Modern LNAPL Management in Canada: Policy Shifts, High-Resolution Characterization, and Execution-Focused Pathways to Closure

Light non-aqueous phase liquid (LNAPL) contamination remains one of the most common and costly impediments to site closure and redevelopment in Canada. While provincial frameworks allow risk-based pathways for petroleum hydrocarbons, the presence of LNAPL continues to trigger additional regulatory expectations – particularly related to mobility, stability, and "extent practicable" removal – that can complicate remedial decision-making and prolong active management. For remediation contractors tasked with executing these projects, uncertainty often arises not from a lack of available technologies, but from how evolving policy expectations translate into implementable, defensible field actions.

Recent federal and international developments have clarified the regulatory intent behind modern LNAPL management. Environment and Climate Change Canada's Guidance Document on the Management of LNAPL at Federal Contaminated Sites formalizes a shift away from presence-based triggers toward behaviour-based criteria focused on mobility, recoverability, and stability. This approach is consistent with widely adopted international practice emphasizing robust LNAPL conceptual site models, measurable performance metrics such as LNAPL transmissivity, and clear criteria for transitioning remediation efforts toward closure. Similar themes have been reinforced through international guidance and practitioner resources, underscoring the importance of defensible, evidence-based decision frameworks.

At the same time, high-resolution in-situ characterization tools have significantly improved a contractor's ability to delineate LNAPL architecture, stratigraphic controls, and potential mobility zones. While these tools do not directly measure LNAPL transmissivity, their integration with targeted baildown testing enables spatially refined transmissivity estimates and stability assessments. When applied with a clear execution focus, this integrated approach allows contractors to better target in-situ destruction and immobilization technologies, reduce ineffective remedial effort, and improve constructability and predictability in the field.

This presentation synthesizes these policy, characterization, and implementation developments and provides practical guidance for Canadian practitioners, including:

Key federal and provincial policy expectations influencing LNAPL remediation in Ontario and other provinces including British Columbia, Alberta;

How high-resolution characterization can be integrated into LNAPL transmissivity evaluation, stability assessment, and performance-based decision frameworks;

Execution-focused considerations for applying in-situ destruction and immobilization technologies under behaviour-based regulatory expectations; and

Case studies demonstrating cost and schedule benefits achieved by shifting from removal-focused remediation toward performance-oriented closure strategies.

Overall, the presentation highlights how evolving policy guidance, combined with modern subsurface characterization and constructable in-situ remediation approaches, is reshaping LNAPL management in Canada – providing more predictable, defensible, and execution-ready pathways to closure for sites historically constrained by LNAPL concerns.

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Kevin French is Vice President of VEI Contracting Inc. and has almost 40 years of experience and expertise in environmental engineering, specializing in site characterization and remediation. He has been involved in the design and implementation of remediation programs across Canada involving permeable reactive barriers, adsorptive and stabilization technologies, in-situ chemical oxidation and reduction, aerobic and anaerobic biodegradation, etc. in soil, groundwater and fractured bedrock for a variety of contaminants, including PFAS, petroleum hydrocarbons, chlorinated solvents, heavy metals, soil sterilants and other compounds. Kevin holds a Bachelors' degree in Engineering from the University of Waterloo and is a Professional Engineer and a Qualified Person in Ontario.