FREQUENTLY ASKED QUESTIONS

2012 Advisory – Active Soil Gas Investigations (ASGI)

California Environmental Protection Agency
Department of Toxic Substances Control
Los Angeles Regional Water Quality Control Board
San Francisco Regional Water Quality Control Board

March 2013

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Responses to Frequently Asked Questions

1. Can the Vapor Pin, as manufactured by Cox-Colvin & Associates, be used to collect subslab samples?

The Vapor Pin is a subslab sampling device designed for quick installation. While the Vapor Pin has not been extensively used in California, Cal/EPA encourages the use of innovative technologies. When using the Vapor Pin, all recommendations in DTSC's 2011 Vapor Intrusion Guidance should be considered:

- The collection of subslab samples should follow the procedures in Cal/EPA's 2012 Active Soil Gas Investigation Advisory, which recommends leak testing and shut-in testing.
- Purging and sampling rates should not exceed 200 milliliters per minute.
- To avoid air breakthrough from nearby foundation cracks within the slab, sampling containers with volumes of less than or equal to one liter should be used.
- If using a shrouding device with gaseous leak check compounds, the shroud should cover the entire sampling system, including the sampling canister.
- Prior to sampling, at least two hours of time should elapse following installation of a probe to allow for the subsurface to equilibrate.
- A sufficient number of subslab sampling events should be conducted to account for seasonal and spatial variability.
- At least two subslab probes should be installed in each building, with one probe installed in the center of the building's foundation. Subslab probes should not be installed near the edges of the foundation due to the effects of wind on the representativeness of contaminant concentrations.

2. Are older soil gas probes subject to purge volume testing?

No distinction should be made between new and old probes or between probes that are shallow or deep. All probes should be subject to similar procedures. Purge volume testing should be used to determine the most appropriate purge volume to use at the site for a given lithology. A purge volume should always include the tubing and tip void space, along with the void space in the sand pack and dry bentonite.

As stated in Section 4.2.3 of the ASGA, the purpose of purging is to remove stagnant air from the sampling system so that representative samples can be collected from the subsurface. A purge volume test is used to establish the optimal purge volume for a site. The purge volume test is conducted by collecting a soil gas sample after removing one, three and ten purge volumes. The test sample is then

analyzed with the analytical method that was selected for the site's constituents of concern. The purge volume associated with the test results yielding the highest contaminant concentrations is then used as the purge volume for the associated depth and lithology at the site. If VOCs are not detected in any of the purge tests, a default of three purge volumes should be used.

Shallow soil gas and subslab probes, where screens and associated sand packs are less than five feet below surface grade, are subject to purge volume testing. To avoid excessive air removal from shallow probes, sample collection containers should be less than or equal to one liter to avoid the possibility of ambient air entering the subsurface and into the sample. All permanent probes should have an air-tight seal or cap to prevent ambient air from entering the tubing or casing.

3. Do I need to conduct a purge volume test when collecting a vapor sample in a Summa canister?

As described in Section 4.2.3, the purging process removes ambient air trapped within the probe material and tubing. A purge volume test determines the optimal purge volume for the given lithology. Because the probe material, the tubing, and the lithology are not impacted by the type of sampling container, a step purge volume test should always be conducted at a new site, regardless of the sample container type.

4. What instruments can be used for conducting leak checks in the field?

Leak check instruments are dependent on what leak check compound is use in the field. Some commonly used liquid leak check compounds are n-propanol, 1,1-difluroethane (1,1-DFA), and pentane. Commonly used gaseous tracer compounds include helium and sulfur hexafluoride. In the field, these compounds can be analyzed by either a mobile laboratory or field instrument. Typically, n-propanol, 1,1-DFA and pentane are evaluated with a mobile laboratory; however, helium and sulfur hexafluoride can be evaluated with hand-held instruments.

When collecting samples in passive stainless steel canisters, leak check compounds can be quantified by the stationary laboratory; however, sample quantification usually occurs after the field crew has demobilized. If the sample contains the leak check compound above the sample rejection criteria, that sample is compromised and resampling can only occur upon remobilization. Accordingly, Section 4.2.2.1 of the ASGI recommends collecting a sample in the field for leak compound screening purposes and analyzing the sample before the field crew demobilizes. Qualitative devices, such as a photoionization detector (PID), should not be used to determine whether the sampling system has a leak.

5. What materials are acceptable for probe construction?

There are a multitude of tubing and sampling tip materials available to the practitioner. Section 3.2.3, page 12 of the ASGI states:

To minimize purge volume, use small diameter (1/8 to 1/4 inch) sampling tubing from the vapor probe tip to the ground surface, made of material which will not react or interact with site contaminants. The probe tip, probe and probe connectors should all have the same diameter to provide a good seal between the formation and the sampling assembly." Additionally, bullet number 3 of the same section and page states "*Metal tubes should not be used to collect hydrogen sulfide samples. Nylaflow®, polyetheretherketone (PEEK), and Teflon® are recommended for soil vapor sampling. Low-density polyethylene (L-D PE) should not be used due to decreased performance relative to other tubing types in both off-gassing of VOCs inherent in the tubing structure (contribution to background) and for decreased contaminant recovery (reactivity). Reduced recovery of naphthalene was observed when using Nylaflow® tubing with small sample sizes. For additional information, see Appendix B.*

Soil gas sampling tips come in a variety of styles depending on the application. Tips should allow subsurface vapors to enter the sampling system with little or no restriction. Prior to sampling, an assembled soil gas probe, tip and tubing should be blank tested at a frequency of one analysis per new batch of tubing or material used (see Question 3 above).

6. The ASGI describes a "down-hole rod" being used during installation of the soil gas probe. What material can be used for this "down-hole rod?"

Section 3.2.1 of the ASGI states that a down-hole rod should be used to support the well tubing in the borehole. A rod refers to a downhole probe support device that is generally used in boreholes deeper than 15 feet to ensure that probe tips are placed at the appropriate depth. A small diameter PVC pipe that is capped at either end is the most commonly used material for probe support. The probe support is created by attaching the probe tip and tubing to the exterior of the PVC pipe. Other materials may be used, such as metal, as long as the probe support is free of contaminants. Depending on the depth, centralizers may be necessary to ensure the probe support is in the center of the borehole.

7. What is involved in collecting an equipment blank and how should it be performed?

As stated in Section 3.5 of the ASGI, equipment blanks should be collected at the beginning of sampling and at least once each day after decontamination. Equipment blanks are usually collected following decontamination of non-dedicated equipment to evaluate potential cross contamination from the sampling equipment. Usually, one or two equipment blanks are collected per day. In addition to tubing, items subject to equipment blank testing are push rods, auger flights, glass

sampling syringes, and pressure gauges. Equipment blank testing of tubing is explained in Question 3. The most common method of collecting an equipment blank is to pour distilled water over a recently decontaminated piece of equipment and collect the water in a container that is appropriate for the analytical method that will be used, which, at a soil gas site, will usually be VOCs. The blank water should be tested for all VOCs that are included in the site's analytical suite.

Drill rods containing contaminated soil should be decontaminated before reuse. If soil gas samplers arrive at the site after drill rig demobilization, equipment blanks should be provided by the drilling contractor. A syringe equipment blank is not an acceptable substitute for the driller's equipment blank.

A syringe blank may be collected by sampling ultra-pure air as it passes through the syringe. Additionally, as discussed in Question 3, an equipment blank is recommended for probe tubing and probe tips. The equipment blank for the tubing and probe tips demonstrate there is no residual contaminant carryover from other sites or the manufacturing process.

8. How do I conduct equipment blank sampling on tubing?

As stated in Section 3.2.3 of the ASGI, an assembled soil gas probe, tip and tubing should be blank tested at a frequency of one analysis per batch of tubing or material used. Demonstration of equipment cleanliness enhances the quality of soil gas data. The need for blank testing of tubing, probe tips, or an assembled soil gas probe should be evaluated through the data quality objectives (DQOs) process. Demonstrating cleanliness is needed because even new, unused, tubing may be stored inappropriately, such as near fuel sources or exhaust ports. Likewise, probe tips may contain residual oils from the manufacturing process. Cal/EPA is flexible in regards to the approaches to blank testing. Some common ways of blank testing are as follows:

- Coiled Tubing. Spools of tubing can be blank tested by collecting a sample of the dead air within the tubing. The tubing should not be purged prior to sampling and the sampling volume should be less than the dead space within the tubing. The air should be analyzed for site constituents. The air sample from the coiled tubing can be collected by either the field crew or by laboratory personnel prior to taking the tubing to the site.

- Assembled Soil Gas Probe. A soil gas probe can be assembled and then blank tested prior to insertion into the subsurface. A length of tubing representative of the maximum sampling depth for the site should be cut from the tubing spool and a probe tip attached to one end. Pressure gauges, fittings and valves can also be attached as appropriate. A sample of dead air from the probe should be collected in the same manner as when collecting a soil gas sample. The sampling volume should not exceed the dead space in the probe. This testing can be conducted in the field or by the stationary or mobile laboratory prior to using the tubing. If conducted by a stationary laboratory, the dead air in the

assembled probe may be replaced by zero-grade air and this zero-grade air may be tested.

- Probe Tips. Probe tips can be blank tested with distilled water. The most common method is to pour distilled water over the tip and through the inside, collecting the water in a container appropriate to the analytical method. The collected water should be tested for all site contaminants.

9. How do I sample with a differential pressure gauge?

Several sections of the ASGI (4.3, 5.1.2, and Appendix D) refer to use of a pressure gauge. The differential pressure gauge should be located on the inlet side of the purge pump or inline when using a syringe so that the vacuum exerted on the subsurface can be accurately measured. Sampling vacuum should not exceed 100 inches of water.

10. How do I decontaminate sampling syringes and differential pressure gauges?

Section 5.4 of the ASGI recommends disassembling and heating glass syringes and bulbs in order to decontaminate them. This can be achieved by using a laboratory wipe saturated in solvent, such as methanol, to clean the inside of the equipment. The equipment should then be flushed with ambient air and placed on a warm surface, such as near a gas chromatography (GC) injection port.

11. Are a shroud and Summa canisters required to obtain data usable in a health risk assessment?

Section 4.2.2 of the ASGI describes leak check testing. The intent of leak testing is to demonstrate the integrity of the sampling system. Both gaseous and liquid leak check compounds can accomplish this goal when used properly in the field. Using gaseous leak check compounds in a properly constructed shroud offers the advantage of instantaneously quantifying system leaks in the field with a hand-held instrument prior to sample collection. Thus a shroud provides an opportunity to immediately resolve significant leaks, avoid collecting compromised samples and reducing field time and unnecessary sample analysis.

Liquid leak check compounds are equal to gas leak check compounds in their ability to demonstrate the integrity of the sampling system. However, if a mobile laboratory is not being used, then it may be days or weeks before leaks are discovered and that the integrity of the samples were compromised. Thus, soil gas samples will need to be recollected by remobilization of the field crew, and, in some cases, reinstallation of the vapor wells is needed. If a mobile laboratory or field screening is used, leak check compounds can be detected prior to sample collection, and these problems avoided. With a mobile laboratory, significant leaks in the sampling train can be alleviated prior to sampling. If a mobile laboratory is not employed, a leak check compound screening sample can be taken to a fixed laboratory prior to sampling to ensure no leaks are present.

USEPA Methods 8015, 8021, and 8260, when modified pursuant to the recommendations in Appendix F of the ASGI, can be used in risk assessments.

12. What is recommended when moisture is observed in the sampling tubing or container?

If moisture is observed in the sample tubing or container, the vapor well should be abandoned and a new well installed to avoid trapping moisture. Moisture entrainment can be avoided by sampling a sufficient distance from the capillary fringe or by avoiding highly saturated soil. Moisture may have the effect of biasing the soil gas samples because soil moisture may not be in equilibrium with soil gas.

The degree of potential sample bias is a function of subsurface equilibrium. When soil moisture and soil gas are in equilibrium, the VOCs in the pore water entrained in the sampling system may be released into the air stream during the agitation of the water, biasing the sampling results high. Likewise, when soil moisture and soil gas are not in equilibrium, soil gas contamination may partition into newly introduced pore water, biasing the sampling results low.

In Southern California, soil gas concentrations typically decrease following rain events due to the addition of new pore water in naturally dry soils. In Northern California, soil gas concentrations typically increase following rain events due to naturally moist soils coupled with the capping effect of rainfall events.

The ASGI states in section 5.2.3: "*Moisture detected in either the sampling train or the sample container may indicate saturated conditions in the subsurface. Vapor phase compounds may partition into the dissolved phase, affecting the recovery of target analytes and causing analytical results to be biased low."*

Hence, vapor samples could be biased either low or high depending on the subsurface equilibrium. In either scenario, moisture should be avoided to alleviate potential bias.

13. Should the ASGI be used for measuring oxygen in soil gas at petroleum sites for site closure pursuant to the State Water Resources Control Board's recently approved Low Threat Closure Policy?

Oxygen measurements collected for site closure should have the highest possible data quality objectives. Accordingly, sample bias needs to be minimized in order to obtain representative samples. The sampling recommendations in the ASGI can be used to obtain high quality data. To prevent sample bias, for example, the following should be considered when sampling:

- Proper soil gas probe construction
- Probe equilibration times
- Proper probe purging
- Probe shut-in testing
- Use of leak check compounds