Improving Performance of Abiotic Destruction and Anaerobic Bioremediation at Multiple Sites through the Use of Passive Flux Meters

Chris Lee (clee@regenesis.com) (REGENESIS, Kenosha, WI)
Craig Sandefur (CSandefur@regenesis.com) (REGENESIS, San Clemente, CA)

Background/Objectives. Successful designs and applications for in situ treatment of chlorinated volatile organic compounds (cVOCs) requires an accurate measurement of site variables. Three of the most critical variables to successful implementation and performance are an accurate measurement of groundwater velocity, contaminant flux and the target zone thickness. An accurate understanding of the groundwater velocity and contaminant flux profile aids in the emplacement of in-situ injectable products, particularly within heterogeneous aquifers, to ensure successful remedial outcomes.

Commonly the target zone and its properties are characterized from information obtained during the site investigation phase. More specifically the target zone is determined from a combined understanding of the sorbed phase contaminants, dissolved phase contaminants, site geology and groundwater depth. Although a compilation of information is essential for any site assessment, often the site investigation data alone is insufficient for a successful remediation phase.

In recent decades the number of sites completing contaminant flux-based investigations has been increasing. In particular, the use of passive flux meters (PFMs) to obtain direct measurements of Darcy Velocity and contaminant flux has proven to be quite useful. It has become more apparent that dissolved phase contaminant plumes migrate through transport zone(s) that are not necessarily intuitive from examination of traditional site investigation data. Although PFMs are commonly thought as a pre-remediation tool, they can be used at any stage of the project.

Approach/Activities. We will present data from multiple sites where passive flux meters were used identify the target treatment zone, contaminant flux and groundwater velocity at underperforming sites. These underperforming sites typically observed 50% reduction or less, and a shorter than expected longevity following their initial treatment(s). The sites consisted of TCE ranging from 1 to 18 mg/L with lesser amount of cis-1,2 DCE and vinyl chloride.

PFMs were deployed into monitoring wells within the previously treated areas in efforts to identify the zone(s) where the contaminant flux appears to be a persisting problem. At each of these sites the vertically treatment zone and dosing were adjusted based on the PFM results.

The product re-applications were completed at each of the sites following the deployment of the PFMs. Performance monitoring data have been collected from these sites for up to two years. Compared to the previous non-PFM informed applications, re-applications at PFM-informed sites achieved nearly 100% performance for both parent and daughter products.

Results/Lessons Learned. Mounting evidence supports the notion that direct measurements of contaminant flux provide critical data to the success of the project. Although they are commonly thought as a pre-remediation tool, PFMs can be used at any stage of the project. PFMs are a simple and cost-effective tool that utilizes existing monitoring wells to identify the specific zones that are the root cause of underperformance. The data from PFMs are invaluable when re-

evaluating an underperforming site. PFMs offer an alternative to more costly remedial investigation techniques to strategically achieve the desired project success.