SUPPLEMENTAL REMEDIAL INVESTIGATION WORK PLAN

Ken's Texaco
101 East University Way
Ellensburg, Washington

Prepared for: Grange Insurance and Davis Law Office, PLLC

Project No. 120061 • January 20, 2016

Aspect CONSULTING

earth + water

Aspect CONSULTING

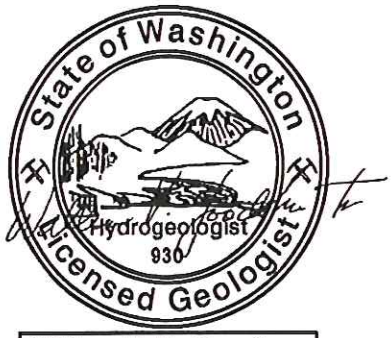
SUPPLEMENTAL REMEDIAL INVESTIGATION WORK PLAN

Ken's Texaco
101 East University Way
Ellensburg, Washington

Prepared for: Grange Insurance and Davis Law Office, PLLC

Project No. 120061 • January 20, 2016

Aspect Consulting, LLC



Kirsi S. Longley
Sr. Project Environmental Scientist
klongley@aspectconsulting.com

William V. Goodhue, LHG
Principal Hydrogeologist
cgoodhue@aspectconsulting.com

\\biserver1.aspect.local\Documents\120061 Ken's Texaco\Deliverables\Supplemental Work Plan\Work Plan_Ken's Texaco.docx

Contents

List of Attachments

1 Introduction

Aspect Consulting, LLC (Aspect) has prepared this work plan for supplemental remedial investigation activities to further define impacts due to historic petroleum releases from the former Ken's Texaco (the Site), located at 101 East University Way in Ellensburg, Washington. The Work Plan presents a planned approach to supplementing previously completed remedial investigation activities through additional assessment of potential residual off-property petroleum impacts to soil, soil gas, and groundwater.

The objectives of the supplemental investigation described in this Work Plan are to complete the collection of adequate Site characterization data to fully define the lateral boundaries of Site soil, soil gas, and groundwater impacts, and allow for completion of a Remedial Investigation (RI) report that meets the requirements of the Model Toxics Control Act (MTCA). Planned supplemental investigation activities include:

- Conducting a sub-slab soil vapor assessment, including:
  - Obtaining authorization to access the residence located at 802 North B Street;
  - Completing private and public utility locates at vapor point locations; and
  - Installing two temporary sub-slab vapor probes (SG-1 and SG-2) and collect one round of sub-slab soil gas samples.
- Conducting a soil and groundwater investigation, including:
  - Obtaining street use permits from the City of Ellensburg;
  - Consulting with a traffic control contractor to design Traffic Control Plans for each of the right-of-way drilling areas;
  - Completing private and public utility locates at drilling locations;
  - Installing six monitoring wells (MW-17 through MW-22) to investigate lateral extent of soil and groundwater impacts, using air knife methods for the upper five feet;
  - Surveying and developing new monitoring wells; and
  - Conducting quarterly groundwater monitoring at all wells onsite (including the six proposed new wells) for one year.
- Preparing an RI report summarizing the existing soil, soil gas, and groundwater conditions.

Procedural details for completing the above work elements are provided in the subsequent sections.

2 Soil Gas Investigation

This task includes evaluation of potential soil vapor impacts to the north of the former Ken's Texaco property on the residential property located at 802 North B Street. A sub-slab soil gas survey will be implemented below the basement floor slab of this residence to evaluate the potential presence of soil vapor impacts below the residence. To adequately evaluate the approximately 850 square foot basement area, two sub-slab vapor sampling probes will be installed, one on the east and one on the west ends of the basement.

The installed vapor probes will be allowed to equilibrate for at least 16 hours between sampling probe installation and sample collection. Sub-slab soil gas samples will be collected in accordance with Aspect's sub-slab soil gas standard operating procedures included in Appendix A. The soil gas samples will be analyzed by Eurofins AirToxics for TO-15 analysis including total petroleum hydrocarbons (TPH) and air-phase petroleum hydrocarbons (APH) as extra analytes, and Modified ASTM D-1946 for helium (leak detection analyte). Analytical results will be evaluated using the Environmental Protection Agency's (EPA) *Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites* (2015) and Ecology's *Guidance for Evaluation of Soil Vapor Intrusion in Washington State: Investigation and Remedial Action* (2009).

3 Soil and Groundwater Investigation

Attached Figure 1 depicts the inferred extent of residual soil and groundwater impacts after the completion of an interim soil removal remedial action in 2012. Proposed supplemental monitoring well locations, also shown on Figure 1, include off-property locations across the street from where residual soil impacts are present on the property perimeter, and/or where data gaps exist in the delineation of potential off-property groundwater impacts. Three wells will be installed in the sidewalk on the south side of East University Way, two in the sidewalk on the west side of North B Street, and one in the alley on the north side of the 802 North B Street residence.

3.1 Right-of-Way Permitting

Prior to mobilization, a permit to work in the City of Ellensburg (the City) right-of-way is required by the City. Permitting and traffic control requirements will be determined in cooperation with the City. Traffic control plans for City right-of-way sidewalk well installation will be developed by a subcontractor and submitted to the City as part of their street-use permit application process. All of the well installation work will be conducted as per the traffic control plans approved by the City, which may include lane closures, work hour restrictions, signage, and flaggers.

3.2 Site Visit and Utility Locates

An initial Site visit is planned prior to mobilization to confirm and mark out drilling locations for a public utility locate. Underground utilities will be located prior to monitoring well installation by performing a one-call public locate request. A private locating service will be subcontracted at the time of drilling to confirm the public locate markings.

All borings will first be air knifed and vacuum excavated to five feet below ground surface (bgs) to accommodate for potential unmarked utilities. This type of excavation is critically important when working within City right-of-ways as most often major utility mainlines servicing the community are present in the streets and sidewalks. If a utility is encountered during this procedure, the boring will be abandoned and an alternate boring location in this vicinity will be selected.

3.3 Well Installation

After air knife and vacuum excavation, the borings will be installed using sonic drilling techniques and completed as 2-inch monitoring wells. Total anticipated well depth is 30 feet, or shallower, if a confining layer below the unconfined aquifer is identified. Sonic drilling is required because previous drilling attempts using direct push probe and hollow stem auger techniques have either encountered refusal before reaching the aquifer or sample recovery was limited by cobbles and the very dense nature of the native soil at the Site, making full characterization very difficult. Sonic drilling is expected to provide a continuous core of soil through the dense soils and allow more accurate characterization of geology and vertical contaminant distribution.

Soil cores collected during drilling will be logged in accordance with methods ASTM D-2487 and D-2488 for visual classification of soils using the Unified Soil Classification System. The soil will be field screened on-Site by a geologist using visual and olfactory methods, in addition to screening soil cores using a photoionization detector (PID). Four soil samples will be collected from each boring based on the results of field screening. Samples will be collected in accordance with EPA Method 5035A, and archived for potential analysis. Up to three soil samples from each soil boring, two samples with the greatest potential for petroleum impacts based on field screening and one sample from the bottom of the boring, will be submitted to a state-certified laboratory for analysis. If field screening does not indicate notable petroleum impacts, one soil sample from the vadose zone/groundwater interface and one from the bottom of the boring will be submitted for analysis.

Soil analyses during previous investigations at this Site were conducted following the analytical schedule in Table 830-1 of WAC 173-340, but results indicate that only a select few of the petroleum related chemicals in this table are present at this Site. As such, soil samples retained for analysis during this supplemental phase of investigation will only be analyzed for gasoline-range petroleum hydrocarbons and benzene, toluene, ethylbenzene, xylene (BTEX) (NWTPH-Gx/BTEX), and diesel-range extended petroleum hydrocarbons (NWTPH-Dx).

All monitoring wells will be constructed in accordance with WAC 173-160 by licensed drillers and configured for specific applications on this project. Wells will consist of 2-inch-diameter, threaded Schedule 40 PVC slotted screen and blank casing. Well screens will be 0.010-inch slot (10-slot) or 0.020-inch slot (20-slot), and 15 feet in length to accommodate seasonal groundwater level fluctuations. The anticipated average depth to water is 12 to 16 feet below grade, and the screens will be set with the top of the screen at approximately 10 feet below grade. The actual screened interval will depend on the conditions observed at the time of drilling. A filter pack consisting of 2/12 silica sand will be placed in the annular space surrounding the screen extending 2 feet above the screen and an annular seal consisting of bentonite chips will be placed above the filter pack. All wells will be completed with an appropriate protective seal, typically a concrete surface seal with a high-traffic rated Sherwood monument flush-mounted at grade. The wells will be secured with locking well caps. An As-Built Well Completion Diagram will be prepared for each installation.

3.4 Monitoring Well Development and Survey

Each monitoring well will be developed to remove fine-grained material from inside the well casing and filter pack, and to improve hydraulic communication between the well screen and the surrounding water-bearing formation. The field geologist will document all well development activities. Well development for all wells installed by sonic methods will be performed using a surge block and a 12-volt submersible pump. During development, the surge block will be surged along the entire length of the submerged well screen. Each well will be developed until visual turbidity is reduced to minimal levels, or until 10 casing volumes of water has been removed.

Following monitoring well development activities, the well locations and top-of-casing elevations will be surveyed by a state licensed land surveyor.

3.5 Groundwater Monitoring

Four consecutive quarters of groundwater sampling will be conducted after well installation. The first groundwater sampling event will take place after the six new wells have been installed, developed, and allowed to equilibrate for a minimum of 1 week.

Each quarterly groundwater sampling event will begin with a full-round of depth-to-groundwater measurements collected from all six new monitoring wells and the existing 10 monitoring wells at the Site. Water levels will be gauged from the mark on the PVC casing, or if no mark is present, from the north side of the casing using a water level meter. Water levels will be recorded in increments of hundredths of a foot and converted to elevation above mean sea level using the survey data. The water levels will enable determination of groundwater flow direction and gradient.

Groundwater sampling will then be performed at each well (the six new monitoring wells and the existing 10 wells) using a peristaltic pump, dedicated tubing, and standard low-flow groundwater sampling techniques. Following stabilization of field parameters (temperature, specific conductance, dissolved oxygen, pH, oxidation-reduction potential, and turbidity), groundwater samples will be collected directly into laboratory-supplied sample containers from the pump tubing discharge, placed on ice in a cooler, and maintained under chain-of-custody procedures until they are delivered to the laboratory.

All groundwater samples will be analyzed gasoline-range TPH and BTEX (NWTPH-Gx/BTEX); diesel-range TPH (NWTPH-Dx); and total lead. Select wells located on the former Ken's Texaco property will also be analyzed for additional parameters, such as ethylene dichloride (EDC) and natural attenuation parameters (alkalinity, chloride, nitrate and nitrite as N, sulfate, dissolved manganese, and dissolved methane) as specified in Table 1. EDC is not suspected in any of the off-property wells because it has only been detected in two wells near the source area at the center of the property.

3.6 Investigation Derived Waste

All investigation-derived waste (IDW) such as soil cuttings, decontamination water, purge water, and disposable personal protective equipment generated during the drilling activities will be collected and stored in 55-gallon steel drums. The drums will be stored on the former Ken's Texaco property pending laboratory analysis. The drums will be clearly labeled with a description of the contents and designated as nonhazardous waste pending analysis. IDW will be disposed off-Site in accordance with laboratory results and federal, state, and local regulations.

4 Analysis and Reporting

Upon completion of the supplemental soil investigation activities and one year of quarterly groundwater monitoring, an RI report will be prepared. The RI will present a site conceptual model, a brief summary of the interim remedial action, a summary of Site characterization data collected since 2012's interim remedial action, a figure presenting delineation of petroleum impacts at the Site, and evaluate the stability of groundwater impacts. The data evaluated in the RI will only include data collected since the interim remedial action in 2012, because data collected since that date are considered to represent existing conditions. The RI report will include boring logs for all existing monitoring wells, summary analytical tables, and pertinent figures that illustrate key findings of the RI.

5 Limitations

Work for this project was performed for Grange Insurance and Davis Law Office, PLLC (Clients), and this memorandum was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This memorandum does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

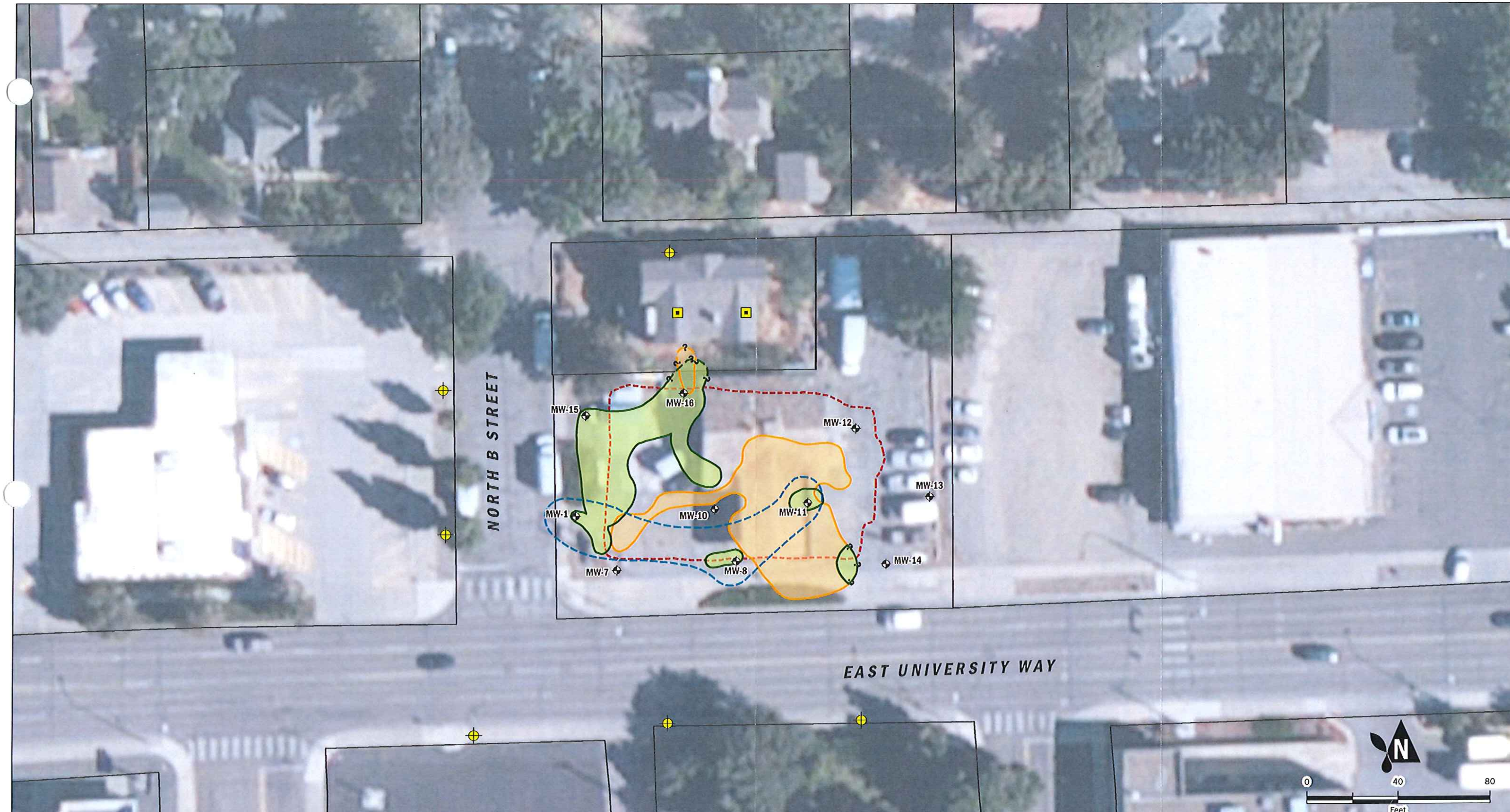
TABLE

Table 1 - Groundwater Sampling Matrix

Pr #120061 - Ken's Texaco, Ellensburg, WA

	TPH-Gx/BTEX	TPH-Dx	EDC	Total Lead	Alkalinity	Chloride	Nitrate/Nitrite	Sulfate	Diss. Fe	Diss. Mn	Diss. Methane
MW-1	x	x		x							
MW-7	x	x		x							
MW-8	x	x		x							
MW-10	x	x	x	x							
MW-11	x	x	x	x	x	x	x	x	x	x	x
MW-12	x	x		x	x	x	x	x	x	x	x
MW-13	x	x		x							
MW-14	x	x		x							
MW-15	x	x		x	x	x	x	x	x	x	x
MW-16	x	x		x	x	x	x	x	x	x	x
MW-17 through MW-21	x	x		x							

FIGURE



Proposed Additional Investigation Locations

Former Ken's Texaco
101 East University Way
Ellensburg, Washington

Aspect Consulting	SEP-2015	BY KSL / RAP	FIGURE NO. 1
	PROJECT NO 120061-002	REVISED BY ---	

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

APPENDIX A

SOP for Sub-Slab Soil Gas Sampling

Standard Operating Procedure for Sub-Slab Soil Gas Sampling

Purpose

The purpose of this SOP is to provide field personnel with an outline of the specific information needed to collect and document representative sub-slab soil gas samples. The recommended sub-slab soil gas sampling technique, as presented in this SOP, is based on the assumption that soil gas samples should be representative of chemicals that may volatilize from the uppermost aquifer into the vadose zone or from soil contamination within the vadose zone.

Sampling Equipment and Materials

The following equipment and supplies are necessary to properly conduct sub-slab soil gas sampling:

- Rotary hammer drill with 5/8-inch diameter drill bit.
- Extension cord and generator (depending on access to power and outlets). Note that if a generator is required, it may be necessary to vent the exhaust outside.
- Appropriate number of vapor pin assemblies with silicon sleeves.
- 1½-inch diameter drill bit and vapor pin drilling guide (for flush mount applications).
- Vapor pin secure cover and #14 spanner wrench (for flush mount applications).
- Wet/dry shop vacuum with HEPA filter to collect drill cuttings.
- ¾-inch diameter bottle brush for cleaning vapor pin hole after drilling.
- Vapor pin installation/extraction tool and dead blow hammer.
- VOC-free hole patching material and putty knife (for temporary applications).
- Summa canisters, flow controllers, and fittings from laboratory for collection of samples per the sampling and analysis plan.
- Adjustable crescent wrench for Swagelok fittings on summa canisters.
- Leak test shroud to enclose vapor point, tubing, and summa canister.
- Tracer gas (laboratory grade helium), typically supplied in a gas cylinder.
- Tracer gas meter capable of measuring concentrations in parts per million.
- Tedlar bags for field screening during leak testing.
- Flow regulator and tubing to connect tracer gas cylinder to vapor shroud.

- Disposable ¼-inch (outer diameter) Teflon®-lined tubing, ¼-inch compression tee, and #15 silicone tubing for connecting summa canister to leak test should purge line and vapor pin.
- Air pump (peristaltic) and flow meter for purging vapor point.
- An accurate and reliable watch set to the correct time.
- A calculator.
- Field notebook, applicable project work plans or sampling analysis plans, and Chain of Custody and Custody Seals.
- Health-and-safety equipment and supplies (e.g., personal protective equipment [PPE]) as described in the relevant site health-and-safety plan (HSP).
- Shipping packaging for the canisters (typically provided by laboratory).

Sampling Procedures

Preparation for Sampling

- Prior to beginning, have the sampling locations cleared for utilities, verify access agreements are in place, and obtain required permits, as appropriate.
- Install sub-slab vapor sampling pins at locations described in the sampling and analysis plan according to manufacturer's instructions.
- Allow for an "equilibration period" of at least 16 hours between sampling pin installation and sample collection.

Sampling Methodology

Sample Collection

- Verify the canister number engraved on the canister matches the canister number listed on the certified clean tag attached to the canister to insure proper decontamination of the canister was completed. Fill out the sample tag attached to the canister (do not use Sharpie pens when air sampling).
- Verify that the canister valve is closed, and then remove the threaded cap at the top of the canister.
- Connect the flow controller with built in pressure gauge at the top of the canister (canister may also have integrated pressure gauge) and connect the Teflon tubing using Swagelok fitting provided.
- Place the canister in the leak test shroud and connect to both the purge line (included with leak test shroud) and the vapor pin using the ¼-inch compression tee. The valve on the purge line should be open.
- Seal the lid on the leak test shroud and inject helium into the shroud using the gas cylinder and flow regulator. Maintain a known concentration of tracer gas in the shroud (typically 20 to 50 percent). Maintain the selected concentration of tracer gas for the duration of the sample.
- Purge each soil vapor port at approximately 100 mL/min using the air pump to ensure that the soil gas sample is representative of subsurface conditions. A

minimum of three tubing/apparatus volumes should be removed, accounting for the thickness of the slab. Use the following equation to calculate approximate volume to be purged:

$$V = \pi \times r^2 \times l$$

Where:

V = Volume of tubing

r = the inner diameter radius of the tubing being used [inches]

l = the length of the tubing being used [inches]

$\pi = 3.14$

Convert to mL using 1 $inch^3$ = 16.387 mL to determine how long to purge port.

- Capture purged vapor in Tedlar bags and field screen the air collected using the helium meter at the end of the purge period. The concentration of the tracer gas in the bag must be less than 5 percent of the shroud concentration to ensure there is no significant leakage in the vapor pin seal or sampling train.
- After confirming the integrity of the vapor pin seal and sampling train, close the valve on the purge line and open the valve on the Summa canister to begin sample collection. Immediately record the initial pressure on the gauge.
- Monitor the pressure of the canister during sampling to verify the flow rate appears correct. It is necessary to check the canister prior to completion because the accuracy of the flow regulators can vary slightly, causing the canisters to fill faster than expected. The final pressure at the end of sampling should be approximately -5 to -6 inches mercury (Hg). If the canister has already reached this point, sampling is complete and this pressure should be recorded as the "final pressure" on the sample tag, the field book, and applicable field forms. Sample collection will be considered complete, regardless of final pressure, after the stated sample period has elapsed.
- Record all sample information in the field book and/or applicable field forms including the following:
  - Pertinent weather information,
  - Sample identification/location,
  - Sample start and end (collection) date and times,
  - Location of sample (distance from walls shown on building floor plan),
  - Initial and final pressure of canister,
  - Canister number, and
  - Notes regarding leak test, if applicable.

- When sampling is complete, close the valve on the summa canister and break down the sampling apparatus. The Teflon tubing and ¼-inch compression tee should not be reused.

Post-Sample Collection Procedures

Fill out tags on summa canisters with the following information: sample identification, date and time sample was collected, the starting and ending canister pressure, the site name, and the company name. Include all this information in the field book plus the start time of sample, and transfer pertinent information to the chain-of-custody record. Pack all Summa canisters in the original shipping containers, sealed with a custody seal, and send to the lab for analysis. The unofficial holding time for this analysis is 30 days. However, attempt to get samples to the lab as soon as possible to allow lab time to conduct re-runs, dilutions, and low-level analyses, as necessary prior to sample expiration.

Analysis

The soil gas samples should be analyzed using in accordance with the sampling and analysis plan. The air samples collected in the Summa canisters have a 30-day holding time. Note the desired analytical methods on the Chain of Custody form, be sure the laboratory is aware of leak tested samples and analysis.

Decontamination

The equipment used for soil gas sampling does not require decontamination in the field. Teflon tubing and ¼-inch compression tee should not be reused. Vapor pins should be decontaminated with an Alconox wash, rinse, and heating to 130 degrees Celsius (270 degrees Fahrenheit).

Documentation

Record all field activities, environmental and building conditions, and sample documentation on the appropriate field forms and field notebook.

References

EPRI, Reference Handbook for Site Specific Assessment of Sub-Surface Vapor Intrusion to Indoor Air, March 2005.

California Environmental Protection Agency, Department of Toxic Substances Control, Los Angeles Regional Water Quality Control Board, San Francisco Regional Water Quality Control Board, Advisory Active Soil Gas Investigations, April 2012.

Department of Environmental Protection, Commonwealth of Massachusetts, Indoor Air Sampling and Evaluation Guide, WSC Policy #02-430, Boston, Massachusetts, April 2002.

New Jersey Department of Environmental Protection, Vapor Intrusion Guidance, October 2005.

New York State Department of Health, Guidance for Evaluation Soil Vapor Intrusion in the State of New York, October 2006.

USEPA, Center for Environmental Research Information, Office of Research and Development, Compendium of Methods for Determination of Toxic Organic Compounds in Ambient Air, Second Edition, Compendium Method To-14A, Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Specially Prepared Canisters with Subsequent Analysis by Gas Chromatography, January 1999.

USEPA, Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway Form Groundwater and Soils, EPA530-F-02-052, November 2002.