Using Multiple Lines of Evidence to Evaluate NAPL Mobility

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Background/Objectives. The remediation of NAPL-impacted sites to a metric of pristine condition is often technically prohibitive, costly, and provides marginal increases in protection to human health and the environment. As such, many NAPL sites remaining in an unused state are being monitored in perpetuity. With the advancement of NAPL mobility understanding, in many cases, NAPL can be managed in place allowing sites to be reused without costly remediation. This approach has been extensively applied in upland environments, however, developing remedies and identifying metrics for mobile and residual NAPL adjacent to sensitive receptors such as surface water is one of the most difficult challenges the environmental industry faces today. NAPL mobility is an important metric used to develop remedial and risk management strategies, define remedial criteria, and quantify risk-based NAPL mobility targets. Unlike many risk-based criteria which represent a concrete toxicity and relatively easily measured value, metrics for NAPL mobility remain nebulous. NAPL mobility and stability are best understood using multiple lines of evidence including historical site data such as depth to NAPL, presence of NAPL in wells, spatial plume stability and site-specific laboratory data such as total petroleum hydrocarbon (TPH) concentrations and NAPL saturation from undisturbed soil cores. This study provides an example of how these multiple lines of evidence can be combined to develop NAPL mobility criteria which define how different areas of the site must manage NAPL left in place adjacent to surface water.

Approach/Activities. This presentation will demonstrate how existing geological, TPH, and laser-induced fluorescence (LIF) data, which provide a relatively high spatial data density in terms of NAPL concentration are correlated with a much more discrete data set of undisturbed soil core analysis. NAPL saturation information obtained from undisturbed soil cores were used to provide interpretation of NAPL mobility specific to soil and NAPL types. In particular, NAPL mobility was be explored under typical groundwater gradients (via water drive test), conservative centrifuge testing, and spontaneous imbibition testing. By combining these two data sets, NAPL mobility metrics (i.e., concentrations and soil types) above which NAPL may migrate or create surface water impacts (e.g., sheen) were developed. .

Results/Lessons Learned. Corollary analysis of data from undisturbed soil cores to other NAPL site characterization data was important for establishing a relationship between large historical data sets describing the NAPL distribution across the site and where those NAPL distributions may pose potential NAPL mobility risks. Although additional testing must be completed to confirm the findings of this evaluation, it provides a technical basis for a starting point to define various NAPL mobility metrics at NAPL-impacted sites.