



Soil Sterilants Program: Application of Remediation Technologies for Bromacil Impacted Sites in Alberta

Victor Bachmann, InnoTech Alberta
Jean Pare, Chemco Inc

Soil sterilants are non-selective residual herbicides that render the treated soil unfit for plant growth for relatively long periods of time. Sterilants were commonly used in Alberta from the 1960s to late 1990s for non-selective vegetation control on oil and gas wells, gas processing plants, rights-of-way, railways, sawmills, pulp mills, and electrical utility sites; residues may also be found at agrochemical dealer sites. Sterilant treated areas can remain devoid of vegetation for many years, depending upon the type, rate and frequency of application of soil sterilant and the climatic conditions. While several technologies have been shown to effectively reduce or eliminate sterilant impacts, there is limited knowledge on the application of these technologies at operational scale or in Alberta specific conditions.

The Soil Sterilants Program (SSP) conducted bench scale testing and economic analysis of existing remediation technologies, identifying Daramend®, hydrogen peroxide with VTX catalyst, and activated carbon as effective in reducing bromacil concentrations in soil. During the fall of 2022, a 12-week meso-scale test of these technologies took place in Vegreville, Alberta on soil sourced from a former substation near Trochu, Alberta with an initial bromacil concentration of 0.54 mg/kg. The treatments were applied to 5 m³ soil cells. Bromacil concentrations, soil moisture, and temperature were monitored. The performance of each technology was assessed on the logistics of application, mechanism of bromacil reduction, and overall reduction in bromacil concentration.

Following the results from the meso-scale testing in 2022, an optimization trial was initiated to evaluate the optimal dosage of Daramend® and moisture management practices for the remediation of bromacil on surface soil in Alberta. Starting in late-summer 2023, a year-long meso-scale project assessed the effectiveness of Daramend® at 2 dosages and 2 moisture regimes were applied to bromacil impacted soil sourced from Bow Island, Alberta with an initial concentration of 0.027 mg/kg. Daramend® was applied to 4 m³ treatment cells at 2 dosage levels, 0.5% (w/w) and 2% (w/w), and 2 moisture management practices. A parallel bench-top study was conducted to evaluate the use of bench-top optimization prior to field application of Daramend® on bromacil impacted sites.

Results from these meso-scale projects demonstrate the efficacy of some available remediation technologies and the issues applying these technologies at scale while

highlighting the persistence of residual bromacil in Alberta soils. Activated carbon and Daramend® were effective in reducing bromacil at concentrations greater than 0.5 mg/kg on test soils at lab and meso-scale scale trials. Daramend® performance in reducing bromacil concentrations was limited on soils with bromacil concentrations below 0.03 mg/kg. Bench-scale testing on soils with low concentrations did not reflect meso-scale performance.

Bios:

Victor Bachmann

Victor Bachmann, B.Sc., is a research technologist with Innotech Alberta where he works on reclamation and remediation research projects that help improve the sustainability of industries in Alberta. He has managed the remediation projects within the Soil Sterilants Program for the past 5 years. Victor has an undergraduate degree from the University of Alberta (BSc - Physics) and a technical diploma from NAIT (Environmental Sciences). He is currently pursuing his MSc in Soil Science at the University of Alberta. Outside of work, Victor is also President of the Edmonton Nature Centre Foundation where he shares his passion for educating kids of all ages on the importance of nature.

Jean Paré

Mr. Paré has a degree in Chemical Engineering from Laval University. For the last eighteen years he has been involved in the evaluation, development, design, and promotion of both conventional and innovative environmental technologies, working with engineering firms and expert environmental consultants in industry and various levels of government. As Vice President with Chemco Inc., Mr. Paré's responsibilities include the development of remediation strategies, assistance in drafting certificates of authorization, technico-economical analysis, design and supply of storage equipment, pumps and the logistics of supply for projects. Last year he worked with over 350 sites, applying his expertise to various types of contaminants ranging from chlorinated compounds, pesticides, and petroleum hydrocarbons.

He is involved with many environmental organizations, including the Canadian Brownfield Network, ESAA, OCETA, CLRA, and Reseau-Environnement, where he is an active technical committee member and speaker.