Depositional Controls on High-Resolution Aquifer Characterization and Remediation

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ABSTRACT

Subsurface investigation and in situ remediation technologies have historically been linked. The limitations of conventional drilling technologies led to investigations yielding insufficient data density to characterize sedimentary systems and develop remediation strategies with insufficient data points accurately placed to overcome impediments to site remediation imposed by heterogeneity. The demand for cost-effective remedial strategies has spawned an expanding array of direct push technology (DPT) tools for aquifer characterization and remediation. Geophysical and hydrogeologic measurement tools combined with discrete sampling allow geoscientists to collect high-resolution site characterization (HRSC) data and develop an enhanced conceptual site model (CSM) that accurately reflects transport and storage properties of contaminants in soil and groundwater. Subsequent refinement of the CSM using high resolution data allows remediation geoscientists to target the contaminant mass adequately within the full array of porosity and permeability textures common in both naturally deposited and anthropogenic formations.

While a complete HRSC in advance of remediation is an appropriate goal and defines an environmental management paradigm shift, many sites do not offer the luxury of this approach. Iterative cycles of site characterization, CSM refinement and remediation become fruitful when implemented using high density data and DPT investigative tools.

Louisiana case studies of iterative investigations which identified retail gas stations as sources of petroleum hydrocarbon plumes will be presented which include a dense DPT grid of in-situ chemical oxidation (ISCO) injection. Pressure and flow monitoring allowed injection of large volumes of oxidant into heterogeneous sediments. Data collected throughout the remediation efforts led to revised CSMs and cost-effective remedial strategies.

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