Case Studies: Field QA/QC Monitoring of Subsurface BOS 100® Injections

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Background/Objectives. The in situ remediation industry has advanced significantly over the past decades with the introduction of new remedial amendments and improved delivery techniques. However, despite these advances in situ remediation field applications continues to face challenges due to: (1) proper delivery of amendments, and (2) longevity of remedial amendments compared to subsurface processes, including contaminant back diffusion. It has been demonstrated that in situ amendments have a tendency to migrate along preferential, high conductivity pathways, yet the majority of contamination, from historical contamination releases, may be located in low permeable zones. To understand and overcome these challenges, advancements in real-time field monitoring of in situ delivery and longevity are required. Vertex has completed hundreds of in-situ injections in North America and as field practitioners, have experimented with many commercially available approaches for completing and monitoring injections. The objective of this talk is to present recent advances in delivery approaches, including the use of vertical injection intervals, injection tip configuration, and injection pressure and flow rates. This talk will specifically assess the monitoring completed around the injection of carbon-based amendments to assess the longevity of these amendments and whether they can be used for full in situ remediation using a single application.

Approach/Activities. Field data will be presented from two case study sites where strong controls were implemented over the horizontal and vertical location of injection points. Both sites involved the injection of a carbon-based amendment via a grid of interlocking, depth-targeted, temporary injection intervals for the remediation of chlorinated solvent impacts. A review of the geology, hydrogeology, injection program and the corresponding in-field and post-injection monitoring techniques will be presented including the use of monitoring wells, nested implants, geochemistry, and high resolution sampling.

Results/Lessons Learned. The presentation will summarize principles for the effective delivery of carbon-based amendments using temporary point methods where there is a strong control over horizontal and vertical injection intervals, as well as the benefits and limitations of various field monitoring techniques. An overview of cost implications for the various techniques will also be presented.