Case Study: VC11

Vertebrae Well Systems for Vapor Intrusion

SITE INFORMATION

Two Former Dry Cleaner Locations, Leon Valley, TX

CONTAMINATION

At two dry cleaner sites, sub-slab releases of tetrachloroethene (PCE) resulted in a large-area dilute groundwater plume in karst terrain. The sub-slab release presented two principal soil remedial action objectives: 1) mitigation or elimination of the vapor intrusion (VI) pathway, and 2) source control to eliminate the soil to groundwater contaminant pathway.

BACKGROUND

Soil vapor extraction (SVE) pilot testing in surficial soils at one site using vertical wells was determined to be technically impractical based on low flow rates, low mass removal rates, and insufficient radius of influence to impact sub-slab contamination. Currently the VI pathway is mitigated with a sub-slab depressurization system.

OBJECTIVE

In order to permanently eliminate both pathways, nested segmented horizontal wells were installed, and pilot tests conducted. To maximize flexibility in operation and optimize mass removal rates, Vertebrae™ Well Systems (VWS) were installed at each site to facilitate SVE pilot testing. VWS were selected to minimize set-back, drilling length, and surface disturbance. Installation was completed with virtually no disruption to businesses.

RESULTS

The previous SVE pilot test conducted on vertical wells provided indication of borehole short-circuiting and low radius of influence. The VWS allowed placement of longer screens installed 6 feet below slab and directly in the impacted soil with no concern of short circuiting. This resulted in high flow rates (around 1 cfm per foot of screen in clay) and higher mass removal rates since screens are proximal to the center of mass of contamination. The longer screens and higher flow rate also resulted in increased zone of influence. The resultant sub-slab depressurization will eliminate the indoor air pathway while cleaning up soil contamination by SVE.

PILOT TEST DATA

The SVE pilot tests were run on all Vertebrae well segments individually and as a full system. Maximum flow rates ranged from 11.65 scfm to 24.96 scfm among the well segments. The anticipated air flow rate of 5 scfm per well segment was dramatically exceeded. Individual flow rates indicate separation and control of each targeted zone of vapor removal.

	Well ID	Max Flow Rate (scfm)	Flow/ft. (scfm)	Total Vertebrae Flow Rate (scfm)
Source Area 1	SVE-1	24.96	1.25	**37.08**
	SVE-2	17.88	0.89	
Source Area 2	SVE-1	11.65	0.78	**41.23**
	SVE-2	17.16	1.14	
	SVE-3	14.76	0.98	

CONCLUSIONS

In summary, vertical wells may seem inexpensive and convenient; however, the use of VWS allows placement of screen sub-slab directly in contamination, higher overall flow rate due to longer screens compared to shallow vertical wells, and virtually no risk of short circuiting. The VWS demonstrates higher mass removal rates, the ability to isolate segments and flow rates to address heterogeneity and optimize remediation, and simplification of full-scale system construction by reduced trenching and conveyance line installation.

As more sites utilize Vertebrae for Vapor Mitigation, and experience the added control and improved efficiency, more sites will choose Vertebrae as the preferred "tool" to implement and optimize a vapor removal approach.

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