

High Volume Sampling for Reduced Costs and Improved Outcomes in VI Assessment



Sub-slab soil gas samples should deliver more value.

High Volume Sampling (HVS)

Geosyntec developed HVS⁽¹⁾ sampling to integrate samples over a large volume of soil gas extracted from beneath the floor slab of a building to provide spatially averaged sub-slab soil gas concentrations. This approach requires far fewer samples than conventional sub-slab sampling to understand the potential for subsurface vapor intrusion to impact indoor air, and it provides important design data for optimizing mitigation systems, if needed. These advantages focus the investigation and reduce the invasiveness, cost, and duration of vapor intrusion assessment, especially for large buildings.

HVS offers compelling advantages over conventional sub-slab sampling:

- Lower investigation costs and significantly reduced disruption to operations through the collection of fewer samples but with increased sub-slab characterization.
- Demonstrate the absence of significant VOC sources quickly and over large areas of the slab
- Greater confidence in the geometry of sub-slab VOC sources
- Identify and test preferential pathways
- Simultaneously collect data for targeted mitigation system design
- Develop building specific attenuation factors⁽²⁾

⁽¹⁾ References: McAlary, T., P. Nicholson, L. Yik, D. Bertrand, and G. Thrupp. 2010. High Purge Volume Sampling – A New Paradigm for Subslab Soil Gas Monitoring, Ground Water Monitoring & Remediation (V3, No. 2, pp 73-85).

⁽²⁾ McAlary, T., Gallinatti, J., Thrupp, G., Wertz, W., Mali, D. and H. Dawson, 2018. Fluid Flow Model for Predicting the Intrusion Rate of Subsurface Contaminant Vapors into Buildings, Environmental Science & Technology, 2018, 52(15), pp 8438-8445.



Concept to Completion

HVS has been used to solve problems in:

California*	New Hampshire
Florida	New York
Indiana	North Carolina
Maine	Tennessee
Massachusetts	Texas
Michigan	Virginia
Missouri	Wisconsin
New Jersey*	Wyoming

* HVS is mentioned in VI guidance

How can we assess a large building when just a few hotspots below the floor could contribute the majority of VOCs to indoor air? Typical sampling methods rely upon a combination of luck and large numbers of samples to pinpoint sources. High volume sampling provides spatially-averaged VOC concentrations to identify source areas more quickly, with just one HVS test replacing many traditional, discrete sub-slab samples as shown on figure to the right. Relative to the conventional approach of large numbers of small samples, this approach minimizes variability, and provides insight to concentrations between and beyond test locations, providing much more comprehensive and unambiguous information. Conventional sub-slab sampling requires far more sampling locations and does not diminish the risk of missing a vapor source.

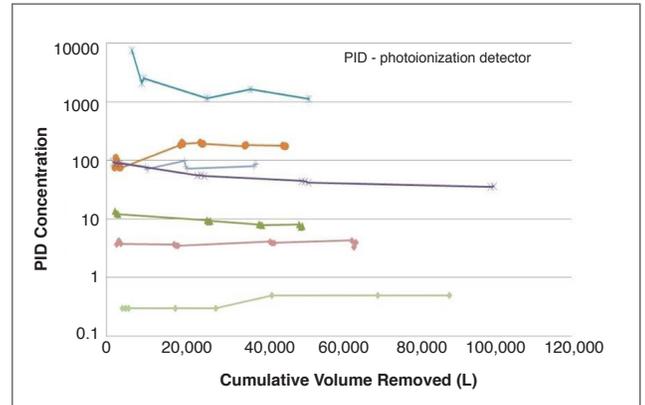


One HVS test (red star showing suction point and yellow circle showing radius of influence) can replace multiple traditional sub-slab soil gas samples (blue dots).

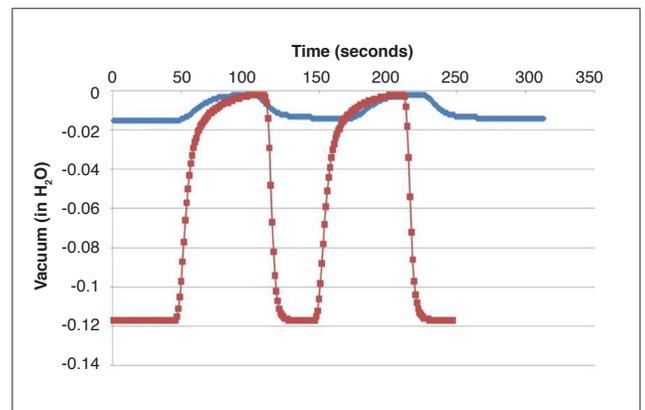
Inexpensive field measurements of concentrations during soil gas extraction convey a great deal of information about source location:

- An increasing trend indicates a source in the vadose zone at some distance from the extraction point
- A decreasing trend indicates a source in the vadose zone close to the extraction point, and can also indicate a preferential pathway
- A stable trend indicates either no source or a source at the water table

Data from a 5-minute test during HVS can be used to calculate key parameters for mitigation system design, reducing overall project cost and effort. Using the same principles as groundwater pump testing, a fan is used to pump sub-slab soil gas and vacuum is monitored at observation points. The information obtained from the vacuum testing can be used to correct the HVS concentration data for the amount of leakage, and to optimize the design of a sub-slab venting system, if needed.



HVS results



Sub-slab pneumatic testing vacuum “drawdown” and “recovery”

Geosyntec continues to develop better approaches to assessing and managing vapor intrusion. We have several other innovations that can reduce cost, save time, and deliver a more confident and unambiguous assessment, all of which work seamlessly with the HVS Method.

About Us

Geosyntec Consultants is a leading consulting and engineering firm that operates over 80 offices throughout North America, Australia, and Europe. We address new ventures and complex challenges involving our environment, natural resources, and civil infrastructure through high-value services, first-to-field deployment of emerging technologies, and innovative solutions for our clients.

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