



Project Highlights

- **ERDENHANCED™** Pilot Study >62% reduction in PCE molar mass in 9-month period.
- **ERDENHANCED™** Proven Cost-Effective **Green** Biostimulation Strategy
- **ERDENHANCED™** Proven Cost-Effective **Sustainable** Biostimulation Strategy
- **ERDENHANCED™** evaluation performed under Ministry of Environment (MOE) approval
- **ERDENHANCED™** Pilot Study Demonstrated Contaminant Reductions in 9-months:
 - >81.5% PCE
 - >83.5% TCE
 - >57% cis-DCE
- **ERDENHANCED™** Reduces Site Time, Operational Costs
- **ERDENHANCED™** Provides Long-Term Complete cVOC Biotransformation
- **ERDENHANCED™** Maximum Solubility Providing Multiple Deployment Options with Minimal Water Usage



Former Dry Cleaner Facility Strip Mall Redevelopment DNAPL Source Zone Green ERD Remediation Burlington, Ontario Canada

BioStryke® Remediation Products, LLC, provide innovative and cost-effective amendment formulations designed to biostimulate treatment zone conditions and enhance the in-situ destruction of Site contaminants. **BioStryke® ERDENHANCED™** leverages existing conditions facilitating passive-aggressive destruction of cVOC dissolved, sorbed, residual source mass eliminating above-ground, energy-consuming emissions-generating equipment. **ERDENHANCED™** is proven effective in terms of both cost and performance, allowing Site compliance with less environmental impact, working with Mother Nature, not against Her.

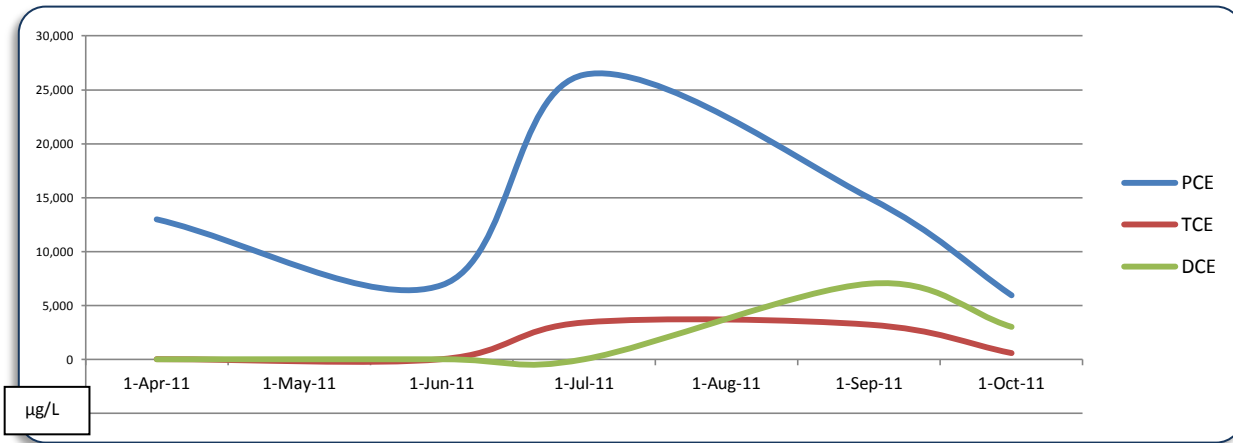
The Site is a former dry cleaner located at the end unit of a suburban strip-mall where tetrachloroethylene (PCE), trichloroethylene (TCE), cis-1,2-dichloroethylene and chloroform have been documented at concentrations above Ontario Ministry of Environment (MOE) standards. In preparation for the establishment of an in-situ reductive dechlorination program and with MOE approval, a Pilot Study was implemented to evaluate the efficacy of **ERDENHANCED™** under actual Site conditions. Within 6-months:

- Concentrations Tetrachloroethylene (PCE) decreased **>81.5%**
- Concentrations Trichloroethylene (TCE) decreased **>83.5%**
- Concentrations cis-Dichloroethylene (DCE) decreased **>57%** and
- **>62%** reduction in PCE molar mass in < 9-months.

The MOE sponsored Pilot Study demonstrated **BioStryke®** amendment **ERDENHANCED™** a cost-effective strategy for passive-aggressive source zone cVOC contaminant destruction providing a low-cost low-risk process to evaluate amendment efficacy prior to full-scale remedial strategy commitment. Pilot Study groundwater was amended using Passive Release Sock (PRS) deployment units. Amendment filled PRS units fit within existing 2-inch groundwater monitoring well. PRS units remain suspended within the screened interval of the test well, undisturbed, passive-aggressively amending a vertical column with an area-of-influence (AOI) of < 3-ft. Groundwater sample/analytical testing events are performed at the start, and at regular intervals throughout the evaluation, to include replacement of PRS deployment units. PRS Pilot Study provides a low-cost, low-risk process for Owner(s), Regulators, and Practitioners to evaluate amendments ability prior to full-scale remedial commitment.

BioStryke® amendments are suitable for any type of deployment such as Direct Push Technology (DPT), infiltrations gallery, and direct application due to enhanced solubility. **BioStryke®** amendments are easy to handle, requiring less water, less pore space displacement, less site time, less overall remedial costs. **BioStryke®** amendments maximize project margins while minimizing project impacts.

At the site, source area PCE groundwater concentrations \approx 13,000 micrograms per liter ($\mu\text{g/L}$) in monitoring well MW-8 located proximate to the former equipment room, the well chosen for amendment deployment. As noted on the previous page, the AOI of the amended test well is very limited, resulting in no long-term impact to site geochemical conditions. As such, Pilot Study impacts are very short lived with groundwater conditions typically returning to baseline conditions in less time than it took to complete the evaluation. However, due to the proprietary components found in **ERDENHANCED™**, full-scale amendment is proven sustainable after a single deployment event. **BioStryke® ERDENHANCED™** facilitates both dissolved phase and residual source mass contaminant destruction by stimulating native microbial populations to scavenge competing terminal electron acceptors (TEAs) such as oxygen, nitrate, oxidized iron/manganese, and sulfate which typically limit cVOC dechlorination. The graph below summarizes the performance data ($\mu\text{g/L}$) collected during the herein described Pilot Study.



It is of great importance to note *prior* to full-scale deployment of **ERDENHANCED™** little detectable concentrations of daughter products were observed indicating minimal biodegradation occurring. Subsequent to full-scale deployment of **ERDENHANCED™**, contaminant destruction rates increased dramatically and continued in a cost-effective and sustainable manner. Table One below summarizes the results of groundwater performance monitoring and analytical testing during the 182-day evaluation period

Table One

DATE	MW-08 cVOC Concentrations ($\mu\text{g/l}$)				MW-08 Geochemistry Data (mg/L)						
	PCE	TCE	cis-1,2 DCE	VC	ORP (mV)	NO ₃	Fe	Mn	SO ₄	TOC	
Baseline Results – PRS Deployment Date											
April 13, 2011	13,000	<8	<8	<6.8	92	2.18	<10	8.67	39.3	5.2	
Pilot Study Results											
June 8, 2011	6,900	<8	<8	<6.8	195	<0.05	5,340	2,020	252	504	
July 21, 2011	23,000	3,400	<20	<17	-170	<0.05	7,880	2,920	41	846	
Sept. 1, 2011	4,800	3,200	7,000	<3.4	-69	<0.05	2,150	3,450	162	784	
Oct. 12, 2011	2,400	560	3,000	<3.4	-95	<0.05	2,060	3,520	351	1,560	
% Change	81.5	83.5%	57.1%	NC	-	-	-	-	-	-	