HAPSITE® GC/MS as an Investigation Tool for Characterizing Trichloroethene in Groundwater

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Background/Objectives. The presentation describes the use of the HAPSITE® ER Chemical Identification System (HAPSITE® ER) as a tool for assessing concentrations of trichloroethene (TCE) in groundwater at the U.S. Army Corps of Engineers, Engineer Research Development Center, Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, New Hampshire. Multiple releases of TCE to shallow soils resulted in extensive subsurface soil, soil gas, and groundwater contamination. Recent sample module updates to the HAPSITE® ER now allow for the analysis of aqueous samples using the ER platform. The HAPSITE® portable gas chromatograph/mass spectrometer (GC/MS) is used at CRREL for daily TCE monitoring of indoor air for comparison with site-specific interim action limits. With the addition of the solid phase microextraction (SPME) module, HAPSITE®'s capabilities now include the on-site analysis of groundwater samples for TCE in support of ongoing investigation, pilot testing, and remediation activities.

Approach/Activities. Prior to the availability of on-site SPME analysis, groundwater sample analysis was performed at off-site labs using Method 8260B. With the new capability of on-site analysis, frequent high quality analysis of groundwater is performed in support of various activities. Split samples were collected and analyzed with both HAPSITE®-SPME analysis and Method 8260B to determine comparability. The HAPSITE® SPME method consisted of a six-point initial calibration with a linear regression of 0.99 or better, providing a high level of confidence in the HAPSITE® data. Frequent analysis of groundwater was performed at monitoring wells in proximity to ongoing soil vapor extraction (SVE) pilot studies to monitor the impact on groundwater as soil gas concentrations decreased. Analysis was also performed site-wide to monitor the impacts of a 30-day constant rate aquifer pilot test.

Results/Lessons Learned. The HAPSITE® SPME method was compared with the results of 8260B analysis. Multiple sample sets were evaluated. Scatter plots of the data were produced with coefficients of determination ranging from 0.97 to 0.99, indicating excellent comparability between the HAPSITE® SPME and 8260B results. The TCE reporting limit for Method 8260B is 0.5 µg/L; the TCE reporting limit for HAPSITE®-SPME is 1 µg/L. HAPSITE®-SPME throughput is 20 samples during an eight-hour day. Groundwater analysis performed with the HAPSITE® allowed for accurate analysis of samples in the field in support of pilot studies and investigations. With rapid turnaround time, the data can be used to assist decision making in the field. Additionally, the per-sample cost of HAPSITE®-SPME analysis is comparable with 8260B, providing these benefits without adding to project costs.