CASE STUDY

TYPE: In Situ Bioremediation (TPH)
COMPONENTS: Oxygenation Equipment and Amendments

ENHANCED IN SITU BIOREMEDIATION OF HEATING OIL CONSTITUENTS DO-IT™ RECIRCULATION SYSTEM

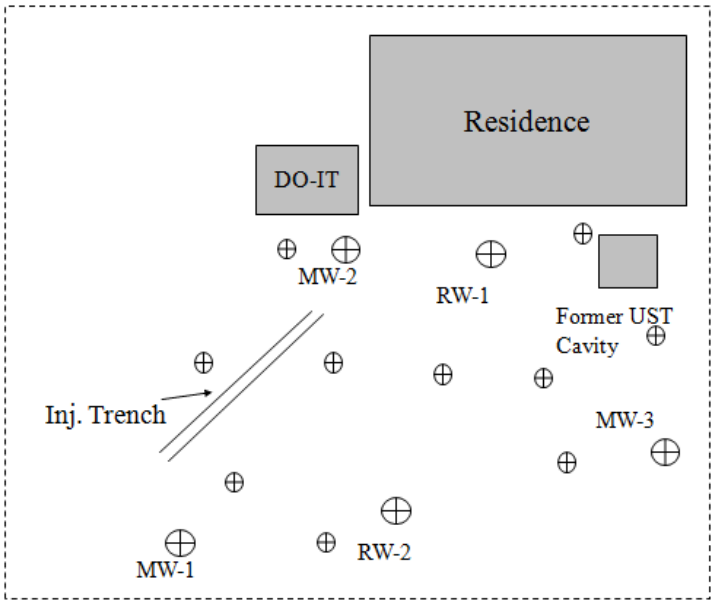
Type of Project:	Full-scale remediation
Contaminants Treated:	VOCs, VOC TICs, BNs, BN TICs, TRPH
Concentration:	Maximum of 12,000 ppb total BTEX observed, LNAPL present
Technology Applied:	Aerobic bioremediation via GW amendments, oxygenation & recirculation
Geology:	Fine sand with a clay horizon (~2 ft thickness)
Treatment Interval:	7-20 ft bgs
Average % Reduction:	>99% reduction of all VOCs, >95% reduction in all BNs
Timeframe:	18 months of active GW recirculation

DESCRIPTION

The DO-IT™ groundwater oxygenation and recirculation process was used at a residential property to treat heating oil-contaminated soil and groundwater. The full-scale location is the source area and has the dimensions of 40 feet wide by 70 feet long, and a saturated thickness of 13 feet (total volume of 1,350 cubic yards). Saturated zone lithology is fine sand with a 1-2 ft thick clay horizon in the smear zone.

The 10-gpm Super-Ox™ equipment was fabricated and installed by ETEC, and was able to oxygenate and re-circulate over ***3.2 million gallons*** of groundwater over an 18-month timeframe. Re-circulating groundwater was amended with ***hydrocarbon-degrading bacteria, nutrients, and secondary electron acceptors (nitrate and sulfate)***.

Groundwater was extracted from 2 recovery wells (RWs). Following extraction, oxygenation, and amendment, the treatment water was redistributed into 10 injection points and a shallow injection trench.



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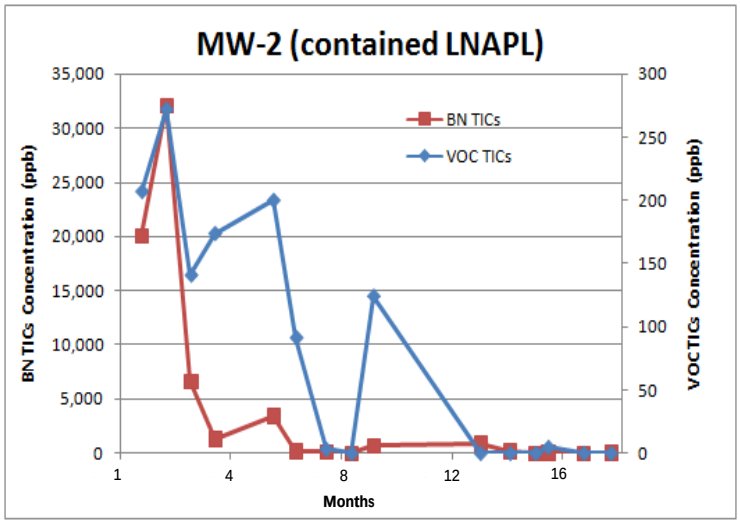
ETEC trained the consultant to operate the Super-Ox™ equipment. We also provided the appropriate biological amendment and nutrient application rates, which were based on the mass of fuel constituents and the size of the impacted area. Monitoring wells were used to assess the effectiveness of the approach. Groundwater samples were analyzed for regulated fuel constituents, nutrients (nitrogen, phosphorus, micro-nutrients), bacterial plate counts, and other water quality parameters (pH, DO, ORP, etc.) during the 18-month treatment. This data was used to modify the treatment system to maximize efficiency.

RESULTS & DISCUSSION

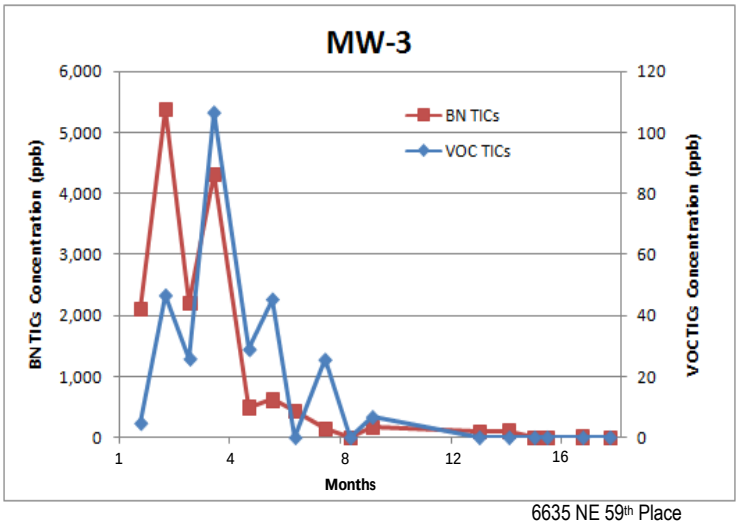
Results and observations from the full-scale implementation include the following:

- VOC, VOC-TIC, and BN concentrations onsite were reduced by greater than 90% within 7-8 months
- VOC and BN concentrations were reduced below detection limits (1 ppb)
- 2,700 lbs. of dissolved oxygen and 3,200 lbs. of secondary electron acceptors were delivered to the subsurface over 18 months
- LNAPL (mobile and trapped) was degraded biologically over time with the aid of surfactants
- No Further Action Issued.



The results demonstrate that aggressive groundwater recirculation can achieve effective electron acceptor delivery that promotes rapid heavy-end range petroleum hydrocarbon reductions within a reasonable timeframe, even in the presence of LNAPL.

TIC (Tentatively Identified Compounds) standards are unique to the state of NJ, which require a more thorough remedial approach. Effective in situ bioremediation using our DO-IT approach shows that achievement of strict regulatory goals can be obtained quickly and cost-effectively.



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