

STANDARD OPERATING PROCEDURE – BER-35

**INSTALLATION OF SOIL VAPOR MONITORING WELLS TO ASSESS
VAPOR INTRUSION**



Effective Date: January 1, 2011

TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	METHOD SUMMARY	1
3.0	PROCEDURE.....	1
4.0	REFERENCES	3

DISCLAIMER:

This Standard Operating Procedure (SOP) was developed based on a compilation of best available information, knowledge, field experience, and general industry practices to provide guidance to KDHE staff in performing the activities defined herein, in a consistent and standardized manner. This document does not contain regulatory or statutory requirements unless specified.

KDHE has made every attempt to present the information in a clear and concise manner for a variety of users. However, KDHE is not responsible for the misuse or misinterpretation of the information presented herein. Under no circumstances shall KDHE be liable for any actions taken or omissions made by non-KDHE users of this document.

In general, this document should be used as a reference. Differences may exist between the procedures referenced in this document and what is appropriate under site-specific conditions. This document does not represent an endorsement of practitioners or products mentioned in the document.

1.0 INTRODUCTION

The objective of this Standard Operating Procedure (SOP) is to describe the equipment, design specifications, and protocols for installation of soil vapor monitoring wells used to assess vapor intrusion. Soil vapor (also known as soil gas) sampling may be used as a component of a comprehensive vapor intrusion assessment. The procedures for collecting soil vapor samples from a well installed pursuant to this SOP are described in KDHE's SOP for Collection of Soil Vapor Samples for Analysis of Volatile Organic Compounds (BER-37). Vapor monitoring wells may also be used for evaluating the performance of remedial systems. Wells constructed for this purpose may differ in construction from the specifications outlined in this SOP. Design criteria for such wells should be described in project specific planning documentation.

Vapor monitoring wells are constructed so that multiple soil vapor samples can be obtained from the same location to track changes in soil vapor concentrations over time. Single or multiple probes may be installed into a single borehole to obtain vertical profile data. Vapor wells may also produce data that are better quality than those collected using temporary direct-push methods (e.g., post-run tubing method, etc.).

Vapor wells can be installed using hand auger equipment, hand driven push/hammer equipment or hydraulic direct-push equipment.

2.0 METHOD SUMMARY

Small diameter inert tubing, used in conjunction with a small screen or inert perforated tip, can be installed down a variety of borehole diameters. Boreholes can be created with hand equipment or direct push systems. Small discreet areas of the formation can be isolated and sampled for soil vapor using vapor wells. Several tubes can also be installed in the same borehole at varying depths (nested). Nested vapor wells must be grouted (sealed) between sampling intervals to ensure that the sample collected is from the targeted depth in the vadose zone.

3.0 PROCEDURE

To install the soil vapor well the borehole must first be created. In coarse materials it may be necessary to use direct push equipment with rods generally used to install mini-wells, (e.g. outer 2.125 in. diameter rods). In this instance the vapor well will be installed in the inside of the tool string. Sand pack and granular bentonite will be delivered down the inside of the tool string during removal of the tool string. Care must be taken not to pull the casing/tubes out of sand pack when extracting the tool string.

Standard Operating Procedure BER-35
Installation of Soil Vapor Monitoring Wells to Assess Vapor Intrusion
Date: January 1, 2011
Page 2 of 4

For tighter soils it is usually easier to advance the direct-push rod or hand auger (e.g. small diameter rods with 2 in. pre-probe, or 2 in. hand auger) to the desired depth, then remove the rod or auger completely. Care must be taken when installing permanent vapor monitoring probes using direct-push and hand driven methods to ensure that the sidewall is not smeared in fine grained soils effectively precluding passage of soil vapor into the borehole. Vapor wells can then be installed in the borehole provided the borehole will stay open. Ensure the desired depth is achieved prior to installing any materials into the bore hole.

A typical commercial vapor well point will be centered in approximately 6-12 in. of granular material (e.g. sand, glass beads, etc.) in the borehole. A granular bentonite plug, placed directly above the sand pack and hydrated, usually consists of approximately two inches of small granular bentonite and 120- 150 ml of de-ionized (D.I.) water. Granular bentonite should be added to the borehole until you reach the surface or to the bottom of the next interval you wish to sample. For nested wells, hydrating the bentonite to seal the bottom of the next interval should be completed prior to adding the next sand pack and probe. An example of a nested vapor well is shown in Figure 1.

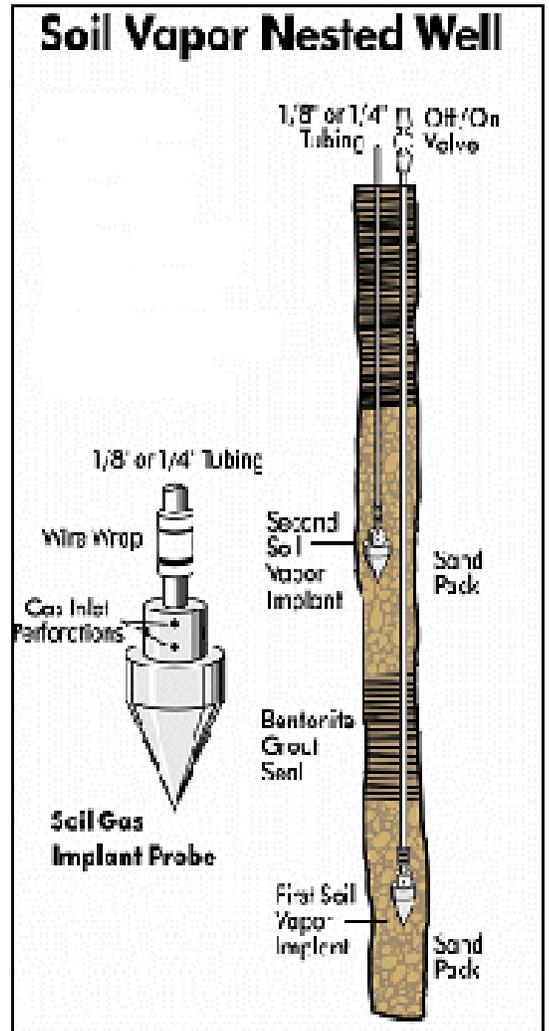


Figure 1. Nested soil vapor well (Courtesy H&P Mobile Geochemistry)

Other items to remember when installing nested vapor wells are as follows:

- Cut probe tubing to an appropriate length to reach the surface, allowing enough material for whatever surface completion is required;
- Ensure the probe tip is located in the middle of the sand pack;
- For deeper applications, it may be necessary to add weight to the tip to allow for easier installation;
- Hydrating grout above and below each gravel pack ensures adequate seals for vapor sampling;
- Label tubes as they are installed and make sure the identification system remains in place for future re-sampling;

Standard Operating Procedure BER-35
Installation of Soil Vapor Monitoring Wells to Assess Vapor Intrusion
Date: January 1, 2011
Page 3 of 4

- Terminate surface ends of tubes with Swagelok caps, valves, or other desired terminations;
- When a single depth vapor well is installed, after the seal is hydrated, grout to the surface unless a permanent surface completion is to be installed.

4.0 REFERENCES

EPA, 1999a, *Compendium Method TO-14A – Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Specially Prepared Canisters With Subsequent Analysis By Gas Chromatography*, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air – Second Edition, EPA/625/R-96/010b, Center for Environmental Research Information, Office of Research and Development, United States Environmental Protection Agency, Cincinnati, OH, January 1999.

EPA, 1999b, *Compendium Method TO-15 - Determination of Volatile Organic Compounds (VOCs) in Ambient Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry*, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air – Second Edition, EPA/625/R-96/010b, Center for Environmental Research Information, Office of Research and Development, United States Environmental Protection Agency, Cincinnati, OH, January 1999.

EPA, 2002, *Draft Standard Operating Procedure (SOP) for Installation of Sub-Slab Vapor Probes and Sampling Using EPA Method TO-15 to Support Vapor Intrusion Investigations*. Ground-Water and Ecosystem Restoration Division, Office of Research and Development, National Risk Management Research Laboratory, U.S. Environmental Protection Agency, Ada, Oklahoma.

EPA, 2006, *Comparison of Geoprobe PRT and AMS GVP Soil-Gas Sampling Systems With Dedicated Vapor Probes in Sandy Soils at the Raymark Superfund Site*, EPA/600/R-06/11, Ground-Water and Ecosystem Restoration Division, Office of Research and Development, National Risk Management Research Laboratory, U.S. Environmental Protection Agency, Ada, Oklahoma. November 2006.

Geoprobe Systems, 2006, *Direct Push Installation of Devices for Active Soil Gas Sampling & Monitoring*, Technical Bulletin No. MK3098, Salina, Kansas, May 2006.

Hartman, B., 2004, *How to Collect Reliable Soil-Gas Data for Risk-Based Applications -Specifically Vapor Intrusions, Part 3: Answers to Frequently Asked Questions*. LUSTLine Bulletin 48, November 2004.

Standard Operating Procedure BER-35
Installation of Soil Vapor Monitoring Wells to Assess Vapor Intrusion
Date: January 1, 2011
Page 4 of 4

ITRC, 2007, *Vapor Intrusion Pathway: A Practical Guide*, Interstate Technology and Regulatory Council, Washington D.C., January 2007.

KDHE, 2007, *Kansas Vapor Intrusion Guidance*, Bureau of Environmental Remediation, Division of Environment, Kansas Department of Health and Environment, Topeka, KS, June 2007.

NYSDH, 2006, *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, New York State Department of Health, Albany, NY, October 2006.