Results of a Vapor Pin™ Investigation with Michigan DEQ

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Introduction

This memorandum summarizes the results of an investigation conducted with Matthew Williams of the Michigan Department of Environmental Quality (DEQ) to determine the suitability of Cox-Colvin's Vapor Pins™ for collecting sub-slab soil gas for the analysis of organic vapors. The investigation compared the results from Vapor Pins™ to those collected from stainless-steel Swagelok fittings set in cement, which are widely regarded as the standard method to collect vapors from beneath a slab. Secondarily, the investigation served as a comparison for two different types of sample containers, analyzed via different methods at different laboratories.

Sampling

The investigation took place at the Federal Mogul site, an industrial facility at which sub-slab sample points constructed from stainless-steel Swagelok fittings set in cement had been previously installed and tested. Previous test results showed high concentrations of tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (cis-DCE) in soil gas, and lower concentrations of aromatic compounds, including trimethylbenzene.

Members of the Michigan DEQ installed four Vapor Pins™, in accordance with the standard operating procedures, within approximately one foot of four existing Swagelok sample points. On August 31, 2011, after allowing soil gas at the points to equilibrate, all sample points were purged and leak tested within a helium-filled shroud. No helium was detected in any of the sample points. The team members then collected concurrent soil-gas samples from the Vapor Pins™ and Swagelok samples points. Samples were collected into evacuated, one-liter, amber glass bottles (Bottle Vacs) and analyzed at the Michigan DEQ laboratory via modified US EPA Method TO-15, gas chromatograph/mass spectrometry (GC/MS).

On November 1, 2011, Mr. Craig Cox of Cox-Colvin and Associates (Cox-Colvin) met with the Michigan DEQ to participate in further comparison of the Vapor Pins™ to Swagelok sample points. As in the August 2011 sample event, all points were purged and leak tested with helium. No helium was detected in any of the sample points. Samples were collected from four Swagelok and four Vapor Pin™ samples into Bottle Vacs, and analyzed by Fibertec Laboratories of Holt, Michigan. Additional samples were collected into evacuated 22-ml glass vials and sent to Microseeps Laboratory of Pittsburgh, Pennsylvania for analysis by gas chromatography (GC), using a proprietary method.

Results

The results of the combined sample events are shown on the attached figures. Each data point on the graphs represents the concentrations for each detected compound from the Swagelok sample points (horizontal axis) versus the Vapor Pin™ sample points (vertical axis). Ideally, the Swagelok and Vapor Pin™ results would be identical and all of the points would fall along a diagonal line stretching from lower left to upper right. Figure 1 shows a correlation between the Swagelok and Vapor Pin™ results that resembles the diagonal line, but with a considerable amount of scatter. The greatest scatter is seen in data collected from Location 12 of the four sample pairs. Figure 2 shows the same data, but with this sample pair removed. The correlation between the Swagelok and Vapor Pin™ sample points in Figure 2 is very strong, even though the samples were collected on different dates, using different types of sample containers, and analyzed by different laboratories using different analytical methods.

We believe that most of the scatter on Figure 1 represents the spatial variability of soil gas at one of the paired sample points. The difference does not appear to result from leakage at either point, since some compounds are higher at the Swagelok sample point, while others are higher at the Vapor Pin™ sample point. The absence of leakage is also supported by the results of the helium leak tests. In any case, when the Vapor Pin™ results differed with the Swagelok results, the Vapor Pin™ results were generally the higher (more conservative) of the two, and would typically be regarded as the better sample.

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Figure 1. Comparison of Vapor Pins™ to Swagelok Sample Points.

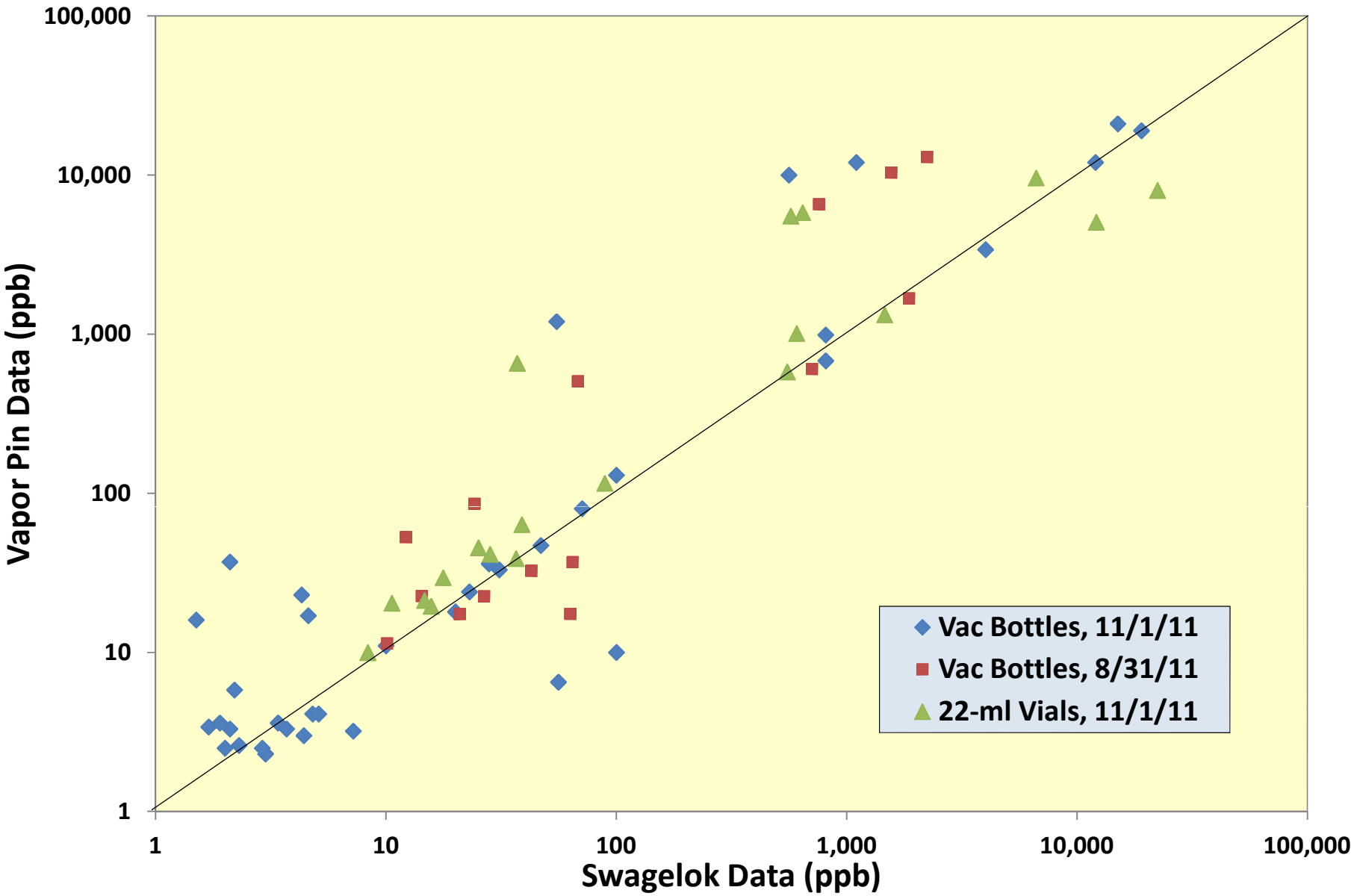

Figure 2. Comparison of Vapor Pins™ to Swagelok Sample Points, with Data from Sample Point 12 Removed.