



### 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™

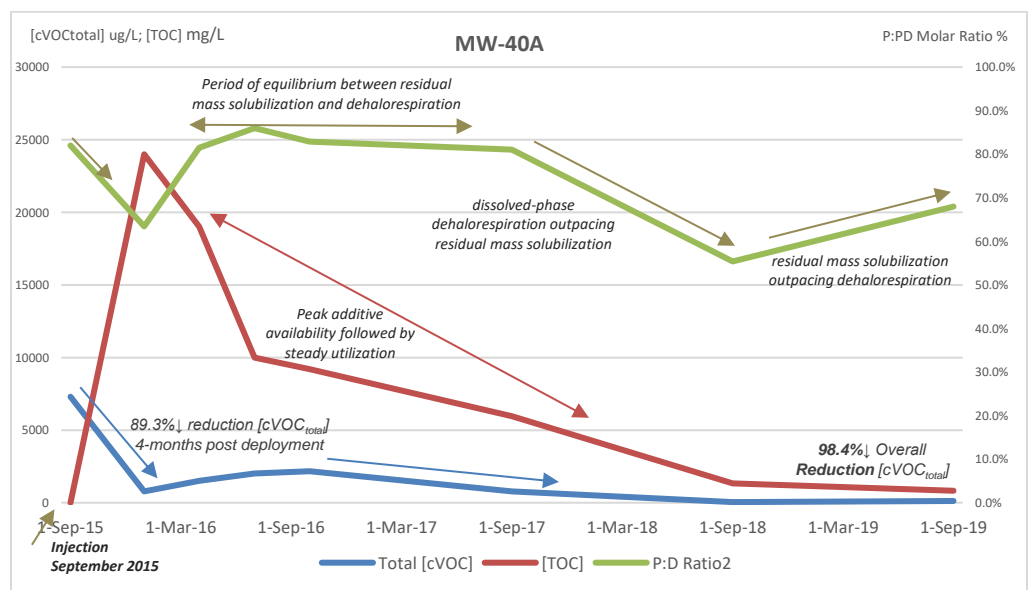
#### Treatability Evaluation, Residual DNAPL Source Zone Remediation – Part II Direct Injection Additive Delivery Approach; Ohio Manufacturing Facility

TerraStryke® Products LLC develop and distribute biostimulation additives proven to cost-effectively maximize the performance of your bioremediation project; expediting contaminant destruction, eliminating rebound, realizing long-term compliance with minimal impact and **less cost**. Our patented biostimulation additives enhance site biogeochemistry (subsurface ecosystem) to sustainably support the complete and cost-effective biotransformation of site cVOC contaminants.

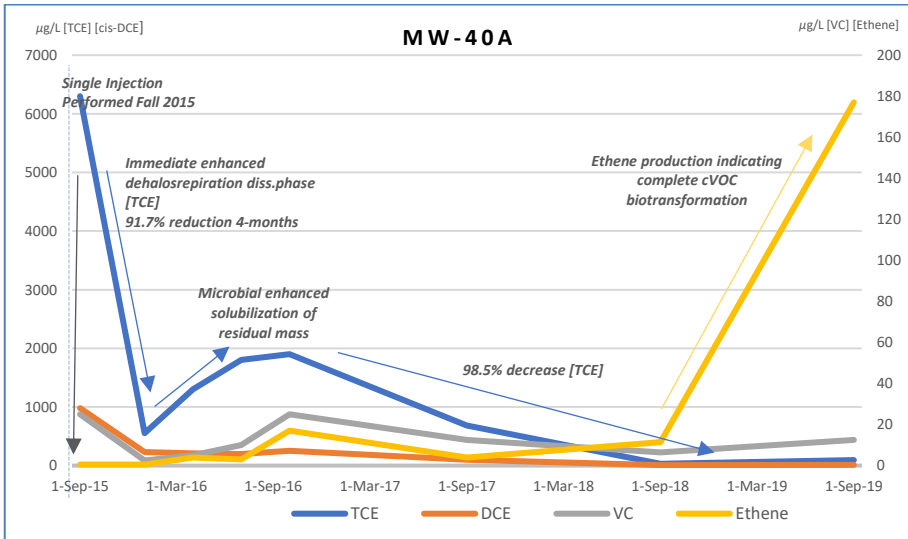
**SITE:** Former industrial facility with Trichloroethylene (TCE) in groundwater at ~30% solubility, indicating significant DNAPL. TCE is the 'parent' cVOC contaminant.

**PROCESS:** Fall 2015 treatability study: 2-injection wells; estimated 35ft AOI. Network of 13 monitoring wells sampled to evaluate additive efficacy through November 2019. Injected 1,040-gallons 12% additive slurry per well, displacing 7.6% pore space volume. Estimated 25,000 c.f. amended zone. Graph below shows results 4-years post injection. See TerraStryke® Pilot Study Guidance Document for list of analytical metrics.

**RESULTS:** Injection wells IW-1A/MW-40A realized **88.8%** and **99.4%** reduction [cVOCs]. Monitoring well MW-43A 40ft downgradient realized **>99.9%** reduction [TCE]; and, 96.9% reduction in total cVOCs with drop in Parent:Parent-Daughter Ratio (P:PD) from 91.1% to 0.6%. Secondary lines of evidence documented to support additive enhanced reductive dechlorination; including temporal increases in carbon, expedited alternative electron scavenging, and consistent Ethene generation confirming complete cVOC biotransformation. The plot below demonstrates microbial utilization of additive, expedited residual mass solubilization, and dissolved-phase contaminant destruction.



The following graph plots changes in individual [cVOC<sup>s</sup>] 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  
1,056 pounds additive/750-gallons water

98.5% ↓ decrease [TCE]

98.7% ↓ decrease [cis-DCE]

50.0% overall decrease [VC]

35,000% increase [Ethene] indicating

The next graph plots changes in individual [cVOC<sup>s</sup>] over the 4-year evaluation period from monitoring well MW-43A. The initial decrease and then significant increase in [cis-DCE] indicates robust utilization of all dissolved phase contaminants followed by, solubilization/dehalorespiration of additional parent mass. 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 [TCE]

51.1% ↓ decrease [cis-DCE]

96.6% reduction total [cVOC]

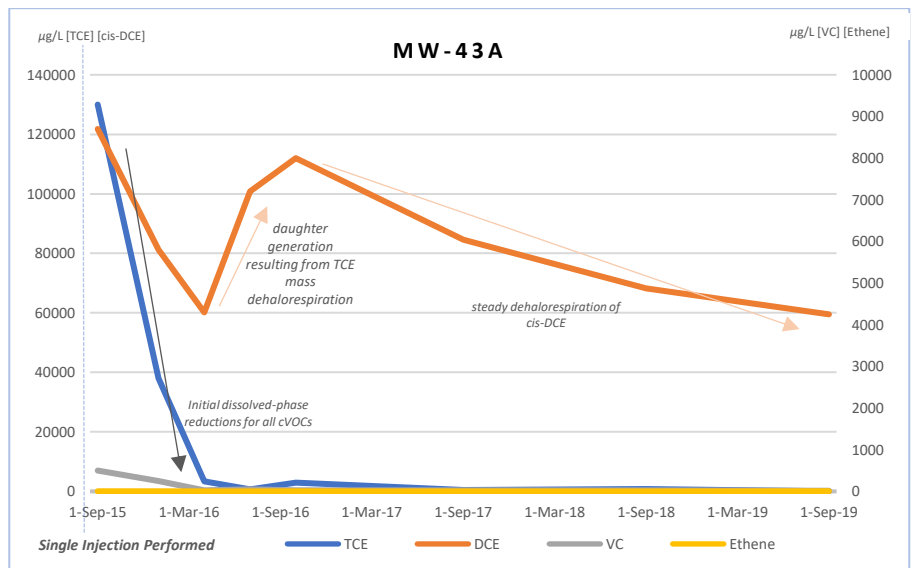
99.6% ↓ reduction Parent:Parent Daughter Ratio (P:PD Ratio)

Baseline P:PD Ratio 91.1%

1-year P:PD Ratio 6.4%

4-year P:PD Ratio 0.6%

Continuous Ethene generation evidence for complete cVOC biotransformation



Single injection event produced sustainable and complete biotransformation throughout additive enhanced ecosystem. Visit our website to read more about how you can realize cost-effective and *complete* chlorinated remediation success.