Treatment Success and Application Insights with Colloidal Activated Carbon for Hydrocarbon Plumes: A Multi-Site Review

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Background/Objectives. The use of active carbon technology for in situ remediation is becoming a familiar and sought-after approach to remediate hydrocarbon plumes. The speed of treatment is highly attractive to practitioners who need high certainty to reach cleanup targets, especially if prior methods have failed and drained remediation budgets. This talk will focus on small-diameter colloidal activated carbon (CAC) and electron acceptor supplementation applied at 22 sites to treat hydrocarbon plumes. CAC provides the unique advantage of being easily applied under low pressure for complete flux zone treatment and rapid groundwater reductions.

Remediation practitioners often decouple remedial design from the application. When the application is decoupled or under-emphasized, remediation practitioners often miss treatment targets compared to the original design's effort. Many parameters can affect how well a remedial injection performs, although application-related variables such as volumes, spacing, pressures, or tooling used for the injections are important. One aspect of CAC contributing to high success rates is when field adjustments are made based on the appearance, or not, of the material in groundwater samples or soil cores taken from the site. This is essentially performing adaptive implementation using the product as a field tracer.

Key injection parameters and some concepts of adaptive implementation will be shown in addition to benzene and MTBE results from a number of the sites.

Approach/Activities. Site data were compiled from the 22 sites and evaluated for common spacing and injection volumes used to make some specific application-related guidelines important to these projects. Additionally, wells from sites with 12 months or more of monitoring data were plotted to show combined performance trends post-injection for benzene and MTBE.

Results/Lessons Learned. Sites that dropped below 50% effective pore-space filled or sites that deviated more than 20% in design spacing are expected to perform better with confirmation that those parameter changes would work. Most sites (16 of 22) have already reached closure with sustained reductions of benzene or MTBE reaching low ppb ranges. A critical result highlights that even with the best calculations and intentions, site variability is often best addressed by confirming product location and making real-time injection adjustments to reach design parameter targets leading to remedial success.