

Sample Spacing with the Vapor Pin®

Soil gas, including sub-slab soil gas, normally exhibits considerable spatial heterogeneity. It is therefore critical to screen or sample soil gas from an adequate number of locations to evaluate vapor intrusion, or to locate sub-slab sources of contamination. Because Vapor Pins® can be installed in several minutes, using hand-held equipment, and because they can be reused multiple times, Vapor Pins® make it possible to collect a large number of field readings, and if desired, analytical samples, within reasonable time frames and budgets.

According to U.S. EPA's Vapor Intrusion FAQs (2012)¹, “....*recommendations vary as to how many sub-slab samples are appropriate — ranging from one sub-slab sample collected for every 330 square feet (or two to three samples collected for every average-sized home) to one sub-slab sample for an average residential dwelling of 1,500 square feet....*” This corresponds to collecting samples along a rectangular grid spacing of 18 to 39 feet. Cox-Colvin typically uses a grid spacing of 20 to 30 feet for sub-slab screening and sampling, but as great as 40 feet for unusually large facilities. The sample number can be reduced slightly by collecting soil gas in a hexagonal array, but the additional effort to lay out a non-rectangular grid, might offset any savings.

An advantage of using Vapor Pins® is that, because they form a seal against the slab immediately, sub-slab soil gas can be screened with a photo-ionization detector (PID) minutes after installation, and a denser sample array can be installed in areas of interest. The figures below illustrate the results of a sub-slab soil-gas investigation conducted with Vapor Pins® to locate the source of chlorinated solvents in groundwater. Contamination was indicated by the presence of a groundwater plume, but the suspected sources – former Above-ground Storage Tanks (ASTs) and vapor degreasers – didn't fit the groundwater plume. A team of two people, equipped with a hand-held rotary hammer, a PID, and Vapor Pins®, installed, sampled, and plugged approximately 30 sub-slab locations each day, along a 20-foot spacing. Vapor Pins® were decontaminated overnight and reused the following day. The PID results, confirmed by laboratory samples, showed that the sub-slab contamination corresponded to the location of one-time exterior doors and loading docks, and is probably tied to pre-1952 handling and disposal practices, not former ASTs or vapor degreasers.

Notice also, the close correlation between laboratory results (Figure 1) and hand-held PID results (Figure 2). In most cases, only a small number of laboratory samples are collected from the points with elevated PID response. A sample spacing of 40 feet would probably have located the sub-slab contamination, but the denser spacing of 20 feet better defined its shape and size.

¹ US EPA, 2012. Superfund Vapor Intrusion FAQs, Office of Solid Waste and Emergency Response, February 2012.

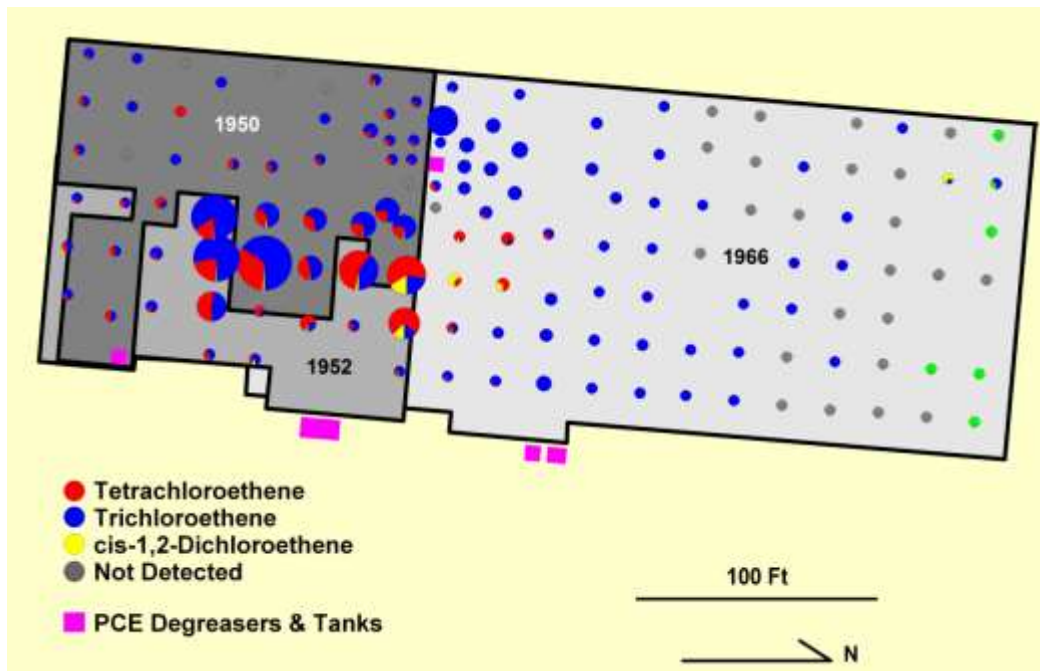


Figure 1. Sub-Slab Soil-Gas Analytical Results and Building Configurations over Time. Soil-gas concentrations are plotted on a logarithmic scale.

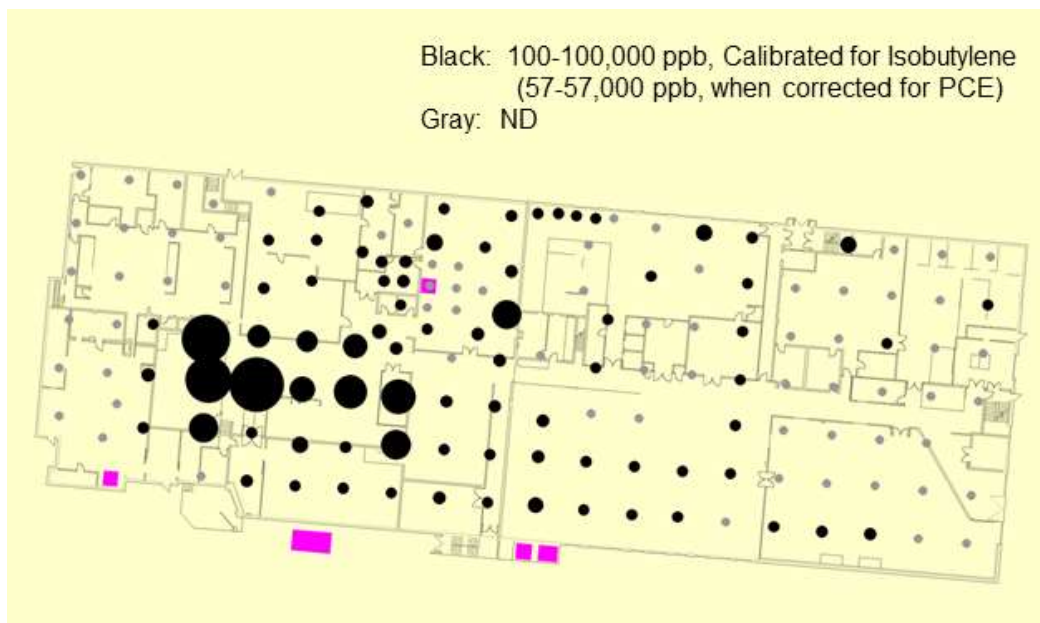


Figure 2. Sub-Slab Soil-Gas Analytical Results Photo-Ionization Detector Results. Soil-gas concentrations are plotted on a logarithmic scale.

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