Groundwater Monitoring Efficiencies Using Modern Data Collection and Analysis Tools at a Site Transitioning to MNA

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Background/Objectives. Monitored natural attenuation (MNA) commonly follows active groundwater remedies as the final step to attain cleanup levels. Long-term groundwater monitoring, needed to verify that MNA remains effective, represents a long-term cost for responsible parties. Modern technologies can help reduce those costs by streamlining data collection and analysis and by facilitating monitoring program optimization. This presentation will demonstrate the use of such tools to support the transition from an active in situ remedy to MNA for a former manufacturing site located in New Jersey.

Approach/Activities. Remediation to address trichloroethene (TCE) dense non-aqueous phase liquid (DNAPL) and associated soil and groundwater impacts was conducted using a combination of in situ thermal remediation (ISTR) and on-site and off-site in situ bioremediation/chemical reduction. The in situ bioremediation/chemical reduction was implemented in phases, each followed by a period of post-remedial groundwater monitoring. Groundwater monitoring within the entire plume area is conducted annually to support regulatory compliance and transition to an enhanced MNA remedial strategy.

Innovative combinations of field data collection tools including the Microsoft O365 SharePoint platform, the ArcGIS Field Maps app, the ArcGIS Survey 123 app, and a custom low-flow sampling app built in Microsoft® Power Apps are leveraged to support accurate and efficient groundwater sampling. These field data collection tools are linked to an Azure SQL Database to store the data collected. Data are made available for analysis through a Microsoft Power BI dashboard as well as ArcGIS Online and custom summary table creation tools. Together, these tools create an automated work-flow from data collection to data analyses including interactive mapping and summary tables and interactive groundwater concentration trend summaries calculated using the Mann-Kendall statistical analysis method.

Results/Lessons Learned. Recently developed technological innovations are transforming the collection, storage, analysis, and visualization of environmental field-collected data. Electronic field data collection tools enable environmental professionals to ensure data integrity by structuring the data collection process. This capability is reducing data collection errors, resulting in improved data quality, while also simplifying the data collection process for field crews. Additionally, the automated reporting tools have become an invaluable hub to access commonly needed project information. The automated Mann-Kendall groundwater trend analysis has eliminated the effort typically required to evaluate groundwater constituent trends, demonstrating return on investment (ROI). This drives enhanced quality and increased efficiencies for project deliverables as the site transitions to MNA, which will likely require monitoring for decades to come. Further, the ROI for this innovative combination platform is inherently scalable through application to other project sites.