C58 Forensic Evaluation to Determine Multiple Release Contributions at a UST Site

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After attending this presentation, attendees will understand through a case study how to use multiple methods to evaluate site conditions and contributions of different petroleum hydrocarbon releases.

This presentation will impact the forensic science community by showing that this research has direct impact on allocating release contribu- tions between multiple liable parties.

A case study is presented evaluating the contributions of multiple and different petroleum hydrocarbon releases under three different owners at a leaking underground storage tank (LUST) site. Three gasoline underground storage tanks (USTs) were installed in 1961 by the initial gasoline station owner. A diesel UST was installed in 1995 by the second owner, who had purchased the property in 1993. A fuel oil UST was discovered and removed in 1996. An initial gasoline release was reported by the first owner in 1993, based on the assessment of soil and groundwater and identification of free product. In addition, a gasoline UST failed a tightness test in 1990. A diesel surface spill of approximately 20 to 80 gallons occurred in 1999, when a dispenser nozzle fell from an unattended school bus. A gasoline dispenser connection release occurred in 2004 and was reported by the third owner, who had purchased the property in 2001. Approximately 16.6 gallons of free product and 3,300 gallons of groundwater with free product were recovered between 1993 and 2006. Oxygen was injected into the ground- water between 1999 and 2001 in association with the 1993 reported release in order to (1) enhance biodegradation in the UST basins and on the down- gradient site boundary, and (2) limit the further offsite migration of contam- inants. Approximately 40 to 60 cubic yards of source soils were excavated in the 2004 dispenser release area during the 2006 repair and replacement of dispensers and piping.

Comparison of available volatile organic and polynuclear aromatic compound soil and groundwater data, collected from 1993 through 2006 and between releases, indicates that the initial gasoline release(s) are dominant and the contributions of the other known 1999 diesel spill and 2004 gasoline dispenser releases are limited. The degradation and transport of benzene, toluene, ethylbenzene, xylenes, trimethylbenzenes (TMBs), and methyl *tert*-butyl ether (MTBE) are consistent with an older release pattern, where ethylbenzenes, xylenes and TMBs are primarily observed in the upgradient plume area and MTBE dominates on the plume front. Excel radar plots are constructed to evaluate petroleum hydrocarbon composition over time and identify contaminant source types. Review of 2006 soil and groundwater chromatograms supports that the residual contaminant mass is predominantly weathered gasoline; however, diesel impact is identified. The 2004 dispenser release appears limited because it would be expected that a near-by well be impacted, but this was not observed. Observations of the historic and con- tinued presence of free product and increases in groundwater contaminant levels are associated with low groundwater levels in a deeper-screened well, the installation of shallow-screened wells that intersect the groundwater table and associated free product, and the termination of oxygen injection allow- ing the free product present to re-source groundwater impact, such that new release scenarios were not indicated or readily identified.

Gasoline and diesel have composition ratios of ethylbenzene to xylenes of approximately 0.20 ± 0.05. Biodegradation will remove xylenes faster than ethylbenzene and the ethylbenzene to xylenes ratios (EXRs) in ground- water will increase with time. EXR data not showing an increasing trend and remaining near the range anticipated for new releases can indicate the presence of “free product” and/or significant source material. Groundwater time series data between 1994 and 2006 show such a free product response, except for a temporary increasing EXR trend associated with the 1999 to 2001 injection of oxygen enhancing biodegradation within the free product area and is not indicative of a new release response.

In conclusion, three releases were reported and identified in the avail- able data: the 1990 to 1993 gasoline UST releases, the 1999 diesel surface spill, and the 2004 gasoline dispenser release. Inventory records were requested to review for evidence of other unknown release(s), if any. The initial gasoline UST releases contribute the predominant contaminant mass. Diesel impact is identified, but is not a significant mass compared to gasoline contributions. The 2004 gasoline dispenser release appears limited or the nearby well should have shown some impact, which was not observed. EXRs indicate persistent free product/source material since at least 1994 and enhanced biodegradation during the 1999 to 2001 oxygen injection, but no observable new release over historic levels.

Petroleum, Release, Allocation

 ** Presenting Author*