Remediation Technologies Symposium 2026

DILLON

Integrated Remediation:

Combining In-Situ Biochemistry and Phytoremediation for Plume Control

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Outline

- Site Overview & Background
- Remedial Action Plan
- Challenges
- Progress to Date
- Questions



About Us

- Dillon is a Canadian, employee-owned consulting firm
- Specialize in engineering, environmental science, planning, and management
- Founded in 1946 in London, ON, over 20 offices throughout Canada



Ellen Hachborn
Associate

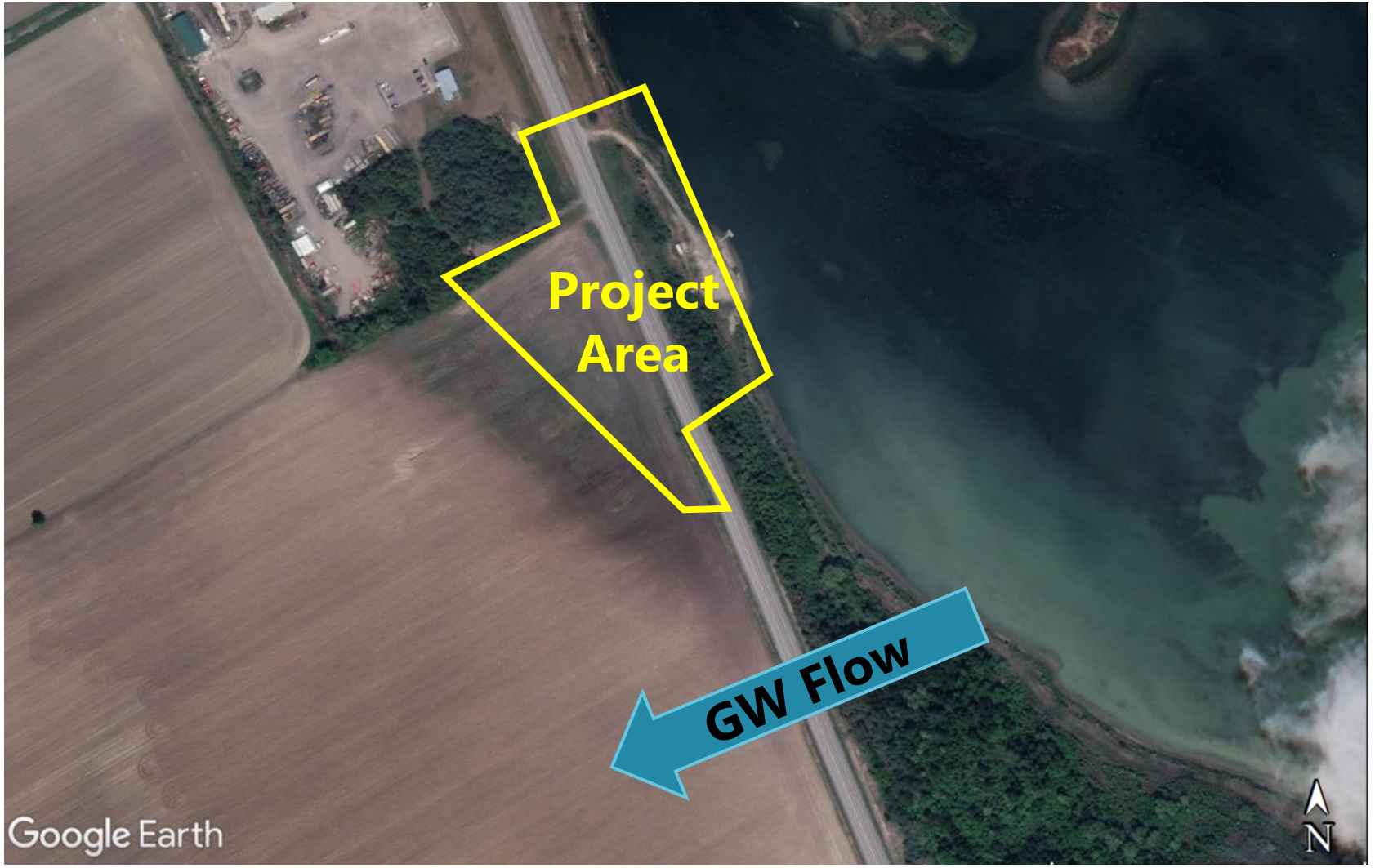
Site Conditions

Hydrogeology:

- Shallow, unconfined overburden aquifer
- Water table depth: ~1.7 m below ground surface
- Regional groundwater flow: Southwest toward agricultural field

Geology & Stratigraphy:

- Silty sand overburden overlying dense, impermeable clay boundary
- Micro-topography along clay surface controls localized cVOC pooling



Project Area Overview

- Monitoring Well Location
- Extraction Well Location
- Parcel Boundary
- In-Situ Injection Area
- Phytoremediation Area



Timeline



2003:
Plume Identification

2006:
Pump & Treat

2018:
Remedial Options Analysis & Pilot Test

2019:
Low-Level Membrane Interface Probe program

2020:
First Injection

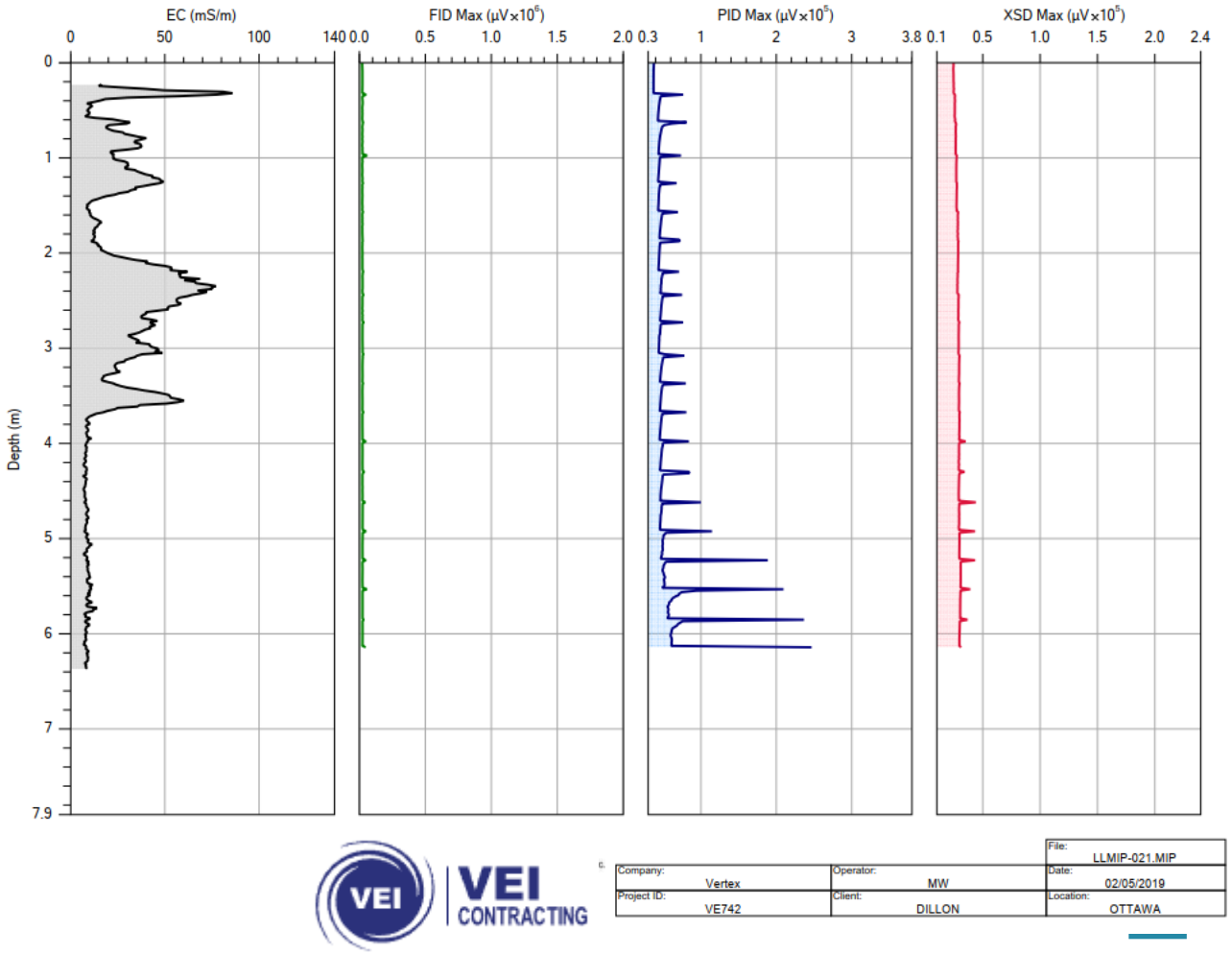
2022:
Phyto-remediation Start

2023:
Second Injection

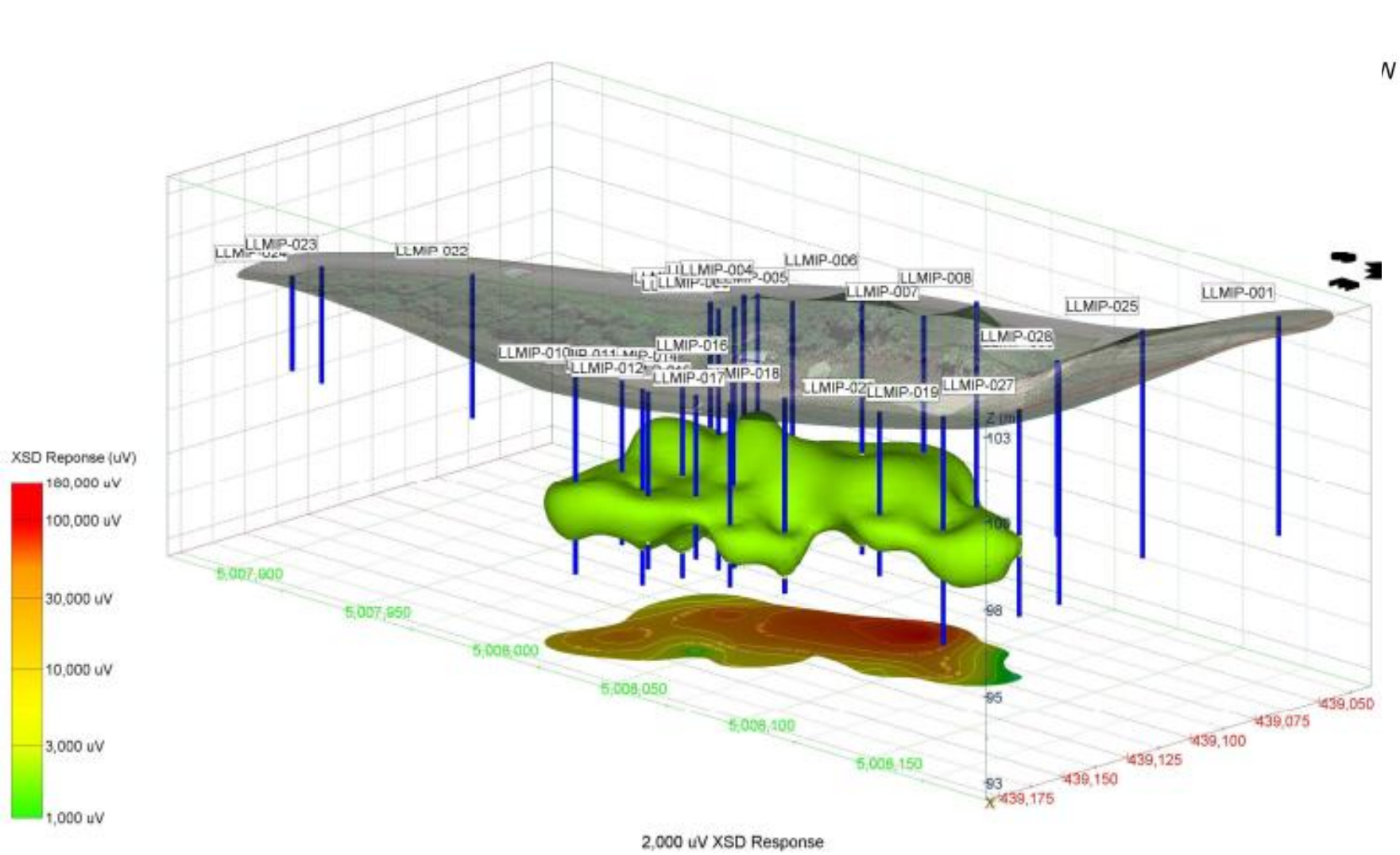
2024 – Present:
Ongoing Monitoring

Low Level Membrane Interface Probe (LLMIP) Survey

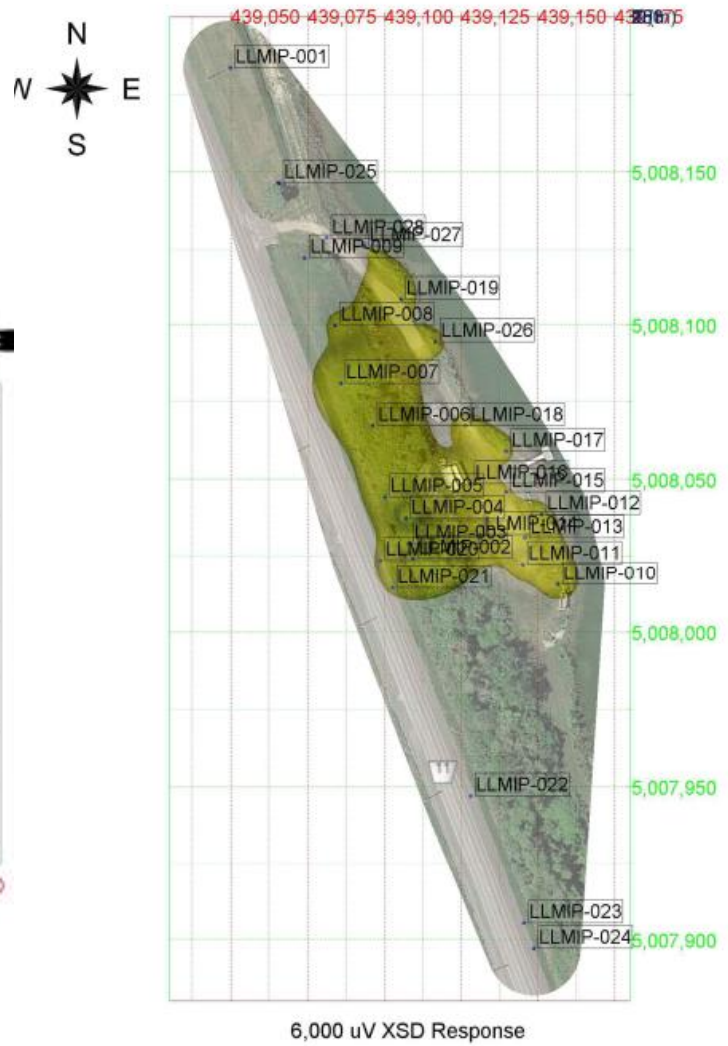




LLMIP Survey



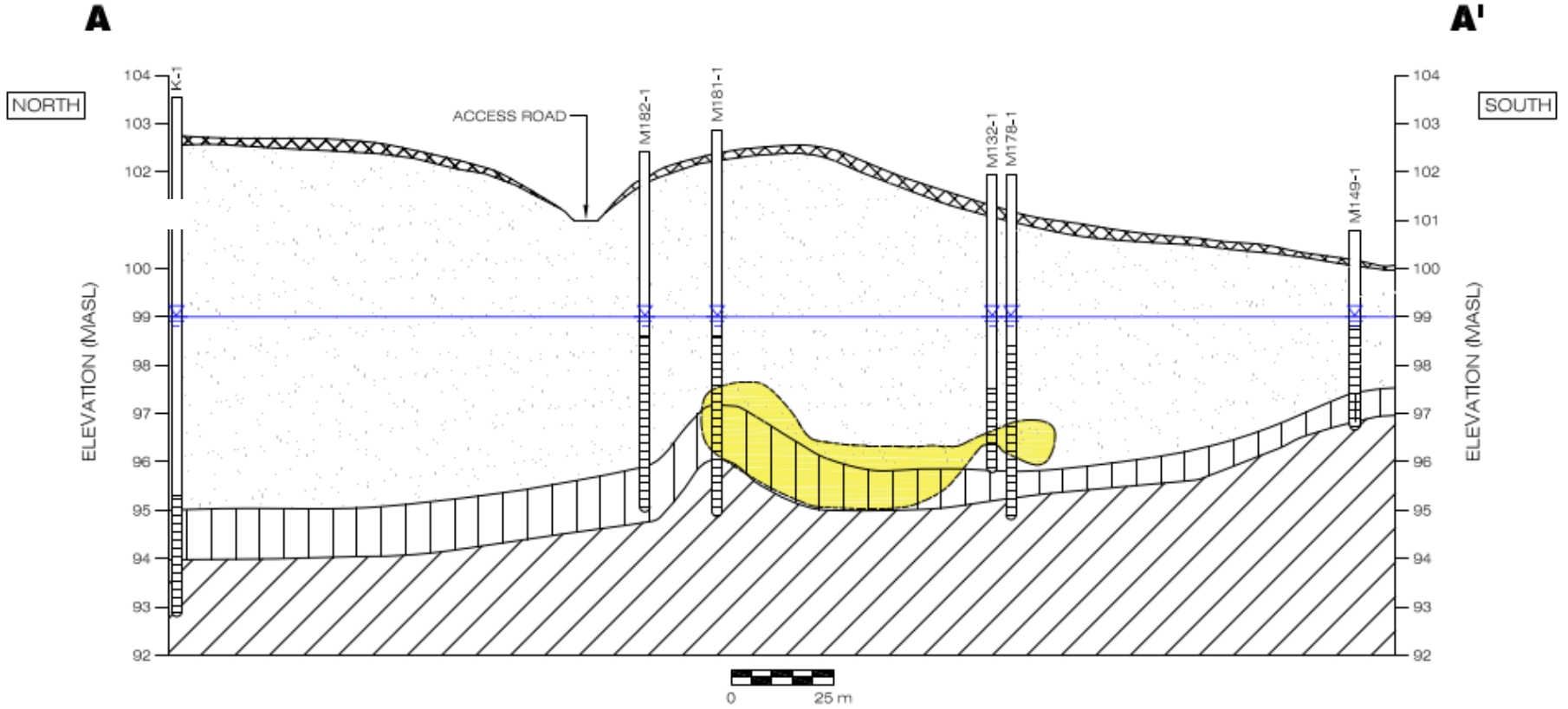
2,000 uV XSD Response



6,000 uV XSD Response

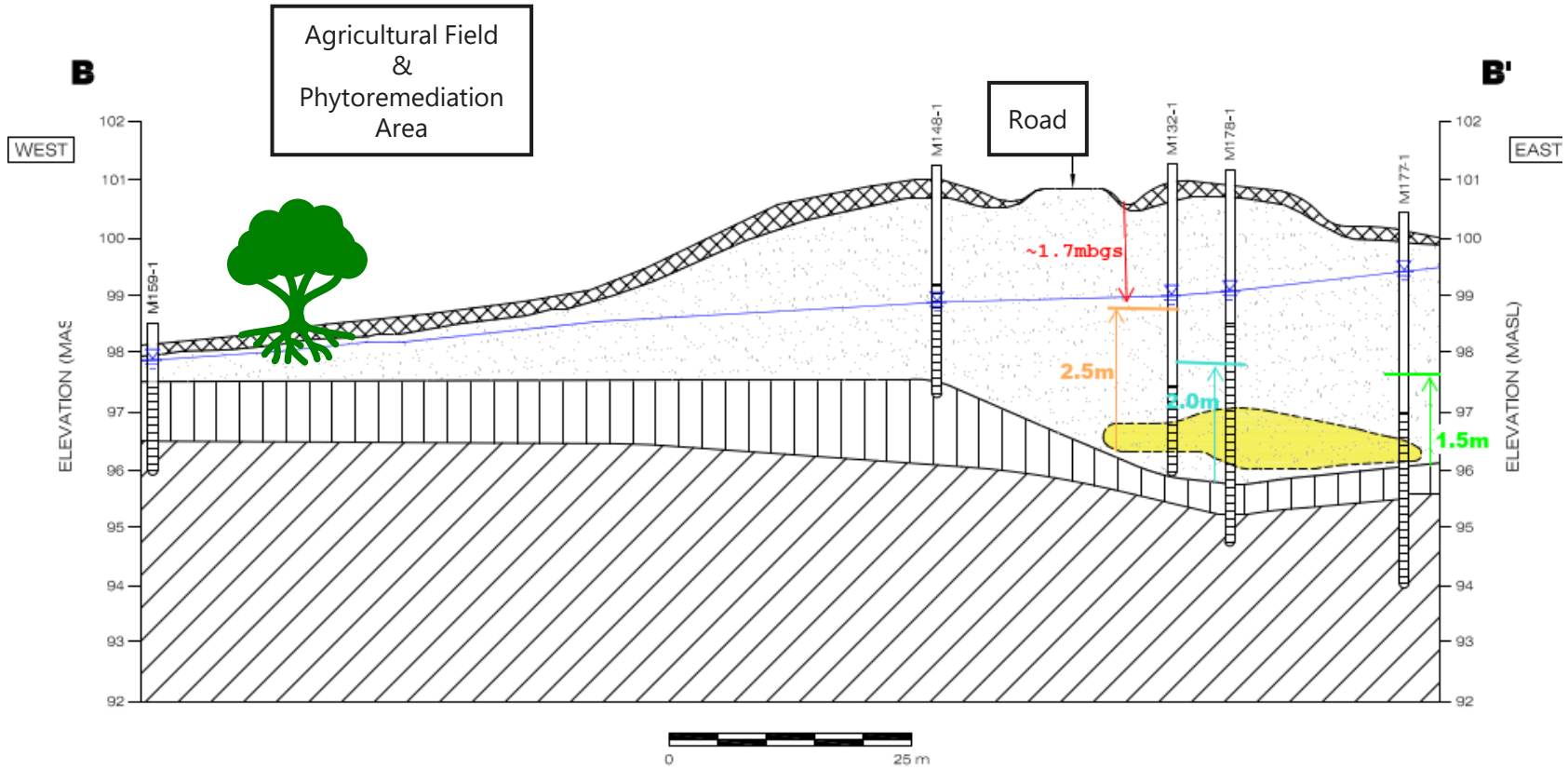
Conceptual Site Model (CSM)
North to South



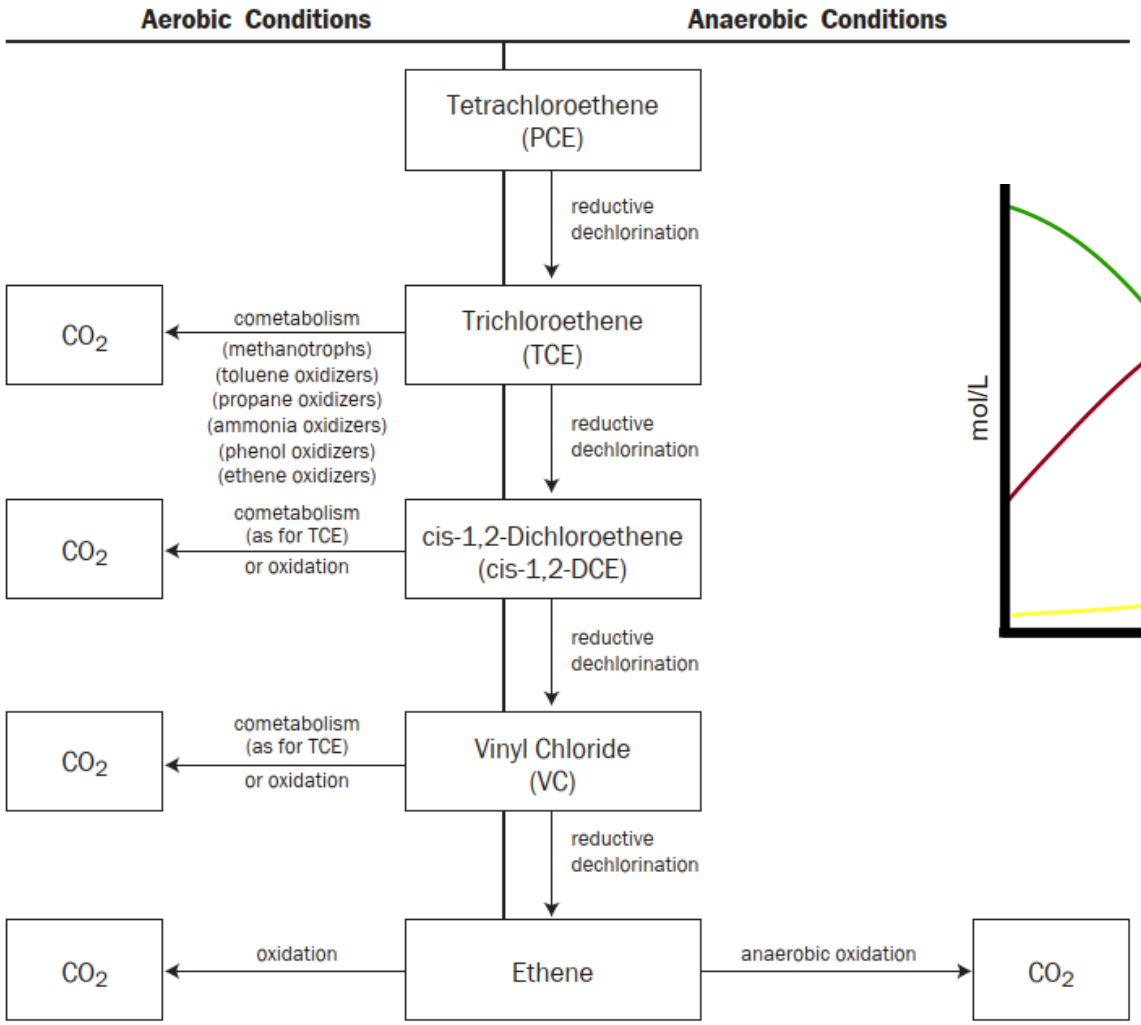


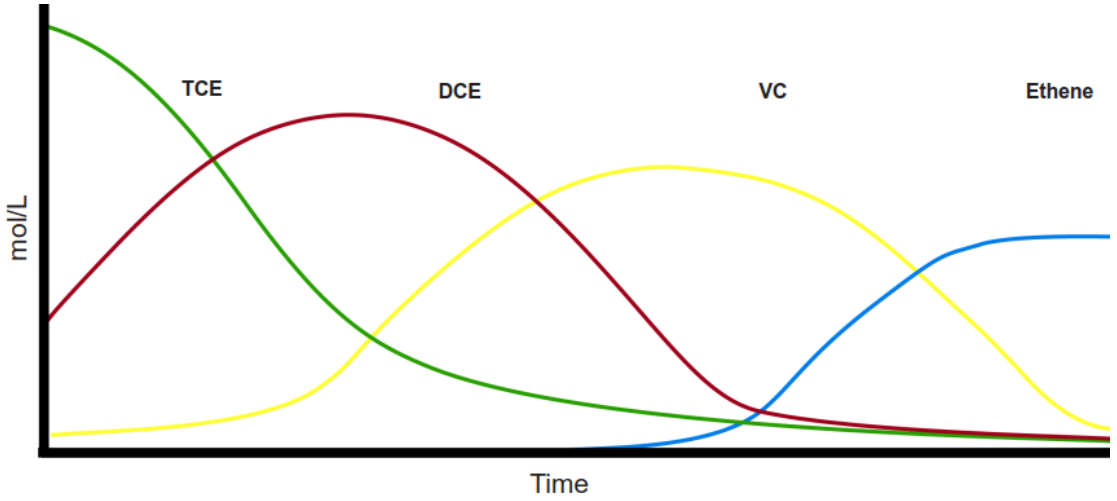
Conceptual Site Model (CSM)
West to East





TCE Degradation Products & Pathway





Reagent Selection

Field chemistry observations:

Low/non-detect DO, nitrate and sulfate

Strongly negative ORP

Elevated DOC and iron

EHC-L was selected

Water-soluble iron-fermentable carbon

2-3 years reducing conditions

No extra buffering needed

Baseline conditions prevent VC stall

Pilot Test 2018

Objective: Proof-of-concept for in-situ biochemical remediation during the Remedial Options Analysis.

Field Scope: Tested injection pressures, lateral distribution, and daylighting controls in shallow silty sand.

Outcomes: Verified native geochemistry supported TCE breakdown and secured regulatory approval to replace pump-and-treat.

2020 Injection

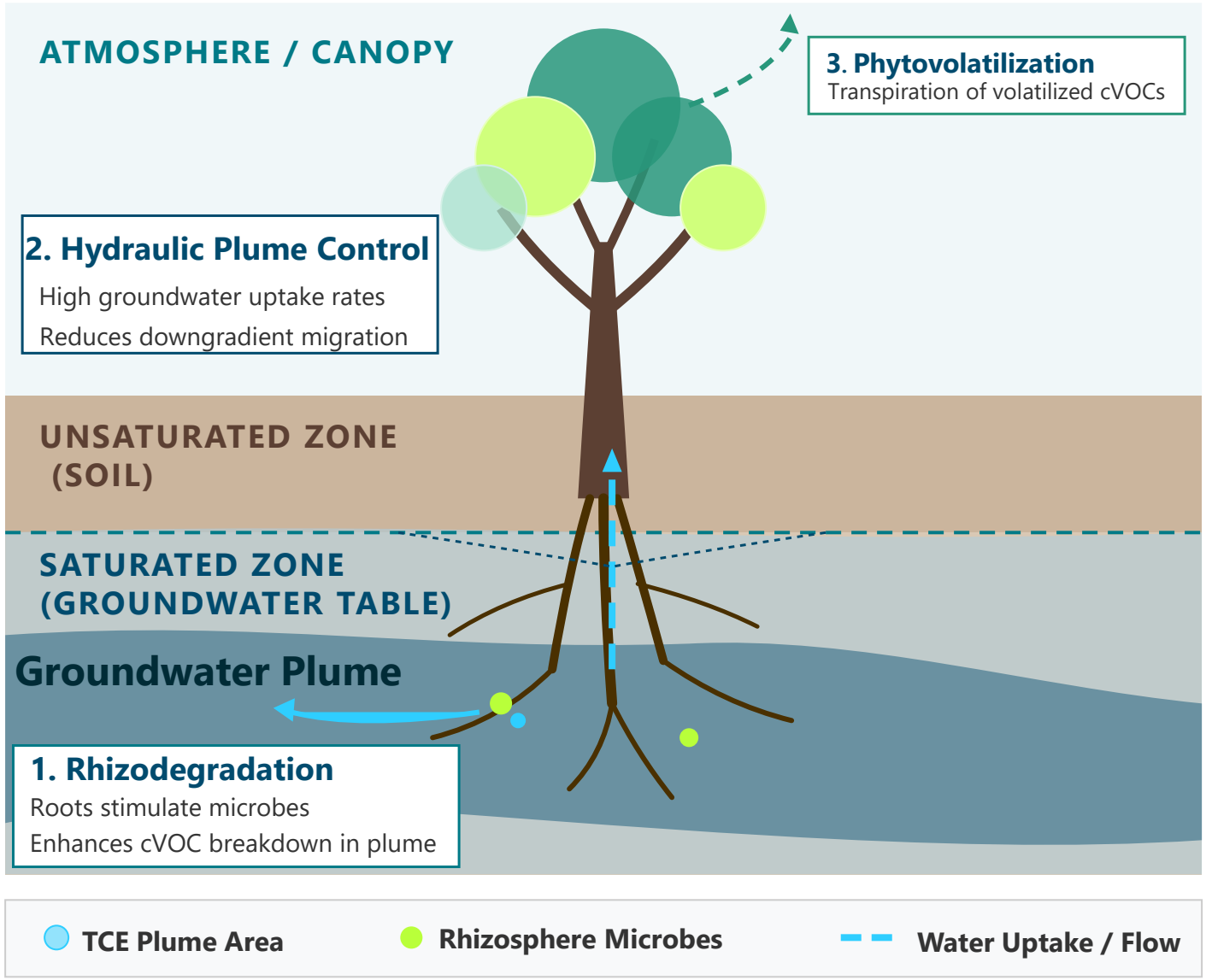
- Ground Force Environmental injected EHC-L reagent in January/February 2020 over several weeks
- Injected at 3 depths (1.5, 2, and 2.5 m) with 4 m spacing for points across several lines
- Total of 109 injection points and 67,620 L of diluted reagent



Phytoremediation Mechanisms

Species Strategy:

- Poplar & Willow
  - fast growth & high hydraulic uptake)
- Cedar
  - year-round stability & root activity



Phytoremediation Implementation

- Planted April-May 2022 with the assistance of Dartec Horticultural Contractors
- Total of 180 trees over four rows and spaced approx. 5 m apart in the field downgradient of the injections (SW)
- 60 of each species alternating





2023 Injection

- VEI injected EHC-L reagent in December 2023 over 10 days
- Injected at 3 depths (1.5, 2, and 2.5 m) with 4 m spacing for points across several lines
- Reduced points in 2.0 m horizon due to topography issues with planned injection points
- Total of 93 injection points and 57,600 L of diluted reagent



Challenges

Pre-Injection Program



Post-Injection Program



Challenges - Weather

Injection Day 4



Injection Day 5



Challenges - Topography

Trees, topography & slippery conditions



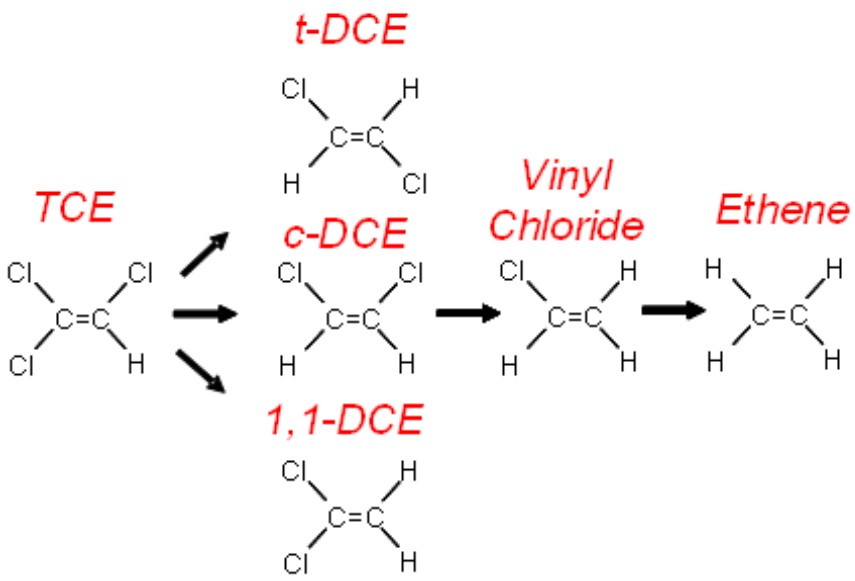
2 m horizon line

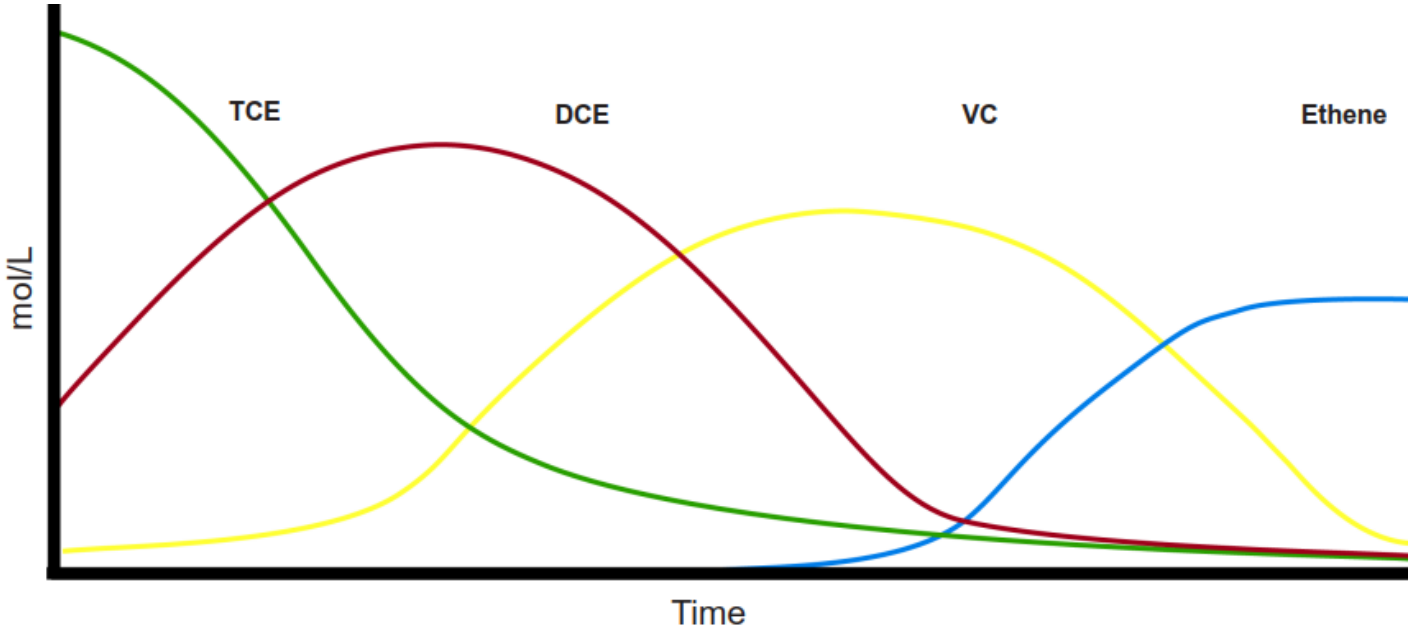


Challenges – Various Factors

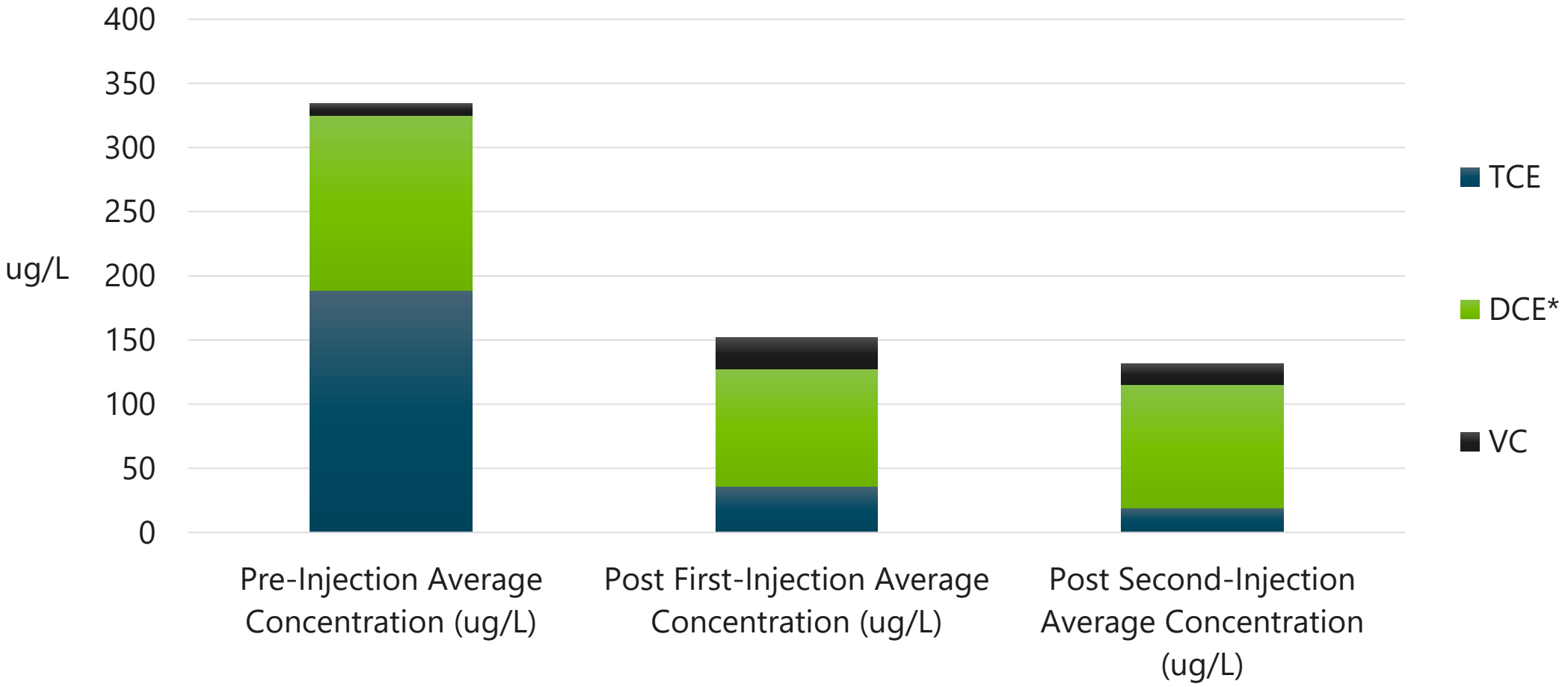
- Weather delays
- Site topography
- H&S requirements
- Precipitation and recharge
- Protect sensitive receptors
- Slow iterative process

TCE Reductive Dechlorination



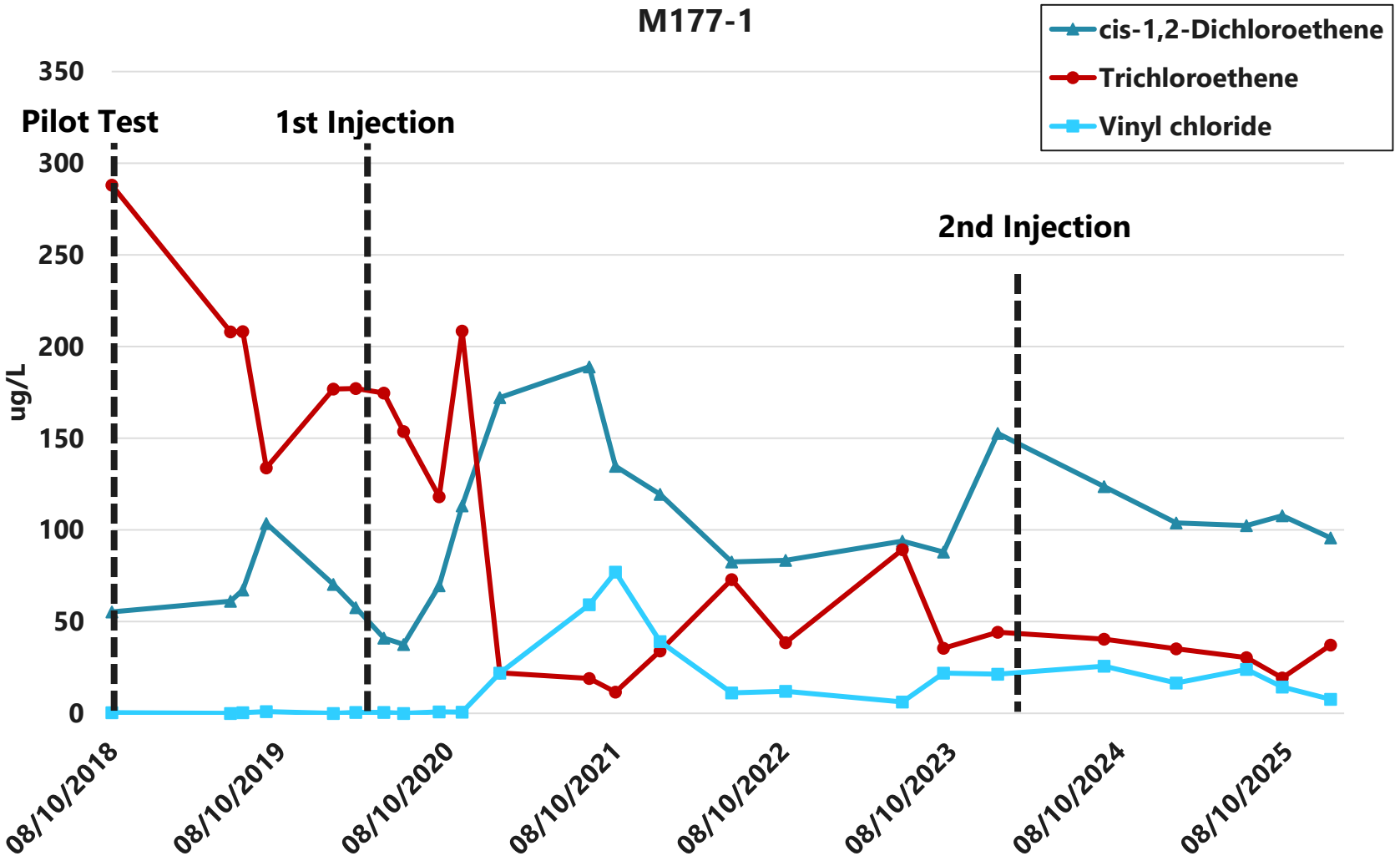


Remediation Performance Results



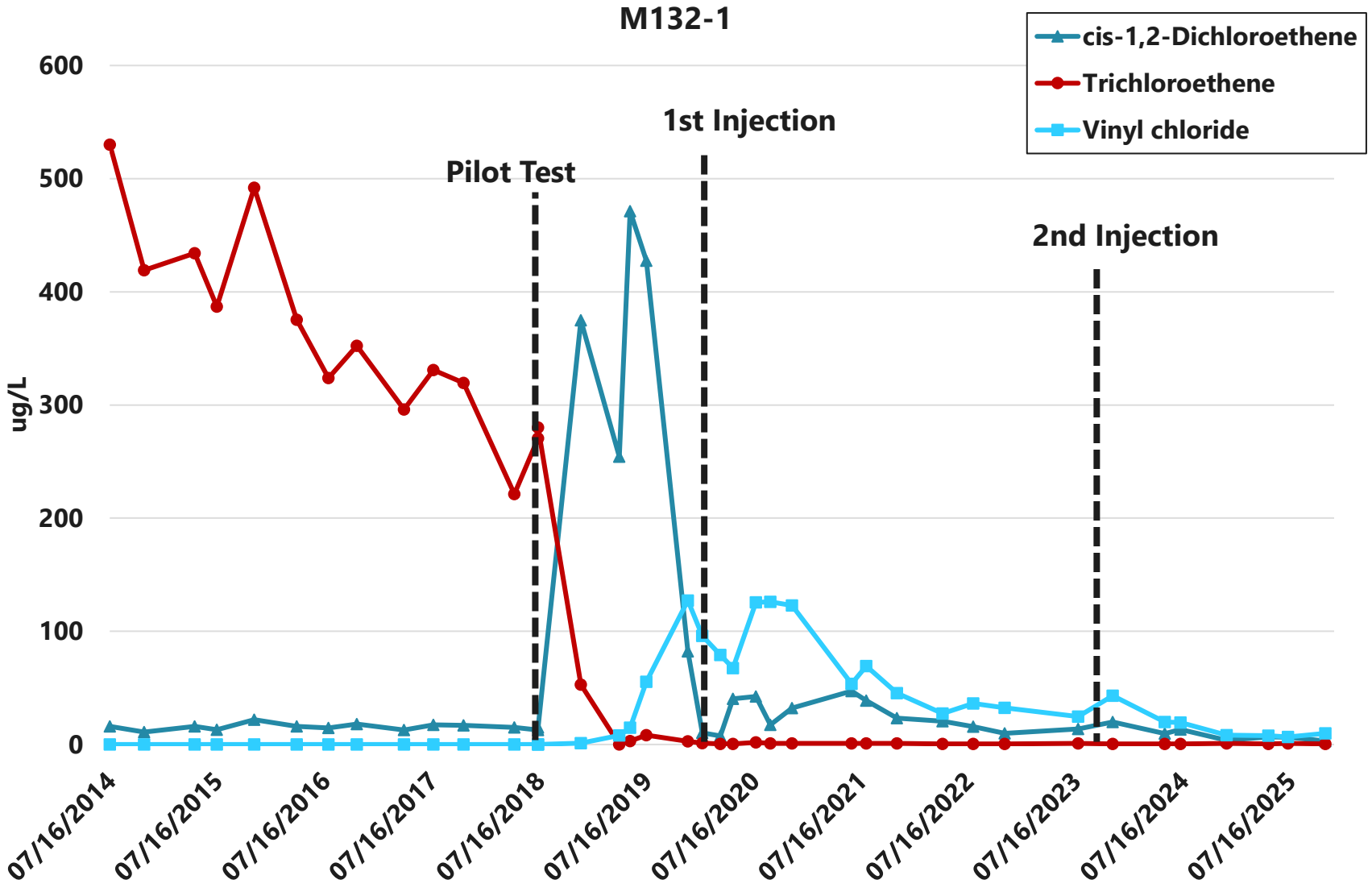
** Note: Concentrations of DCE are equal to the sum of the isomers.*

Plume Degradation at M177



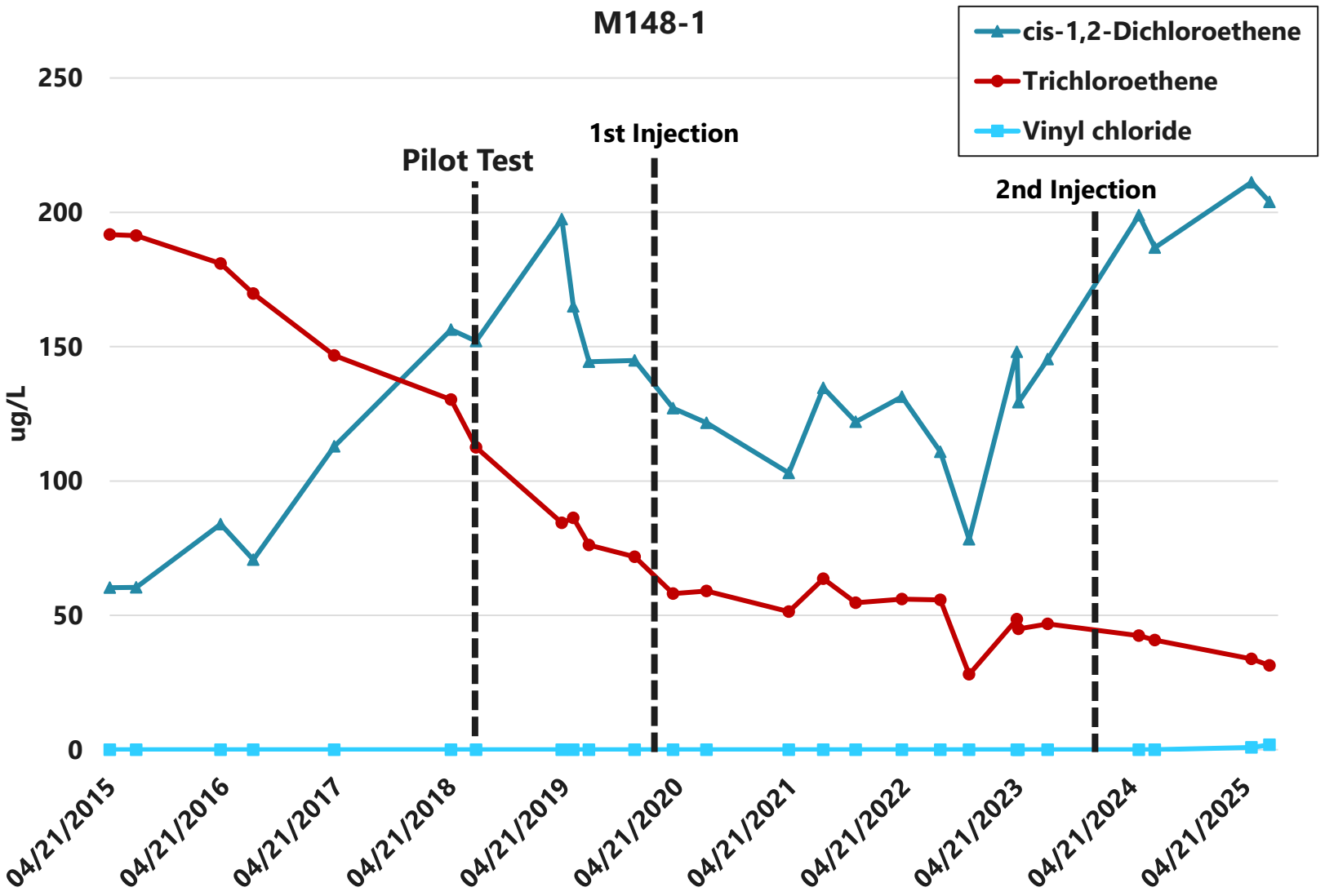


Plume Degradation at M132





Plume Degradation at M148





Next Steps

1. Continued monitoring of groundwater chemistry at wells
2. Sampling of phytoremediation media
3. Replacement of trees as needed



Thanks to the team!



Brent Loney



Matt McCurdy



Kevin Robinson



Elsa Hergel

VEI Contracting



Thank You!

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