

Each monitoring well will be developed to remove water introduced into the well during drilling (if any), stabilize the filter pack and formation materials surrounding the well screen, and restore the hydraulic connection between the well screen and the surrounding soil.

The depth to water in the monitoring well will be measured prior to development. The total depth of the well will also be measured and recorded. The monitoring wells will be developed by pumping, surging, bailing, or a combination of these methods after construction. Development of each well will continue until the water is as free of sediment as practicable with respect to the composition of the subsurface materials within the screened interval. The removal rate and amount of groundwater removed will be recorded during well development procedures.

During well development, water will be collected and stored on site.

The horizontal locations and elevations of the monitoring wells will be surveyed by a licensed surveyor subcontracted to GeoEngineers. A survey reference notch will be established on the north side of each monitoring well casing.

3.4. Groundwater Elevations

Depths to groundwater, relative to the monitoring well casing rims, will be measured to the nearest 0.01 foot, using an electronic water level indicator. The electronic water level indicator will be decontaminated with Liquinox® solution wash and a distilled water rinse prior to use in each well. Groundwater elevations will be calculated by subtracting the water table depth from the surveyed casing rim elevations.

3.5. Groundwater Sampling

3.5.1. Direct-Push Borings

Groundwater samples from direct-push borings, if collected, will be utilized for qualitative evaluation of groundwater contamination and to aid in selecting locations for subsequent monitoring wells. Groundwater samples will be collected by first inserting a temporary screen into the borehole. Following insertion of the temporary screen, the temporary well will be developed and purged with several well volumes in an attempt to reduce turbidity of the groundwater sample. However, the level of development will not be to the same criteria as for permanent monitoring wells. Immediately following purging, groundwater samples will be collected with a portable peristaltic pump. Water quality parameters (temperature, pH, re-dox potential, conductivity, dissolved oxygen and turbidity) will be monitored and recorded, if possible. Following collection of a groundwater sample, the temporary screen will be removed and the direct-push boring will be abandoned in accordance with applicable state regulations. Sample containers will be filled completely to eliminate headspace in the containers. Chain-of-custody procedures will be observed from the time of sample collection to delivery to the testing laboratory.

3.5.2. Monitoring Wells

Each groundwater sample will be collected using low-flow purging methods. During well purging, water quality parameters (temperature, pH, conductivity, dissolved oxygen and turbidity) will be monitored and recorded. The groundwater samples will be transferred in the field to laboratory-prepared sample containers and kept cool during transport to the testing laboratory. The sample containers will be filled completely to eliminate headspace in the container. Chain-of-custody procedures will be observed from the time of sample collection to delivery to the testing laboratory.

Additionally, measurement of VOCs in the well headspace will be taken using a PID by first inserting the PID probe into the well casing immediately after removal of the well cap. Measurement of free product, if present, will be completed by lowering a disposable bailer into the well until it partially penetrates the groundwater table. Alternatively an oil-water-interface probe will be used to measure free product. Each groundwater sample will be collected using low-flow purging methods. During well purging, water quality parameters (temperature, pH, conductivity, dissolved oxygen and turbidity) will be monitored and recorded. The groundwater samples will be transferred in the field to laboratory-prepared sample containers and kept cool during transport to the testing laboratory. The sample containers will be filled completely to eliminate headspace in the container. Chain-of-custody procedures will be observed from the time of sample collection to delivery to the testing laboratory.

3.6. Decontamination Procedures

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 (Liquinox® and potable tap water).
4. Rinse with potable tap water.
5. Rinse with distilled water.

3.7. Handling of Investigation-Derived Waste

IDW, which will mainly consist of drill cuttings and decontamination/purge water, will be placed in DOT-approved 55-gallon drums. Each drum will be labeled with the project name, general contents, and date. The drummed IDW will be stored on-site pending analysis and disposal.

Disposable items, such as sample tubing, disposable bailers, bailer line, gloves and protective overalls, paper towels, etc., will be placed in plastic bags after use and deposited in trash receptacles for disposal.

3.8. 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.

3.9. 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.

3.10. 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.

3.11. 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 either Roby's property or Gold Nugget Market property);
- 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.

3.12. 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 B
Quality Assurance Project Plan

APPENDIX B
QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan (QAPP) was developed for the proposed data gap investigation activities at Roby's property in Buena, Washington. The data gap investigation is being conducted to assist Ecology in characterizing the source, constituents and extent of groundwater and soil contamination at the site. Objectives of the site characterization are discussed in the Work Plan. Sampling procedures are outlined in the Sampling and Analysis Plan (SAP), included as Appendix A 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. David Lauder, PE 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 Robert Miyahira and/or Scott Lathen.

1.3. QA Leader

The GeoEngineers project QA Leader is under the direction of David Lauder 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 C. 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 Table B-1 and are discussed below.

2.1. Analytes and Matrices of Concern

Samples of soil and groundwater will be collected during site characterization activities. Tables B-2 and B-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 B-2 and B-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 B-2 and B-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 B-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 Table B-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 (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 B-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 B-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

Table B-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 B-1

Measurement Quality Objectives

Roby's Station Interim Action (Data Gap Investigation)

Buena, Washington

Laboratory Analysis	Reference Method	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]	
		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%	50%-150% (soil) 37.9%-162% (water)	≤20% (MS) ≤32.3% (Dup)	≤20% (MS) ≤35% (Dup)	≤20%	≤20%
Diesel- and Heavy oil-range Petroleum Hydrocarbons	Ecology NWTPH-Dx with silica gel/acid wash cleanup	73%-133%	54.5%-136%	70.1%-139%	54.5%-136%	50%-150%	≤25% (MS) ≤40% (Dup)	≤32.5% (MS) ≤25% (Dup)	≤25%	≤25%
Volatile Organic Compounds (VOC)	EPA 8260B	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	42%-147&	40%-125%	42%-147%	40%-125%	36%-145% (soil) 40%-125% (water)	≤60%	≤30%	No Data	No Data
Polychlorinated Biphenyls (PCB)	EPA 8082	63.1%-147%	42.6%-134%	50.6%-145%	50%-150%	27.9%-154% (soil) 40%-137% (water)	≤40% (MS) ≤40% (Dup)	≤35% (MS) ≤35% (Dup)	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

https://projects.geoengineers.com/sites/0050406002/Draft/Work Plan/[Robys Table B-1.xls]Table B-1

Table B-2

Methods of Analysis and Practical Quantitation Limits (Soil)

Roby's Station Interim Action (Data Gap Investigation)

Buena, 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]
TPH - Diesel Range	NWTPH-Dx with silica gel/acid wash cleanup	10	2,000
TPH - Oil Range	NWTPH-Dx with silica gel/acid wash cleanup	25	2,000
Volatile Organic Compounds (VOCS)			
Benzene	EPA 8260B	0.015	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	0.030	0.1
Semi-Volatile Organic Compounds (SVOC) and Polychlorinated Biphenyls (PCB)			
SVOCs	EPA 8270C	Varies	Varies
PCBs	EPA 8082	0.050	1

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

https://projects.geoengineers.com/sites/0050406002/Draft/Work Plan/[Robys Table B-2.xls]Table B-2

Table B-3

Methods of Analysis and Target Reporting Limits (Groundwater)

Roby's Station Interim Action (Data Gap Investigation)

Buena, 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 / NWTPH-HCID	100	1,000/800[1]
TPH - Diesel Range	NWTPH-Dx (with silica gel/acid wash cleanup) / NWTPH-HCID	250	500
TPH - Oil Range	NWTPH-Dx (with silica gel/acid wash cleanup) / NWTPH-HCID	500	500
Volatile Organic Compounds (VOC)			
Benzene	EPA 8260B	0.2	5
Toluene	EPA 8260B	0.5	1,000
Ethylbenzene	EPA 8260B	0.5	700
M+P Xylene	EPA 8260B	0.5	1,000[2]
O-Xylene	EPA 8260B	0.5	1,000[2]
Methyl T-Butyl Ether (MTBE)	EPA 8260B	0.5	20
Semi-Volatile Organic Compounds (SVOC) and Polychlorinated Biphenyls (PCB)			
SVOCs	EPA 8270C	Varies	Varies
PCBs	EPA 8082	0.100	0.1

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

https://projects.geoengineers.com/sites/0050406002/Draft/Work Plan/[Robys Table B-3.xls]Table B-3

Table B-4

Test Methods, Sample Containers, Preservation and Holding Time

Roby's Station Interim Action (Data Gap Investigation)

Buena, Washington

		Soil				Groundwater			
Analysis	**Method**	**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
Diesel- and Oil-Range Hydrocarbons	Ecology NWTPH-Dx with silica gel/acid wash cleanup	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	1 liter amber glass with Teflon-lined lid	Cool 4 C, HCl to pH < 2	14 days to extraction 40 days from extraction to analysis
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
PCBs	EPA 8082	100 g	4 or 8 oz glass wide-mouth with Teflon-lined lid	Cool 4°C	1 year from collection	1 L	1 liter amber glass with Teflon-lined lid	Cool 4°C	1 year from collection

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

https://projects.geoengineers.com/sites/0050406002/Draft/Work Plan/[Robys Table B-4.xls]Table B-4

Table B-5

Quality Control Samples Type and Frequency

Roby's Station Interim Action (Data Gap Investigation)

Buena, 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
Diesel and Oil Range Hydrocarbons with silica gel/acid wash cleanup	1/20 groundwater samples and 1/20 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
PCBs	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

https://projects.geoengineers.com/sites/0050406002/Draft/Work Plan/[Robys Table B-5.xls]Table B-5

APPENDIX C
Health and Safety Plan

Site Health and Safety Plan
Buena LUST Sites, Interim Action (Data Gap Investigation)
Buena, Washington

November 23, 2011

GeoEngineers
523 East Second Avenue
Spokane, Washington 99202
509.363.3125

Table of Contents

GEOENGINEERS, INC.
SITE HEALTH AND SAFETY PLAN
Buena LUST sites, Interim Action (Data Gap Investigation)
File No. 0504-060-02, -03

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-Roby's Station, Buena, WA Interim Action-Gold Nugget Market, Buena, WA
Project Number:	0504-060-02 0504-060-02
Type of Project:	Data Gap Investigation- Assess Soil and Groundwater Conditions
Start/Completion:	November 2011-February 2012
Subcontractors:	Environnemental West Exploration, Inc. Advanced Underground Utility Locating, Inc. Pavement Surface Control, Inc. (traffic control if necessary)

2.0 WORK PLAN

The proposed scope of work is summarized below:

- Complete direct-push explorations, including soil and groundwater sampling;
- Install groundwater monitoring wells;
- Collect soil samples from the monitoring well borings; and
- Measure depth to water and collect groundwater samples from the new and existing monitoring wells.

2.1 Project Goals

The goal of the project is to assess current soil and groundwater conditions to allow Ecology to assess the overall risk to human health and the environment, and ultimately implement a remedial approach to reduce risks.

2.2 Site History

Petroleum contamination was identified in 1993 at various sites in Buena including Roby's Property and Gold Nugget and USTs were removed from the properties. Petroleum-contaminated groundwater is present at the Gold-Nugget site. Petroleum-contaminated soil and groundwater also are present at the Roby's property. Additionally, during recent demolition activities at the Roby's property, an existing waste oil UST was discovered. The contents of the UST (approximately 300 gallons) were removed and disposed of off-site. Results of analytical testing indicate that the waste oil contained PCBs at concentrations less than hazardous levels, but greater than MTCA Method A cleanup levels for industrial land use.

2.3 List of Field Activities

Check the activities to be completed during the project

X	Site reconnaissance	X	Field Screening of Soil Samples
X	Exploratory Borings	X	Vapor Measurements
	Construction Monitoring	X	Groundwater Sampling
X	Surveying	X	Groundwater Depth and Free Product Measurement
	Test Pit Exploration		Product Sample Collection
X	Monitoring Well Installation		Soil Stockpile Testing
X	Monitoring Well Development		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
Robert Miyahira	40 hour	11/18/10		11/18/10		
Scott Lathen	40 hour	2/16/11		3/25/11		

Chain of Command	Title	Name	Telephone Numbers
1	Project Manager	Dave Lauder	509.363.3125
2	HAZWOPER Supervisor	Bruce Williams	509.363.3125
3	Field Engineer/Geologist	Robert Miyahira	425.941.2055
		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)	Environmental West	
	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: Toppenish Community Hospital
502 W 4th Avenue
Toppenish, Washington

Phone Numbers (Hospital ER): Phone: (509) 865-3105

Distance:

Route to Hospital:

Start out going SOUTHEAST on BUENA RD toward BUENA EXT RD.

Turn RIGHT to stay on BUENA RD.

BUENA RD becomes WA-22.

Turn LEFT onto W 4TH AVE.

502 W 4TH AVE 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

X	Drill rigs
	Backhoe
	Trackhoe
	Crane
	Front End Loader
	Excavations/trenching (1:1 slopes for Type B soil)
	Shored/braced excavation if greater than 4 feet of depth
X	Overhead hazards/power lines
	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 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

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

5.3 Chemical Hazards

SUBSTANCE	PATHWAYS
Aromatic hydrocarbons (benzene, ethylbenzene, toluene, xylenes [BETX])	Air
Gasoline	Air
Diesel fuel	Air
Heavy Oil	Ingestion
PCBs	Ingestion
Halogenated solvents	Air/Ingestion

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

COMPOUND/ DESCRIPTION	EXPOSURE LIMITS/IDLH	EXPOSURE ROUTES	SYMPTOMS/HEALTH EFFECTS
			(weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]
Diesel Fuel — liquid with a characteristic odor	None established by OSHA, but ACGIH has adopted 100 mg/m^3 for a TWA (as total hydrocarbons)	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; headache; dermatitis
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
Mineral Oil – As a mist	The current OSHA PEL for mineral oil mist is 5 mg/m^3 of air as an 8-hr TWA	If the oil is not a mist, then route of exposure is skin and eye contact	Exposure to oil mists can cause eye, skin, and upper respiratory tract irritation
Mineral based crankcase oil – may contain metals, gas, antifreeze and PAHs	It depends on the contaminants	Ingestion, inhalation, skin absorption, skin and eye contact	It depends on the contaminants.
PCBs — colorless to pale-yellow viscous liquid with a mild, hydrocarbon odor	PEL 0.5 mg/m^3 TLV 0.5 mg/m^3 REL 0.001 mg/m^3 IDLH 5.0 mg/m^3	Inhalation (dusts or mists), skin absorption, ingestion, skin and/or eye contact	Irritated eyes, chloracne, liver damage, reproductive effects, potential carcinogen

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
X	Poison Ivy or other vegetation	
X	Insects or snakes	Work gloves and long sleeve shirt
X	Used hypodermic needs or other infectious hazards	Do not pick up or contact
	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

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

______

Additional personal air monitoring for specific chemical exposure:

Action levels:

- The workspace will be monitored using a photoionization detector (PID). 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.

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
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 explorations 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 10 feet of borings*

______________	Method of delineation/ excluding non-site personnel
______________	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.

Drill cutting/excavated sediment disposal or storage:

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

X Secured (list method) 55-gallon drums

___ Other (describe destination, responsible parties): ______

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)
______ 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:

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

10.2 Sampling, Managing and Handling Drums and Containers

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:

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

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 C-1 Health & Safety Meeting;
    - FORM C-2 SITE SAFETY PLAN – GEOENGINEERS' EMPLOYEE ACKNOWLEDGMENT; and
    - FORM C-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 C-1
HEALTH AND SAFETY PRE-ENTRY BRIEFING
BUENA LUST SITES, INTERIM ACTION (DATA GAP INVESTIGATION)
FILE NO. 0504-060-02, -03

Inform employees, contractors and subcontractors or their representatives about:

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

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

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

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

Update all information to reflect current sight activities and hazards.

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

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

Company Employee

Date	Topics	Attendee	Name	Initials

FORM C-2
SITE SAFETY PLAN – GEOENGINEERS' EMPLOYEE ACKNOWLEDGMENT
BUENA LUST SITE
FILE NO. 0504-060-00

(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 C-3
SUBCONTRACTOR AND SITE VISITOR SITE SAFETY FORM
BUENA LUST SITE
FILE NO. 0504-060-00

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