GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

November 20, 2013
Project 123150

VIA EMAIL: sxscharf@gw.dec.state.ny.us

Mr. Steven M. Scharf, P.E.
Project Engineer
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Action, Bureau A
625 Broadway
Albany, New York 12233-7015

Re: Work Plan for Sub-Slab Vapor and Indoor Sampling
NYSDEC Site No. 152021
Property Located at:
50 Engineers Lane
Farmingdale, New York

Dear Mr. Scharf:

GEI Consultants, Inc., P. C. (GEI) is pleased to present you with this scope of work to perform sub-slab, indoor, and outdoor air sampling at the project site referenced above in accordance with requirements of the Voluntary Cleanup Agreement (VCA). The purpose would be to evaluate the current sub-slab soil vapor concentrations in the area of prior remedial activities and determine the effectiveness of the sub-slab depressurization system that was historically in operation.

Health and Safety Plan (HASP)

A site specific Health and Safety Plan (HASP) will be prepared for the field work. The HASP establishes policies and procedures to protect GEI personnel from the potential hazards posed by the field sampling activities proposed on site. Reading of the HASP is required of onsite GEI personnel and will be reviewed by GEI subcontractors as applicable. The plan identifies measures to minimize accidents and injuries, which may result from project activities or during adverse weather conditions. A copy of this HASP will be maintained on site for the duration of the work.

110 Walt Whitman Road, Suite 204
Huntington Station, New York 11746
631.760.9300 fax: 631.760.9301

Soil Vapor Testing Work Plan

The following proposed Scope of Work has been developed to determine the subsurface soil vapor conditions. All sampling will be performed in accordance with GEI's standard operating procedures (SOPs) and New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion (October 2006). GEI's SOPs for sub-slab soil vapor and ambient air sample collection is located in **Appendix A** and **Appendix B** respectively.

Building Evaluation and Chemical Inventory

GEI will perform a chemical inventory of the sampling areas prior to sampling. The purpose of the chemical inventory is to determine if the recent use or storage of any chemicals will affect the analytical data provided by the collected samples. If it is determined that the potential for this exists, GEI will ask the owner/operator to remove the chemicals from the building. GEI will perform the sampling event approximately 24 hours later.

Building factors, such as structure, floor layout, air flow, and physical conditions will be documented during the evaluation.

Sub-Slab Air Sampling

GEI will perform sub-slab air sampling in first floor, and outdoor areas of the building where previous sub-slab depressurization system remedial efforts were completed. Three sub-slab samples (SV-1, SV-2, and SV-3) per the NYSDOH guidelines, sub-slab samples will be obtained from a central location away from the foundation footings and from soil or aggregate immediately below the basement slab of the building. At each of the three sub-slab locations an indoor air sample will be co-located.

Figure 1 shows the soil vapor sample collection locations.

In order to measure the integrity of the surface seal a plastic housing is used to cover the sub-grade vapor points. Helium tracer gas will be introduced into the plastic housing and around the soil vapor probe seals. The laboratory will test for the presence of helium in the sub-grade vapor samples. The soil vapor probes will be connected for sampling to Summa Canisters and tested for Volatile Organic Compounds (VOCs) via United Stated Environmental Protection Agency (USEPA) Method TO-15. Samples will be collected within 6 liter SUMMA canisters collected for an 8-hour time period set at a flow rate of 0.0125 liters per minute.

Indoor Air Sampling

To evaluate the effectiveness of the sub-slab depressurization system in reducing potential indoor air exposure to site related contaminants, a total of three indoor air samples will be completed co-located with each of the three sub-slab soil vapor samples.

Indoor air sample (IA-1, IA-2, and IA-3) and one duplicate sample (IA-X DUP) will be collected in 6-liter batch-certified SUMMA canisters connected to 8-hour flow controllers from each building. Locations will be determined in the field. Collected samples will be transported under chain-of-custody (COC) documentation to a NYSDOH-approved Environmental Laboratory Approval Program (ELAP) laboratory for analysis by EPA Method TO-15 for VOCs.

Outdoor Air Sampling

Outdoor air samples will be collected to provide a basis of comparison between sub-slab and indoor air quality and outdoor air quality.

The outdoor air sample (OA-1) will be collected from the upwind side of the building if possible. The sample will be collected in 6-liter batch-certified SUMMA canisters connected to an 8-hour flow controller concurrently during the sampling event. These collected samples will be transported under COC documentation to a NYSDOH-approved ELAP laboratory for analysis by EPA Method TO-15 for VOCs.

Laboratory Analysis

A laboratory with current NYSDOH ELAP certification will be used for all analysis.

The samples will be analyzed by methods that achieve minimum reporting limits of 0.25 micrograms/cubic meter (ug/m3) to allow a comparison with background levels and with the levels specified in the NYSDOH Guidance Matrix tables.

The laboratory operates a Quality Assurance and Quality Control Plan (QA/QC) program that consists of proper laboratory practices (including the required chain-of-custody), an internal quality control program, and external quality control audits by New York State. Laboratory QA/QC procedures include:

- Verification and/or validation of equipment according to National Institute of Standards and Technology (NIST).
- Regular calibrations and use of reference standards on instruments used for sample analysis.
- Adherence to sample acceptance policy; meaning, samples will not be analyzed if any of the following are encountered: damaged or leaking samples or samples improperly preserved (i.e., no preservative in samples if necessary and/or samples not kept at proper temperature if analysis requires).
- Prior to analysis, samples are to be stored according to SOPs.
- Analysis of Quality Control Samples including: laboratory control blanks, matrix spikes, method blanks, and laboratory duplicate samples.
- The laboratory data will be validated by Laboratory Data Consultants, Inc. under EPA Level IV guidelines.

Evaluation and Report

Preliminary data, product inventory and building questionnaire information will be forwarded to NYSDEC for review.

A report will be prepared after the completion of the sub-slab, indoor air and outdoor air vapor investigation. The report will address the following:

- Soil vapor data will be compared to Volatile Chemical Matrix Tables included in Section 3.4.2 of the NYSDOH's "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" document and NYSDOH background values for outdoor and indoor air.

- Field notes including Organic Vapor Analyzer (OVA)/Photoionization Detector (PID) readings taken from the sub-slab vapor point and other observations made during the sample collection program.

- The report will provide an evaluation of the extent of environmental impact to the site, if applicable.

- If contamination is found to be present, remedial recommendations will be discussed.

- Appendices of the report will include the laboratory data, chain of custody documentation, and photographs.

SCHEDULE

In accordance with NYSDOH guidelines the work is to be performed during the active heating season. GEI anticipates the field collection work to begin within 30 days of New York State Department of Environmental Conservation's (NYSDEC) acceptance of this work plan. A report of the investigation findings can be completed 45 days thereafter.

This work will be scheduled with the building owner and occupants upon approval by NYSDEC. If there are any questions with this work plan please do not hesitate to contact me.

Sincerely,

GEI CONSULTANTS, INC., P. C.

Nicholas J. Recchia, P.G.
Practice Leader
Hydrogeologist

NJR:kmh
Enclosures
c: L.Montgomery

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Figures

50 ENGINEERS LANE, FARMINGDALE, NEW YORK	GEI Consultants	Soil Vapor Sample Locations
LJM ASSOCIATES EAST ROCKAWAY, NEW YORK	Project 123150	Sept. 2013 Figure 1

Appendix A

SG-003 Sub-Slab Soil Vapor Sample Collection

STANDARD OPERATING PROCEDURE

SG-003 Sub-slab Soil Vapor Collection

1. Objective

This procedure outlines the general steps to collect sub-slab soil vapor samples. The site-specific Sampling and Analysis Work Plan should be consulted for proposed sample locations, sample depths, and sampling duration.

2. Execution

Permanent and temporary sub-slab soil vapor probes will be installed using the procedures outlined below. All sub-slab soil vapor probes will be installed using a direct-push drill rig (e.g., Geoprobe® or similar), hand auger, or manually using a slide hammer.

2.1. Document Field Conditions

Document pertinent field conditions prior to installation of any probe locations.

- Record weather information (precipitation, temperature, barometric pressure, relative humidity, wind speed, and wind direction) at the beginning of the sampling event. Record substantial changes to these conditions that may occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport). Data should be obtained for the past 24 to 48 hours. Record the indoor conditions (temperature, heating/cooling system active, windows open/closed, etc.).
- Measure the differential pressure at the building. Measure the indoor and outdoor barometric pressure using a high resolution device. Where possible, measure the sub-slab barometric pressure at the sampling point.
- If sampling near a commercial or industrial building, uses of volatile chemicals during normal operations of the facility should be identified.
- Indoor floor plan sketches should be drawn that include the floor layout with sampling locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, heating, ventilating and air conditioning (HVAC) system air supply and return registers, compass orientation (North), footings that create separate foundation sections, and any other pertinent information should be completed;
- Outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sampling locations (if applicable), compass orientation (north), and paved areas.
- Any pertinent observations should be recorded, such as odors and readings from field instrumentation.

2.2. Sub-Slab Soil Vapor Point Installation Specifications

Each sub-slab soil vapor point will be constructed as follows:

- Drill an approximately 3/8-inch hole through the slab. If necessary, advance the drill bit 2-3 inches into the sub-slab material to create an open cavity.
- Using dedicated inert Teflon or stainless steel tubing of laboratory or food grade quality, insert the inlet of the tubing to the specified depth below the slab. For permanent installation, only stainless steel tubing and fittings will be used.
- For permanent point installations, the annular space surrounding the vapor probe tip will be filled with a porous backfill material (e.g., glass beads or coarse silica sand) to cover 1-inch of the above the tip of the probe.
- Seal the annular space between the hole and the tubing using an inert non-shrinking sealant such as melted 100% beeswax, permagum grout, putty, etc. For permanent installations, cement may be used.
- For permanent points, a protective casing will be set around the top of the point tubing and grouted in place minimize infiltration of water or ambient air, as well as to prevent accidental damage to he permanent point.
- The tubing top will be fitted with a Swagelok® and cap to prevent moisture and foreign material from infiltrating the tubing.

In cases where sub-slab sampling is impractical or infeasible, a surrogate location (attached garage, concrete patio, asphalt driveway, etc.) may be used if it is representative of sub-slab conditions. In surrogate locations, the vapor sampling point may be installed in accordance with SOP SG-002 Soil Vapor Collection.

2.3. Sub-Slab Soil Vapor Sample Collection

Sub-slab soil vapor samples will be collected as indicated in the site-specific Sampling and Analysis Work Plan and in accordance with state or Federal guidance documents. Specifically, sub-slab samples from the points will be collected as follows:

- Document pertinent field conditions prior to sampling as described above.
- A suction pump will be used to remove one to three implant volumes from the sub-slab soil vapor points prior to sampling. Include the volume of any additional tubing added to affix sampling equipment and the annular space between the probe and the native material if sand or glass beads were used.
- The purge rate shall not exceed 0.2 liters per minute.
- Samples will be collected in an individually laboratory certified clean 1-liter SUMMA® canister (or equivalent) using a certified flow controller calibrated for the anticipated sample duration (4 minutes). The regulator flow rate will not exceed 0.2 liters per minute.
- A helium tracer gas will be used to identify any potential migration or short circuiting of ambient air during sampling as described below.

- Remove the protective brass plug from the canister. Connect the pre-calibrated flow controller to the canister.
- Record the identification numbers for the canister and flow controller.
- Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of-custody form for each sample.
- Connect the tubing from the sub-slab soil vapor probe to the flow controller.
- Open the valve on the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.
- Photograph the canister and the area surrounding the canister.
- Monitor the vacuum pressure in the canister routinely during sampling.
- Stop sample collection when the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister.
- Record the final vacuum pressure and close the canister valve. Record the date and time that sample collection was stopped.
- Remove the flow controller from the canister and replace the protective brass plug.
- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.
- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.
- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.
- Samples will be analyzed for volatile organic compounds (VOCs) and naphthalene via modified USEPA modified Method TO-15 and helium via ASTM D-1945
- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. Maintain a copy of the chain-of-custody for the project file.
- Deliver or ship the samples to the laboratory as soon as practical.
- All laboratory analytical data will be validated by a data validation professional in accordance with the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, January 2005 and the USEPA Region II Standard Operating Procedure (SOP) for the Validation of Organic Data modified to accommodate the USEPA Method TO-15 and natural gas analysis by ASTM D-1945.

2.4. Tracer Gas Evaluation

The tracer gas evaluation provides a means to evaluate the integrity of the sub-slab soil vapor probe seal and assess the potential for introduction of indoor air into the sub-slab soil vapor sample. A tracer gas evaluation should be conducted on the each temporary sub-slab soil vapor probe to be sampled in a sampling event. A tracer gas evaluation should be conducted on the each permanent sub-slab soil vapor probe during the initial sampling event and a minimum of 10% of the sub-slab soil vapor probes during subsequent sampling events.

The following tracer gas evaluation procedure uses helium as a tracer gases which can be measured through laboratory analysis or by a portable detector.

- Retain the tracer gas around the sub-slab sample probe by filling an air-tight chamber (such as a plastic bucket) positioned over the sample location.
- Make sure the chamber is suitably sealed to the ground surface.
- Introduce the tracer gas into the chamber. The chamber will have tubing at the top of the chamber to introduce the tracer gas into the chamber and a valved fitting at the bottom to let the ambient air out while introducing tracer gas. Close the valve after the chamber has been enriched with tracer gas at concentrations >10%.
- The chamber will have a gas-tight fitting or sealable penetration to allow the sub-slab soil vapor sample probe tubing to pass through and exit the chamber.
- After the chamber has been filled with tracer gas, attach the sample probe tubing to a pump that will be pre-calibrated to extract sub-slab soil vapor at a rate of no more than 0.2 lpm. Purge the tubing using the pump. Calculate the volume of air in the tubing and purge one to three tubing volumes prior collecting an analytical sample or using a portable device to measuring the tracer gas concentration.
- Samples collected from vapor points during a tracer gas evaluation will be analyzed for VOCs and naphthalene via modified USEPA modified Method TO-15 and helium via ASTM D-1945.
- Alternately, a tracer gas detector may be used to verify the presence of the tracer gas in the chamber by affixing it to the valve fitting at the bottom of the chamber. The tracer gas detector may also be used to measure the tracer gas concentration in the pump exhaust during purging. If used, then record the tracer gas concentrations in the chamber and in the soil vapor sample.
- Based on the concentrations of the tracer gas detected during analysis or direct measurement, determine whether additional gas tracer evaluations are necessary:

If the evaluation on a probe indicates a high concentration of tracer gas in the sample (>10% of the concentration of the tracer gas in the chamber), then the

surface seal is not sufficient and requires improvement via repair or replacement prior to commencement subsequent sample collection.

A non-detectable level of tracer gas is preferred; however, if the evaluation on a probe indicates a low potential for introduction of ambient air into the sample (<10% of the concentration of the tracer gas in the chamber), then proceed with the soil vapor sampling. While lower concentrations of tracer gas are acceptable, the impact of the detectable leak on sample results should be evaluated in the sampling report.

3. References

USEPA modified Method TO-15 and helium via ASTM D-1945.

Section 2.7.1 of the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

4. Contact

Chris Berotti

Appendix B

SG-004 Ambient Air Sample Collection

STANDARD OPERATING PROCEDURE

SG-004 Ambient Air Sample Collection

1. Objective

Describe procedures to collect ambient air samples. The site-specific Work Plan should be consulted for proposed sample locations and sampling duration.

2. Execution

2.1. Document Field Conditions

Document pertinent field conditions prior to sample collection:

- Record weather information, if available (such as precipitation, temperature, barometric pressure, relative humidity, wind speed, and wind direction) at the beginning of the sampling event. Record substantial changes to these conditions that may occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport). Data should be obtained for at least the past 12 hours.
- If sampling near a commercial or industrial building, uses of volatile chemicals during normal operations of the facility should be identified.
- Outdoor plot sketches should be drawn that include the site, area streets, neighboring commercial or industrial facilities (with estimated distance to the site), outdoor air sampling locations (if applicable), and compass orientation (North).
- Any pertinent observations should be recorded, such as odors and readings from field instrumentation.

2.2. Sample Collection

- Samples should be collected in laboratory-certified clean SUMMA® canister (or equivalent) using a flow controller calibrated for the anticipated sample duration (1-hour, 8-hour, etc.). The regulator flow rate should not exceed 0.2 liters per minute.
- Place the canister at the sampling location. If the sample is collected from breathing height (e.g., 3 to 5 feet above ground), then mount the canister on a stable platform such that the sample inlet should be at the proper height.
- Remove the protective brass plug from canister. Connect the pre-calibrated flow controller to the canister.
- Record the identification numbers for the canister and flow controller.
- Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of custody form for each sample.

- Connect the tubing to the flow controller.
- Open the valve on the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.
- Photograph the canister and the area surrounding the canister.
- If possible, monitor the vacuum pressure in the canister routinely during sampling. During monitoring, note the vacuum pressure on the gauge.
- Stop sample collection after the scheduled duration of sample collection but make sure that the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, call the laboratory and discuss the sample viability with them. Determine whether another sample will be taken after sharing the laboratory's opinion with your project manager.
- Record the final vacuum pressure and close the canister valves. Record the date and time that sample collection was stopped.
- Remove the flow controller from the canister and replace the protective brass plug.
- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.
- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.
- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.
- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. Maintain a copy of the chain-of-custody for the project file.
- Deliver or ship the samples to the laboratory as soon as practical.

3. References

USEPA modified Method TO-15 and helium via ASTM D-1945

Section 2.7.1 of the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, dated October 2006.*

4. Contacts

Chris Berotti
Bill Simons