Using Laser-Induced Fluorescence Frozen Core Analysis (LIFFCA) to Improve NAPL Conceptual Site Models

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Laser-induced fluorescence (LIF) is a technique that can detect non-aqueous phase liquids (NAPLs) such as petroleum fuels/oils, coal tars, and creosotes. Direct push logging of the NAPLs inherent fluorescence with depth provides rapid and cost-effective delineation of NAPL. Conducting a multitude of LIF logs at NAPL sites allows a detailed NAPL conceptual site model.

This technique is used on many railroad sites. Typically the results of LIF borings are collected and a fraction of the locations will use a second boring near the LIF boring to align the LIF readout with other data such as the pore fluid saturation or NAPL mobility. However, because of the heterogeneous distribution of NAPL (especially DNAPL) over a small scale, this approach has uncertainty in aligning data from two borings.

Dakota Technologies and CH2M have teamed to develop a laser-induced fluorescence frozen core analysis (LIFFCA) technique that allows for direct comparison of LIF response to non-aqueous phase liquid (NAPL) saturation on frozen sample segments cut from intact cores. LIFFCA allows for direct comparison of LIF response to geotechnical and chemical properties of the exact same intact core segment. Because LIF is a non-destructive method, the frozen sample segments can be cut from the intact cores by a laboratory that specializes in petrophysical analyses and shipped to Dakota for LIFFCA. The core segments can be subjected to LIFFCA and the exact same core segments can then later be returned for geotechnical and/or chemical testing.

This presentation will provide an overview of the approach and data from the several sites where it has been applied. This cost effective approach can greatly increase the certainty in how LIF data is used and the NAPL Conceptual Site Model that are developed from the data.