CASE STUDY

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

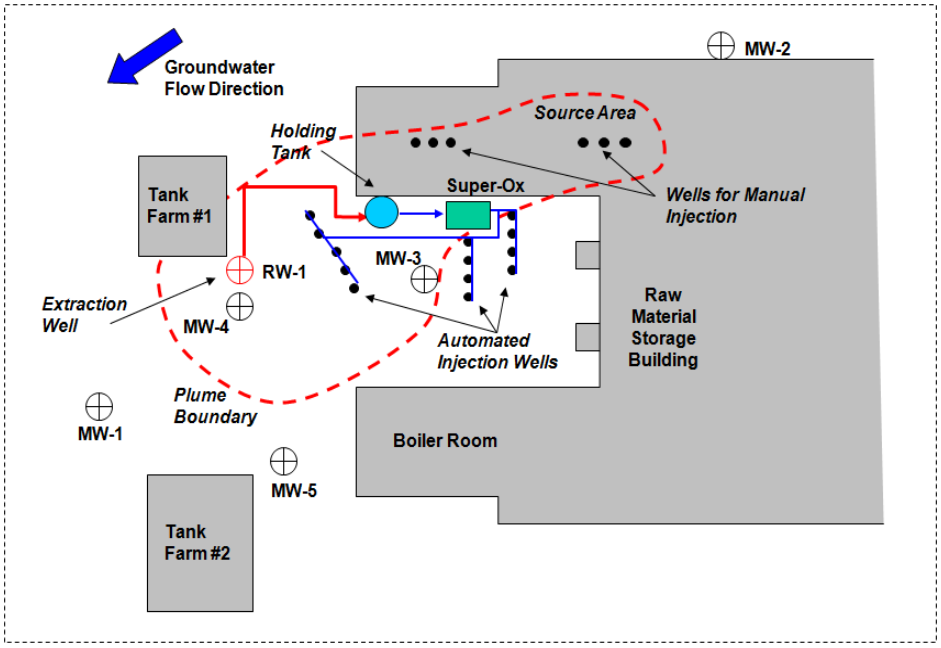
ENHANCED IN SITU BIOREMEDIATION OF BENZENE AND TOLUENE
Industrial Facility, Ohio

Type of Project:	Full-scale remediation
Contaminants Treated:	Benzene and Toluene
Concentration:	Maximum of 8,000 ppb Benzene, 1,400 ppb Toluene
Technology Applied:	Aerobic bioremediation via amendments, oxygenation & GW recirculation
Geology:	Silty sand
Treatment Interval:	8-10 ft bgs
Average % Reduction:	>99% reduction of Benzene and Toluene
Timeframe:	18 months of active GW recirculation
Contact:	Mr. Scott Mounts, August Mack Environmental, 614-798-9922

DESCRIPTION

The DO-IT™ groundwater oxygenation and recirculation process was used at a resin production facility to treat benzene and toluene in groundwater. The benzene and toluene leaked from holding tanks located inside a building. The treatment area measured approximately 80 feet long x 40 feet wide, with a portion of the plume beneath the solvent storage building. With an estimated saturated thickness of 10 feet, the volume of soil/groundwater to be treated was approximately 1,200 cubic yards. Saturated zone lithology was silty sand.

The 10-gpm Super-Ox™ equipment was fabricated and installed by ETEC, and was able to oxygenate and re-circulate ***1.5 million gallons*** of groundwater over an 18-month timeframe. Recirculated groundwater was amended with ***bacteria, nutrients, and secondary electron acceptors (nitrate and sulfate)***.



Groundwater was extracted from 1 recovery well (RW). After extraction, oxygenation, and amendment, the treatment water was redistributed into 13 vertical injection points. Once a month, oxygenated water and amendments were manually injected into vertical wells installed inside the building.

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 contaminants and the size of the impacted area.

Monitoring wells were used to assess progress. Groundwater samples were analyzed for benzene, toluene, nutrients, bacterial plate counts, and other water quality parameters (pH, DO, ORP, etc.) during the 18-month treatment period. This data was used to adjust the nutrient application rates to maximize efficiency.

ETEC ADVANCED BIOREMEDIATION SOLUTIONS

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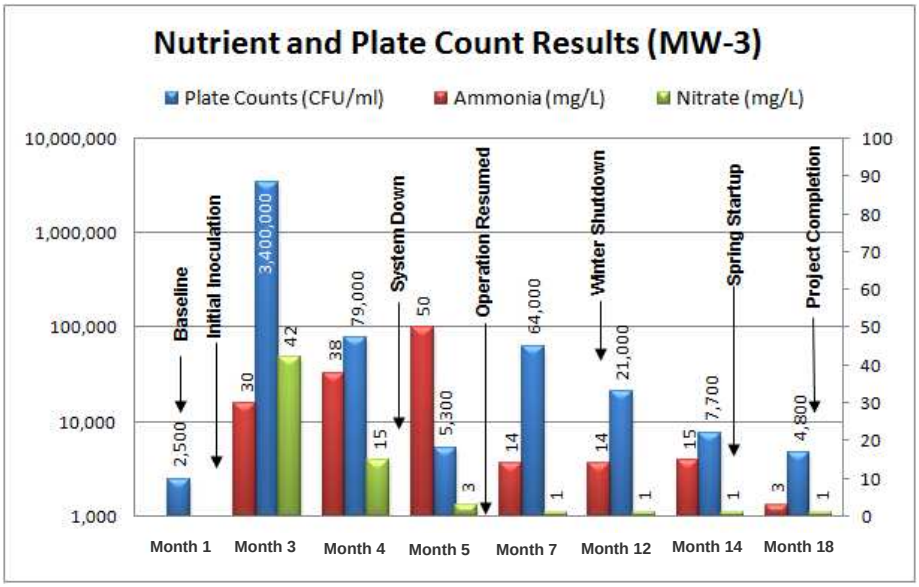
RESULTS & DISCUSSION

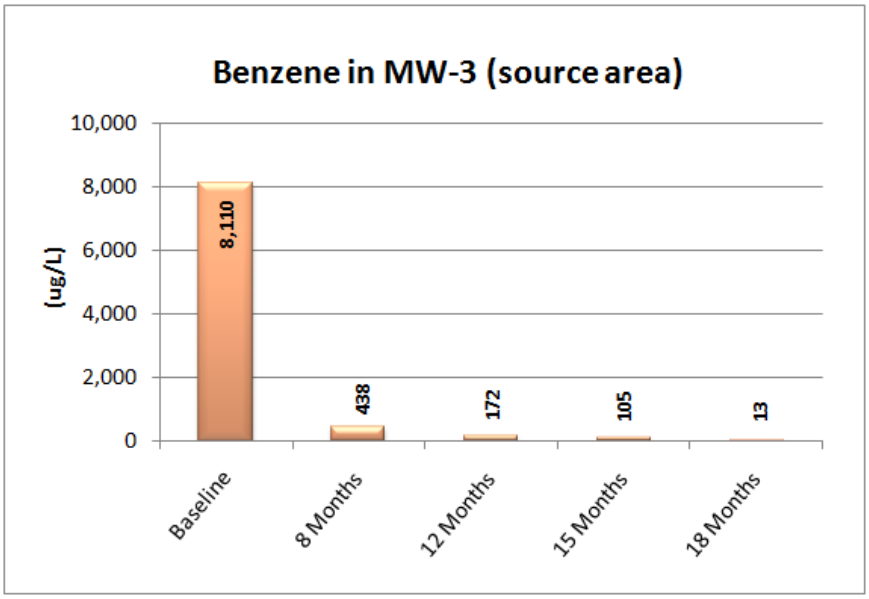
Results and observations from the full-scale implementation include the following:

- Monitoring wells at the distal end of the plume were within regulatory limits within 12 months.
- Nutrients and plate counts were monitored every quarter to verify uptake of nitrate and phosphorus
- 6 months after the conclusion of the project, MW-3 showed no rebound (10 ppb benzene)
- 500 lbs. of dissolved oxygen and 1,000 lbs. of secondary electron acceptors were delivered to the subsurface over 18 months



Data collected during remediation indicated aerobic and nitrate-reducing conditions, and allowed the operator to adjust the addition of amendments so that virtually no nutrient compounds remain after remediation was completed.

The results demonstrate that aggressive groundwater recirculation can achieve effective electron acceptor delivery that promotes rapid hydrocarbon degradation within a reasonable timeframe.



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