CASE STUDY

TYPE: In Situ Bioremediation (TPH)
COMPONENTS: Air Sparging & Biological Amendments

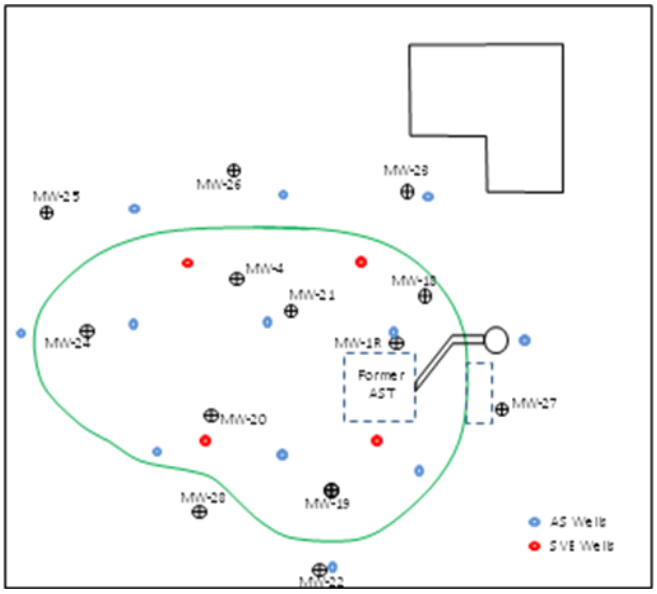
IN SITU AEROBIC BIOREMEDIATION OF DIESEL CONSTITUENTS
AIR SPARGE / SOIL VAPOR EXTRACTION ENHANCEMENT
Former Maintenance Facility, Central Florida

Type of Project:	Full-scale demonstration
Contaminants Treated:	BTEX, Naphthalene, 1- & 2- methylnaphthalene, TRPH
Concentration:	Maximum of 35,000 ppb TRPH observed
Technology Applied:	Air Sparge / Soil Vapor Extraction with aerobic bioremediation via bioaugmentation
Geology:	Fine sand with clayey sand in the saturated zone
Treatment Interval:	32-52 ft bgs
Contaminant Reduction:	100% BTEX reduction, >98% total naphthalene reduction, and >95% TRPH reduction
Timeframe:	12 months Air Sparge / Soil Vapor Extraction with 5 months of biological enhancement

DESCRIPTION

An air sparge / soil vapor extraction (AS/SVE) system was used at a former maintenance facility to treat diesel contaminated soil and groundwater. The full-scale location is the source area and has the dimensions of 55 feet wide by 80 feet long, and a saturated thickness of 20 feet (total volume of 3,200 cubic yards). Saturated zone lithology is clayey sand.

The site infrastructure included the installation of 4 soil vapor extraction (SVE) wells screened from 25 feet bgs to 40 feet bgs. 12 air sparge (AS) wells were installed to a depth of 52.5 feet bgs with 2.5 feet of porous screen (Schumasoil®). The air flow design for each of the 12 AS wells was 10 scfm at 10 psi.



The AS/SVE system was designed to operate for a total of twelve months. After six months of treatment, the decision to enhance the performance of the system with biological enhancements was made. ETEC was contracted to provide biological enhancements and nutrients for the remaining five months of active treatment.

ETEC was provided with the site data and operation reports. From this data, it was determined that the AS component was providing adequate dissolved oxygen to the impacted wells (2-6 ppm DO). Also, the pH of the groundwater was within the 5.5-8.0 SU range acceptable for bioremediation. Biological products and soluble nutrients were to be applied using the available SVE wells for distribution to the upper smear zone soils, and the AS wells were used for introduction to the saturated zone. The solutions were applied

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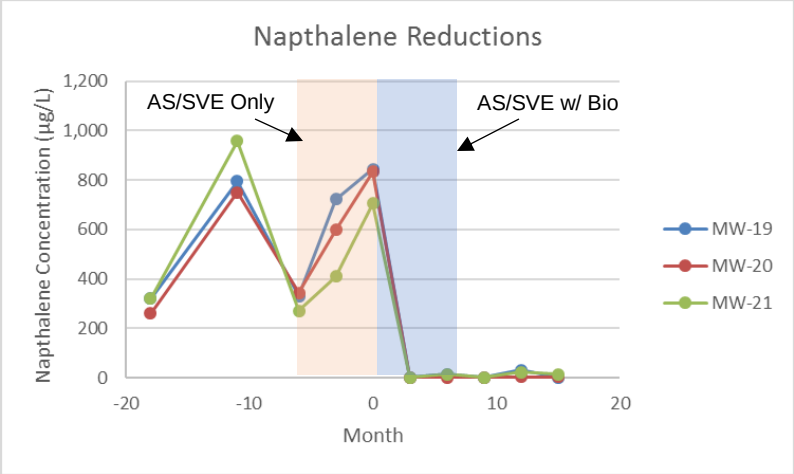
on a monthly basis, and following each inoculation, the AS/SVE system operating continuously to help distribute the biological materials laterally and vertically. We also provided the appropriate biological product and nutrient application rate, which was based on the mass of fuel constituents and the size of the impacted area. Monitoring wells were used to assess the effectiveness of the approach. Groundwater samples were analyzed for regulated fuel constituents during the 12-month treatment. Nutrients (nitrogen, phosphorus, micro-nutrients), hydrocarbon-degrading bacterial plate counts, and other water quality parameters (pH, DO, ORP, etc.) were analyzed during the 5-month biological enhancement. This data was used to monitor and modify the treatment to maximize efficiency.

RESULTS & DISCUSSION

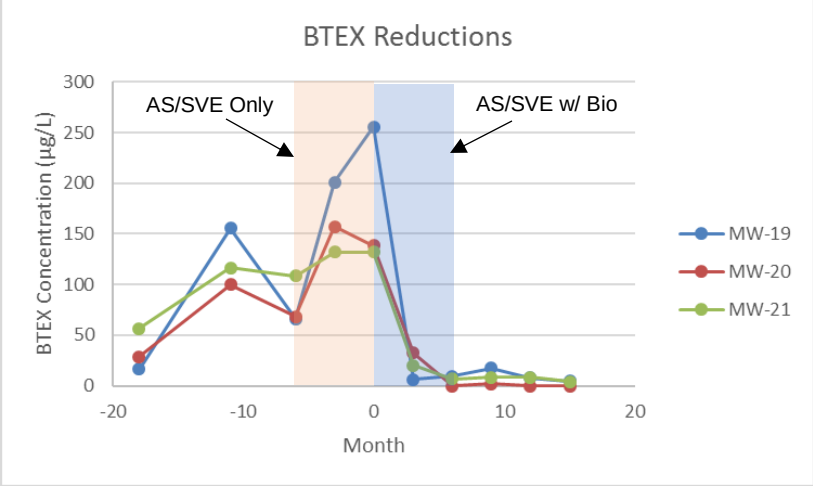
Results and observations from the full-scale implementation include the following:

- Total naphthalene concentrations were reduced by 99% during the 5 month of biotreatment
- BTEX concentrations onsite were reduced by greater than 97% within 5 months of biotreatment
- Benzene concentrations were reduced to non-detect concentrations within 3 months of biotreatment
- TRPH reductions continued in the 6 months following AS/SVE and biological enhancement to achieve regulatory goals (97%)
- Contaminant rebound was non-existent, resulting in a shortened post-remedial monitoring period



Reductions achieved by the AS/SVE system operation had been unnoticeable prior to biological enhancement. Incorporating biological enhancements and nutrients with the AS/SVE system created the ideal aerobic environment for bioremediation.

The addition of biological enhancements and nutrients to the AS/SVE system resulted in immediate achievement of regulatory goals. The combination treatment increased the efficiency of both applications, resulting in a cost- and time-saving cleanup.



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