In Situ Remediation of Petroleum Hydrocarbons in Groundwater using Colloidal Activated Carbon

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This presentation will focus on the in situ application and performance of engineered colloidal activated carbon (CAC) for petroleum hydrocarbon remediation in groundwater. Colloidal activated carbon is an aqueous suspension of a colloidal solid sorbent (activated carbon) mixed with a proprietary anti-clumping surface treatment. The resulting material overcomes distribution limitations common with activated carbon products by altering the surface charge of the colloidal particles, thereby reducing interaction between activated carbon particles and the soil matrix. The reduced interaction with the soil matrix allows the material to be injected into the subsurface under low injection pressures and create a homogenous surface coating in aquifer flux zones. A benefit of coating flux zones with activated carbon is that contaminant back diffusion from lower permeability soils is eliminated and sustained contaminant reductions can be achieved. The CAC material that will be discussed in this presentation is engineered for petroleum hydrocarbon remediation by incorporating anaerobic electron acceptors to enhance the biodegradation of the sorbed contaminants and is formulated with a higher concentration of activated carbon. This technology is highly effective on nearly all soluble hydrocarbons and can be applied using a variety of application techniques such as direct push injection, injection wells, or as an amendment to excavations.

We will present a case study of a successful PRB application at a Southern California Naval Base to treat low-levels of diesel range organics in groundwater (300 to 600 ug/L). Cleanup oversight for the site is managed by San Diego RWQCB. Activated carbon was selected as the treatment technology due its low cost relative to mechanical treatment or hydraulic containment systems and the ability to rapidly achieve sustained low-level reductions. The site's proximity to an ocean bay and presence of sensitive underground infrastructure further supported the use of activated carbon compared to other in situ technologies such as ISCO. The PRB was installed in 2020 over the course of nine days using 46 direct push injection points. Five post-injection sampling events have been completed and monitoring wells downgradient of the PRB are non-detect for diesel range organics in all events. The site has recently been approved by San Diego RWQCB for closure.

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