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Project Highlights

- **ERD**ENHANCED™ **Pilot Study 76.8% reduction in total [cVOC] 8-month period.**
- **[PCE] initially decreased 74.5% additive enhanced solubilization of residual source mass realized a 275% increase [PCE]; followed by 76.6% reduction from peak [PCE].**
- **ERD**ENHANCED™ **Additive enhances natural co-solvent effect, increasing contaminant bioavailability to eliminate rebound out-front.**
- **ERD**ENHANCED™ **enhances cVOC biotransformation; realizing increases in daughter products:**
  - **176% [TCE]**
  - **452% [cis-DCE] and**
  - **191% [VC] by month 6**
- **ERD**ENHANCED™ **enhances reductive dechlorination of parent and daughter cVOCs realizing the following reductions from *peak*:**
  - **81.8% [TCE]**
  - **91.0% [cis-DCE]**
  - **78.8% [VC]**
- **Proven Cost-Effective Strategy for *Sustainable* destruction of residual source mass contaminants**

TerraStryke® ERDENHANCED™

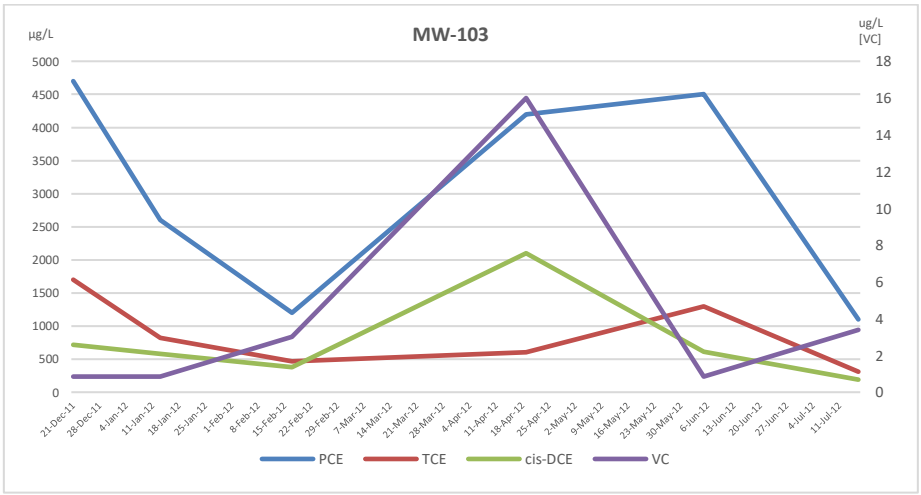
In-Situ Passive Pilot Study Chlorinated DNAPL Source Zone
Former Dry Cleaner Operations; Stoney Creek, Ontario Canada

TerraStryke® Products LLC (*TerraStryke*®) develop-distribute biostimulation additives proven to cost-effectively enhance chlorinated volatile organic compound (cVOC) biotransformation safely and completely. Our patented biostimulation additive **ERD**ENHANCED™ leverages existing biogeochemical conditions to facilitate chlorinated alkane/alkene destruction. **ERD**ENHANCED™ is proven to expedite residual mass (sorbed/ganglia/blebs) solubilization thereby getting the rebound out "up-front".

Background: Former dry cleaner operation, current Site use includes dry cleaning store front, retail, offices, and apartments. Past Site use included use/storage of chlorinated volatile organic compounds (cVOC^s); specifically, Tetrachloroethylene (PCE). Past characterization activity documented adverse impacts to subsurface soils and groundwater. Previous remedial efforts proved ineffective and costly. Owner desired a low-cost, low-impact remedial solution that meets compliance and redevelopment objectives.

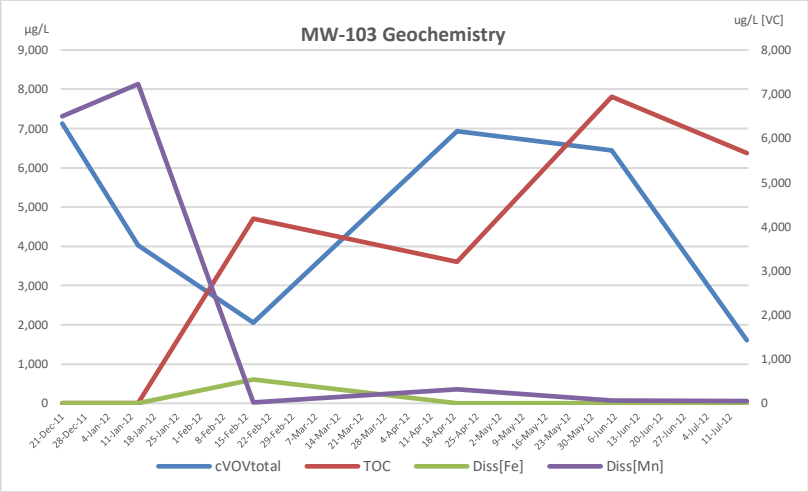
Method: In 2011, the City of Hamilton Ontario sponsored an on-site Pilot Study to evaluate additive efficacy under site biogeochemical conditions. Additive-filled Passive Release Sock (PRS) deployment units were suspended, undisturbed for 6-week periods, in the screened interval of monitoring well MW-9A. PRS units passively amend a limited treatment zone (≤3ft AOI). Five replacement events were completed over a 7-month evaluation period, with baseline and performance groundwater monitoring, sampling, and analytical testing completed during each event. **ERD**ENHANCED™ efficacy determined by comparing performance data to baseline.

Results: 8-months post amending with **ERD**ENHANCED™ the following results were realized:



Specifically, in total cVOC reductions; *after* a 275% increase in parent [PCE] due to additive enhanced co-solvent effect, a **76.8%REDUCTION in [cVOCTOTAL]** was realized after 8-month evaluation. Additionally, ***reductions*** in daughter products include: 76.6% reduction [PCE], 81.8% reduction [TCE], 91.0% reduction [cis-DCE], and 78.8% reduction in [VC]. Furthermore, secondary geochemical metrics recorded during the evaluation provides supportive evidence of amendment enhanced reductive dechlorination.

"Make Something Good Happen Today"



- Three Order of Magnitude Increase [TOC]
- **77.5%REDUCTION in [cVOCTOTAL]**
- **99.1%** decrease in [diss. Fe]
- **99.2%** decrease in [diss. Mn]
- Three Order of Magnitude increase [Cl^-]

Consultant of record did not sample or analyze groundwater for either DO or ORP values.

Additionally, [Ethene] was recorded 6th month of evaluation while general detections of [Methane] were recorded months 2-7 of the evaluation.

[Nitrates] were not recorded above laboratory detection levels throughout the 7-month evaluation.

TerraStryke® **ERDENHANCED™** enhances site biogeochemistry to facilitate the generation of volatile fatty acids (VFAs), providing a co-solvent 'surfactant affect', to assist the solubilization and desorption of residual source mass contaminants; effectively expediting the destruction of dissolve phase contaminants.

TerraStryke® **ERDENHANCED™** expedites the scavenging of competing terminal electron acceptors (TEAs) such as oxygen, nitrate, oxidized iron/manganese, and sulfate which typically limit cVOC dechlorination. As with any in-situ project it is imperative that a vigorous groundwater monitoring and analytical testing program be performed to include, at a minimum, the metrics presented in the adjoining table.

TerraStryke® **ERDENHANCED™** facilitates, increasing contaminant bioavailability and dissolve phase destruction.

TerraStryke® amendments are suitable for any type of deployment such as Direct Push Technology (DPT), infiltration galleries, and direct application due to enhanced solubility.

TerraStryke® amendments are easy to handle, require less water, less pore space displacement, less site time, less overall remedial costs; ***TerraStryke®*** amendments ***maximize project margins while minimizing project impacts***.

Parameter	Methodology	Container & Preservative	Notes
Methane	EPA Method 3C GC Screen	Glass 40-ml VOA	HCl Preserved
Nitrate, Nitrites	EPA Method 6010b	Plastic 250 ml	48-hr Holding Time
Sulfate	EPA Method 375.4	Plastic 250 ml	No Preservative
Chloride[1]	Not Applicable for TPHenhanced	Plastic250 ml	No Preservative
Dissolved Manganese & Iron	ICP EPA Method 6010b	Plastic 500 ml	None, Lab Filtered
Total Organic Carbon (TOC)	TOC SM-5310B	Glass	H_2SO_4 Preserved
pH	Field Monitored	NA	No Purge
Conductivity	Field Monitored	NA	No Purge
Dissolved Oxygen (DO)	Field Monitored	NA	No Purge
Oxidation-Reduction Potential (ORP)	Field Monitored	NA	No Purge

Required Testing Parameters for Each Sampling Event

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Please visit www.terrastryke.com for additional information