Vapor Intrusion Assessment at the Northside Shopping Center, Gainesville, Florida
Proposed Exterior Soil Gas Sampling Approach

Introduction

A work plan for a vapor intrusion (VI) assessment at the Northside Shopping Center, Gainesville, Florida was prepared by Gradient for Cabot Corporation on November 30, 2011 and revised on February 28, 2012. This work plan was developed in response to a request by the U.S. Environmental Protection Agency (US EPA) — as part of a five-year review of the Cabot Carbon/Koppers Superfund Site — that potential human health risks from indoor air VI be assessed at the former Cabot property, where the shopping center is now located. There is currently no reason to believe that a complete VI pathway exists at the site; however, recent US EPA policy requires that VI assessments be conducted at Superfund sites, including those with older remedy decisions, such as the Cabot portion of the site, where remedial efforts were decided and implemented about twenty years ago.

The February 2012 VI assessment work plan (hereinafter, the Work Plan) contemplated VI investigation activities inside three stores of the shopping center (*i.e.*, Winn Dixie, Big Lots, and the former K-Mart), including surveys to obtain information related to store configuration and HVAC[1] systems, sub-slab vapor sampling from seven locations within the stores, and differential pressure measurements to assess the effect of the HVAC systems on the air flow across the floor slabs.

Mindful of potential disruptions to building owners and store operators, the US EPA suggested — during a recent call with stakeholders — the idea of first performing an exterior soil gas assessment along the perimeter of the buildings. If health-based screening levels are not exceeded, the VI assessment would be considered complete and no interior sub-slab vapor sampling would be conducted. The proposed exterior soil gas screening levels for the compounds of interest are provided in Table 1. Additional investigations inside the buildings — including sub-slab vapor sampling consistent with the Work Plan approach and simultaneous indoor air sampling — would only be performed if building exterior soil gas sampling results exceed those screening levels.

This documents outlines the proposed exterior soil gas sampling procedure. Upon receiving feedback from stakeholders, an updated work plan will be prepared and submitted to the US EPA.

Proposed Exterior Soil Gas Sampling Program

We propose that 10 exterior soil gas samples be collected around the perimeter of the shopping center buildings (Figure 1) about 5 feet away from the building walls. The proposed soil gas sampling locations were selected to be proximate to Cabot former process areas (*e.g.*, pine oil/tar refinery and retort areas, see Section 2.1 of Work Plan). Currently, we anticipate that samples will be collected at a depth of about 3 to 5 feet below ground surface, consistent with guidance from the Interstate Technology & Regulatory Council (ITRC).[2] Even though the exterior soil gas sampling depth is greater than typical depth for sub-slab vapor samples, this approach is intended to limit the effects of short circuiting that is more prone to occur during exterior soil gas sampling. To further limit the potential for sample short-circuiting to the atmosphere, the soil gas samples will be collected — to the extent possible — from locations within paved areas with limited evidence of damage or cracking.

Note that we have ruled out the use of directional drilling (*i.e.*, drilling beneath the building slab from an exterior location) in consideration of the potential presence of footer walls surrounding the building

[1] HVAC: heating, ventilation, and air conditioning.
[2] Refer to ITRC's 2007 VI guidance at http://www.itrcweb.org/documents/VI-1.pdf (Section D.4.17, p. 113/172).

foundation, the possible presence of buried utilities that may be difficult to locate, and the lack of readily available technology (although directional drilling has been used for mitigation system installation beneath existing structures, it is not a common VI investigation tool).

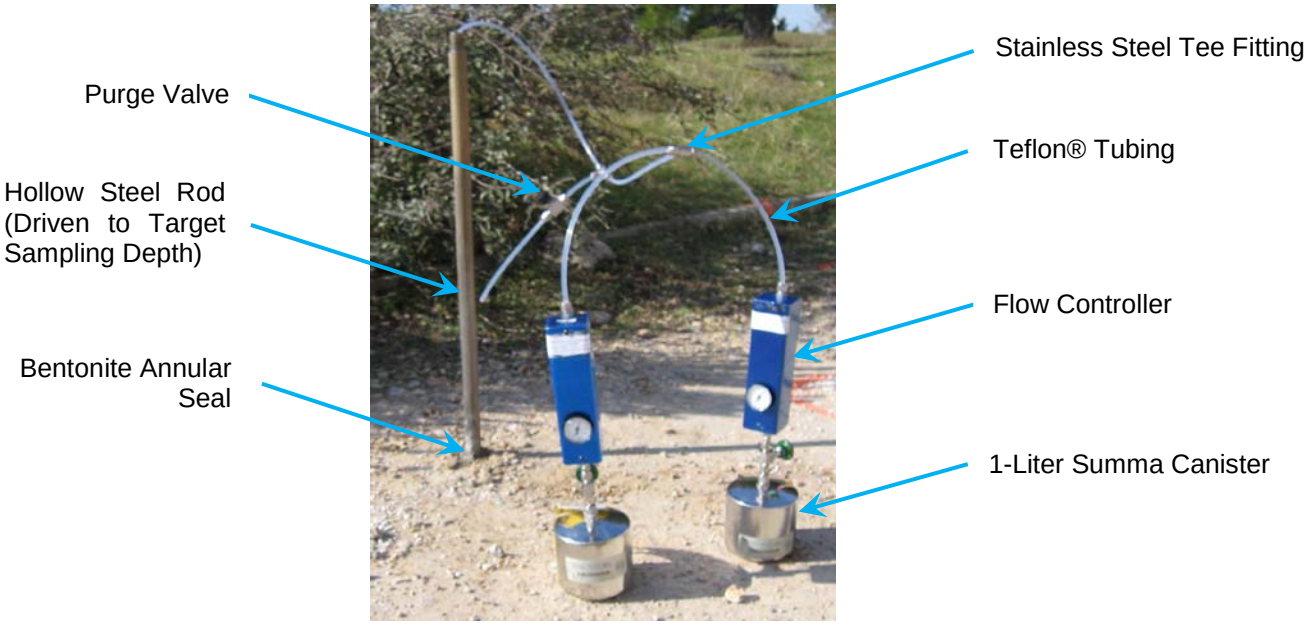
Figure 1 – Proposed Exterior Soil Gas Sampling Locations

The sampling procedure for collecting exterior soil gas is essentially identical to that described in the Work Plan for sub-slab vapor sampling (see Sections 3.4.2 through 3.4.4 and Exhibits 2, 3, and 4). Samples will be collected as follows (see example of exterior soil gas sampling setup on Figure 2):

- Pre-evacuated, 1-liter Summa canisters equipped with flow controllers (to provide a 1-hour time-averaged sample) will be connected to a subsurface soil gas sampling point (also called a "temporary implant");
- Following implant purge, a soil gas sample will be collected into the Summa canister over a 1-hour period; and

- The canister will be submitted for laboratory analysis of a comprehensive suite of volatile organic compounds (VOCs).

Figure 2 – Example of Exterior Soil Gas Sampling Collection Using a Temporary Implant



Note: In this example, two canisters are used to collect duplicate samples. Duplicate sampling will be done at one or two locations. Single canister sampling will be done at other locations. In addition (and unlike this photograph) samples will be collected within paved areas.

The key difference between sub-slab vapor and exterior soil gas sampling is the sampling point installation as further described below. To install a sub-slab sampling point, a portable hammer drill is used to advance a small-diameter hole into the concrete floor slab to a depth of about 3 inches below the slab (see Section 3.4.1 and Exhibit 1 of the Work Plan). Tubing is inserted into the hole to allow sampling and the annular space between the hole and the tubing is sealed with a rubber plug and beeswax.

The exterior soil gas temporary implants will be advanced using a different procedure, as follows:

- The asphalt or paving will be broken using a potable hammer drill (approximately 1-inch diameter hole) to expose underlying soil;
- A portable slide hammer[3] will be used to push a hollow, 1-inch diameter rod into the ground to the targeted soil gas sampling depth (3 to 5 feet below ground surface, as indicated previously);
- Once the target depth is reached, the rod will be retrieved by a few inches to create a soil gas sampling window;
- Teflon® tubing will be lowered into the hollow rod to allow purge and soil gas sample collection (Figure 2);

[3] The work can be completed by a crew of one to two persons and does not require a mechanized drilling rig. See, for example, http://geoprobe.com/sites/default/files/pdfs/17743_manual_slide_hammer_operation_-_booklet_v.0112.pdf.

- Vapor leakage inside the rod will be prevented through a device called a post-run tubing (PRT) system;[4]
- At ground surface, the annular space between the borehole and rod will be sealed using bentonite or modeling clay to prevent short-circuiting of ambient air to the soil gas sampling window (Figure 2);
- The potential for short circuiting and overall integrity of the temporary implant will be checked at each location prior to sampling using helium and a shroud (or overturned bucket) consistent with the approach outlined in the Work Plan (see Section 3.4.5 and Exhibit 5); and
- Following sampling, the rod will be retrieved, the hole backfilled with bentonite chips, and the paving or asphalt patched.

Schedule

As noted previously, pending review and comments to this outline from stakeholders, an updated work plan will be prepared and submitted to US EPA during the month of May or early June. Shopping center owner(s) will be contacted to obtain access agreement and store owners will receive courtesy notification as appropriate. Upon obtaining agreement, we anticipate that a few weeks will be needed to schedule the sampling program with a tentative sample collection date during the month of August. Pending weather constraints, the sampling program should take no more than two to three days to complete.

Table 1
Reference US EPA Industrial/Commercial Indoor Air Screening Levels and Proposed Exterior Soil Gas Screening Levels

Compound Name	US EPA Industrial/Commercial Indoor Air Screening Levels [a] ($\mu g/m^3$)	Proposed Exterior Soil Gas Screening Levels [b] ($\mu g/m^3$)
Benzene	16	160
Toluene	22,000	220,000
Ethylbenzene	49	490
m-Xylene	440	4,400
o-Xylene	440	4,400
p-Xylene	440	4,400
Naphthalene	3.6	36

Notes:

(a) Industrial indoor air screening levels in micrograms per cubic meter ($\mu g/m^3$) based on the US EPA website on regional screening levels for chemical contaminants at Superfund sites (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/). For carcinogenic compounds (i.e., benzene, ethylbenzene, and naphthalene), values are provided for a 10^{-5} cancer risk consistent with US EPA 2002 draft VI guidance recommendation.[5]

(b) Proposed exterior soil gas screening levels assume an exterior soil gas to indoor air attenuation factor of 0.1, which is based on the shallow soil gas attenuation factor from the US EPA 2002 draft VI guidance and a March 2012 US EPA VI database study.[6]

[4] See manufacturer's guidance document at http://geoprobe.com/sites/default/files/pdfs/soil_gas_prt_oper.pdf for additional information.

[5] See http://www.epa.gov/osw/hazard/correctiveaction/eis/vapor/complete.pdf (2nd paragraph of Section IV.C at p. 10/178).

[6] See http://www.epa.gov/oswer/vaporintrusion/documents/OSWER_2010_Database_Report_03-16-2012_Final.pdf (Table 19 and Figure 34 at p. 79/188).