

## Tracking a Petrogenic Source: Forensics Characterization, Identification, and Quantification of Spilled Crude Oil

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**Background/Objectives.** An accurate assessment of the nature and extent of spilled crude oil in the environment and successful identification of related source(s) is extremely important to identify contributors and apportion responsibility for impacts. As on many other contaminated sediment projects, focus on a single source can result in missing other contributors and inaccurate identification and assignment of responsibility. The objective of the forensics effort was to distinguish the remaining spilled crude oil from petroleum hydrocarbons originating from other sources including high residual background hydrocarbons present in the watershed. This paper briefly describes the most recent work completed to locate and characterize the amount of crude oil remaining in a system several years post spill.

**Approach/Activities.** Comprehensive analysis of parent and alkylated polycyclic aromatic hydrocarbons and sulfur heterocyclic compounds (PAH) and geochemical biomarkers was performed on reference oils, globules, sheens, and sediment samples. A detail forensic evaluation and multiple lines of evidence approach including PAH and biomarker profiles, spatial patterns, diagnostic crossplots, and a multi-parameter concentration-based mixing model, were used to successfully differentiate crude oil residuals in sediments from high levels of residual background hydrocarbons originating from other sources.

**Results/Lessons Learned.** The ability to distinguish the remaining spilled crude oil from residual background hydrocarbons originating from other sources present in the watershed was successfully demonstrated through the application of a multiple lines of evidence environmental forensics approach. Reliance on collective results from multiple indicators while accounting for residual background hydrocarbon sources, helped minimize false identification and reduced uncertainty in the identification of residual spilled crude oil in this system. Calculated residual crude oil concentrations were used to estimate the quantity of residual crude remaining in the system.