



Project Highlights

- **ERDENHANCED™** biostimulates existing site biogeochemistry to support subsurface ecosystem and microbial development.
 - **ERDENHANCED™** amended wells averaged **>96% REDUCTION** in total [cVOC] contaminants in <2-years.
 - **ERDENHANCED™** expedited mass destruction and **>99.9% REDUCTION** in parent [TCE] 40ft downgradient injection locations.
 - **ERDENHANCED™** generates safe and sustainable reducing zone for native microbials to adapt and collectively establish in-situ biotic 'cVOC destroying machine'.
- ERDENHANCED™ is**
- ✓ Sustainable
 - ✓ Cost-Effective
 - ✓ Safe with Minimal Site Impacts
 - ✓ Organically destroys DNAPL
 - ✓ Enhances Microbial Adaptation

TerraStryke® ERDENHANCED™

2015 On-Site Efficacy Evaluation, Residual DNAPL Source Zone

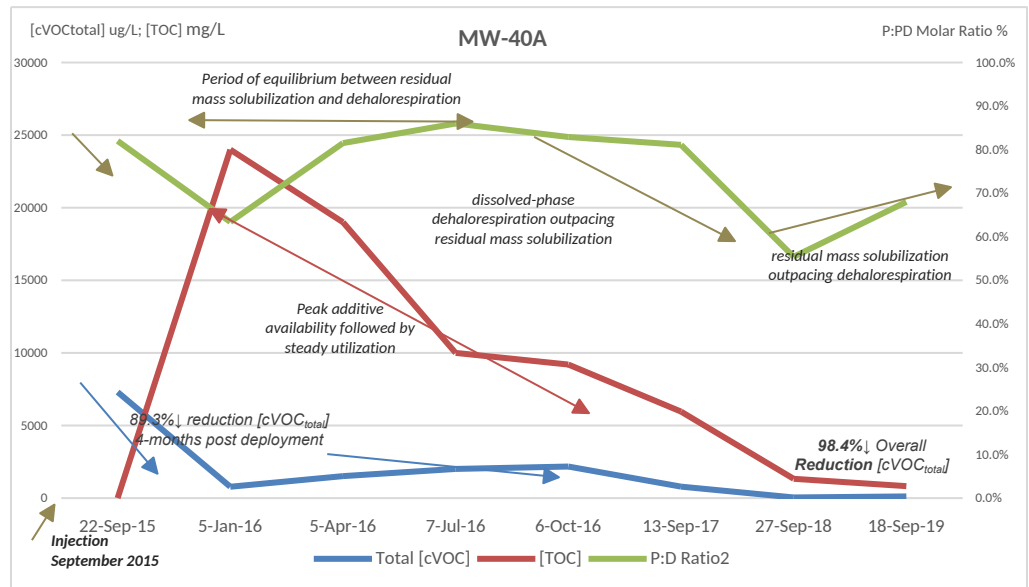
ERDENHANCED™ PRS Additive Delivery Approach; Ohio Manufacturing Facility

SITE: Former industrial facility with Trichloroethylene (TCE) in groundwater at ≈30% solubility, indicating significant DNAPL. TCE is the 'parent' cVOC contaminant.

PROCESS: Treatability study amended 2-injection wells each with estimated 35ft AOI. 1,040-gallons additive slurry deployed per well creating 25,000 c.f. amended zone. Efficacy evaluated using series of thirteen monitoring wells from 2015 to present. Graph below shows results 4-years post injection.

RESULTS: Deployment wells (IW-1A/MW-40A) realized **88.8%↓** & **99.4%↓** reduction [cVOCs] in <12 months; whereas, 40ft downgradient [TCE] decreased **>99.9%↓**; while, Parent:Parent-Daughter Ratio (P:PD) decreased from 91.1% to 0.6%.

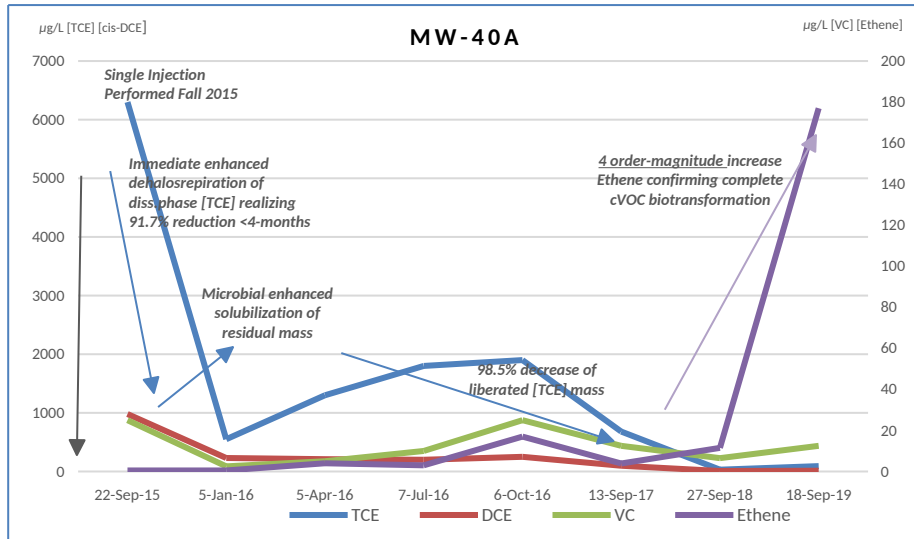
Secondary geochemical evidence supports amendment efficacy and expedited reductive dechlorination of Site cVOCs by indigenous microbial populations including, temporal increases in Carbon; expedited alternative electron scavenging, and Ethene generation throughout confirming complete cVOC biotransformation occurred. The graph below plots additive availability and utilization (TOC), dissolved-phase contaminant concentrations, and changes in P:PD ratios at deployment node MW-40A.



SUMMARY: Introduction of the TerraStryke biostimulant ERDenhanced clearly restored the ecosystem's ability to support indigenous microbials dehalorespiration of cVOC contaminants in an expedited and complete manner, sustainably and organically. **What does this mean to you?** Expedited site compliance by organically eliminating rebound upfront, destroying residual DNAPL and dissolved-phase cVOC contaminants faster, while sequestering Greenhouse gasses; all, with less-impacts, less-effort, and less-cost.



The following graph plots changes in individual [cVOCs] over the 4-year evaluation period from injection well MW-40A. Continuous accelerated generation of Ethene confirms complete biotransformation of *all* cVOCs within amending zone.



MW-40A 4-year Performance Review

- Single* Injection Event providing years of sustainable reducing conditions.
- 1,056 lbs. additive/750-gallons water
- 98.5% ↓ decrease [TCE]
- 98.7% ↓ decrease [cis-DCE]
- 80.0% decreases in [VC]; 50% overall
- 35,000% increase [Ethene] confirming complete cVOC biotransformation
- 96.0% overall decrease total [cVOC]
- NO cis-stall !! - ever!!**

The following graph plots [cVOCs] over 4-year evaluation at monitoring well MW-43A located ≈40ft downgradient. With deployment parent [TCE] decreases 99.5%↓; slightly increases due to microbial enhanced liberation of sorbed mass, >99.9%↓ reduction overall. Increases in cis-DCE due to TCE biotransformation, overall reduction cis-DCE 51.1% with stead downward trend. Continuous decrease in [cis-DCE] post September 2016 peak, along with generation of Ethene, indicates complete biotransformation of *all* cVOCs within amending zone.

MW-43A 4-year Performance Review

Monitoring well located ≈40-feet downgradient injection well MW-40A

>99.99% ↓ decrease parent [TCE]

51.1% ↓ decrease [cis-DCE]

96.6% ↓ reduction total [cVOC]

99.6% ↓ reduction P:PD Ratio

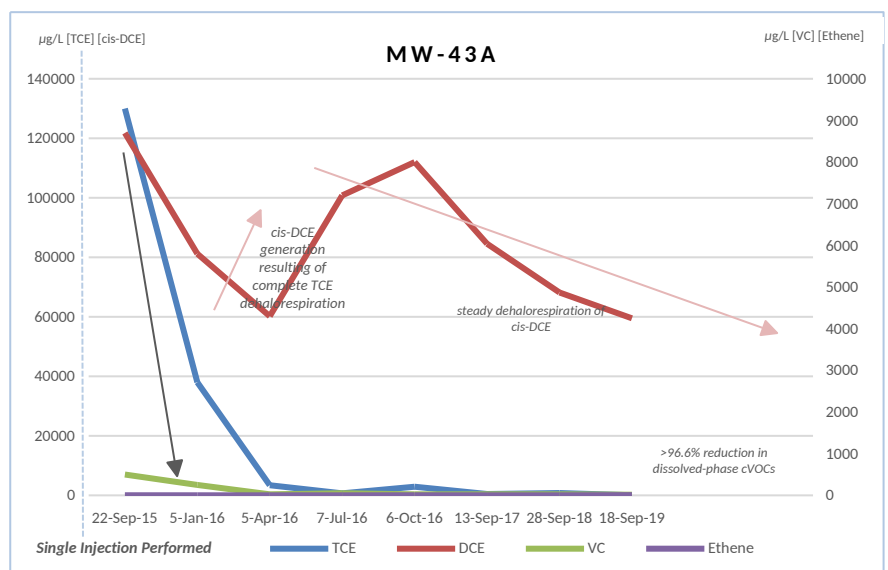
= Molecular **DESTRUCTION!!**

Baseline P:PD Ratio 91.1%

1-year P:PD Ratio 6.4%

4-year P:PD Ratio 0.6%

Ethene generation confirms complete cVOC destruction via additive enhanced cVOC biotransformation.



TerraStryke biostimulation additives enhance the existing ecosystem (treatment zone) to facilitate the indigenous microbial populations, and others, ability to organically and sustainably destroy Site contaminants with less-impact and less-costs.