



**Keystone
Environmental**
Knowledge-Driven Results



Multi-Faceted Approach to Achieving Remedial Closure at an Active Rail Yard

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Presenter: Jason Christensen, P.Eng.
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Environmental
Consulting

Engineering
Solutions

Assessment &
Protection

»»» Introduction

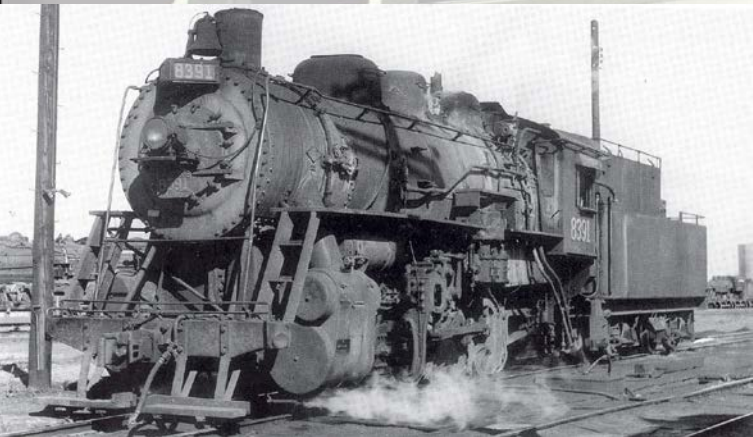
- Background
- Site Description
- Remedial Approach
- Achieving Closure

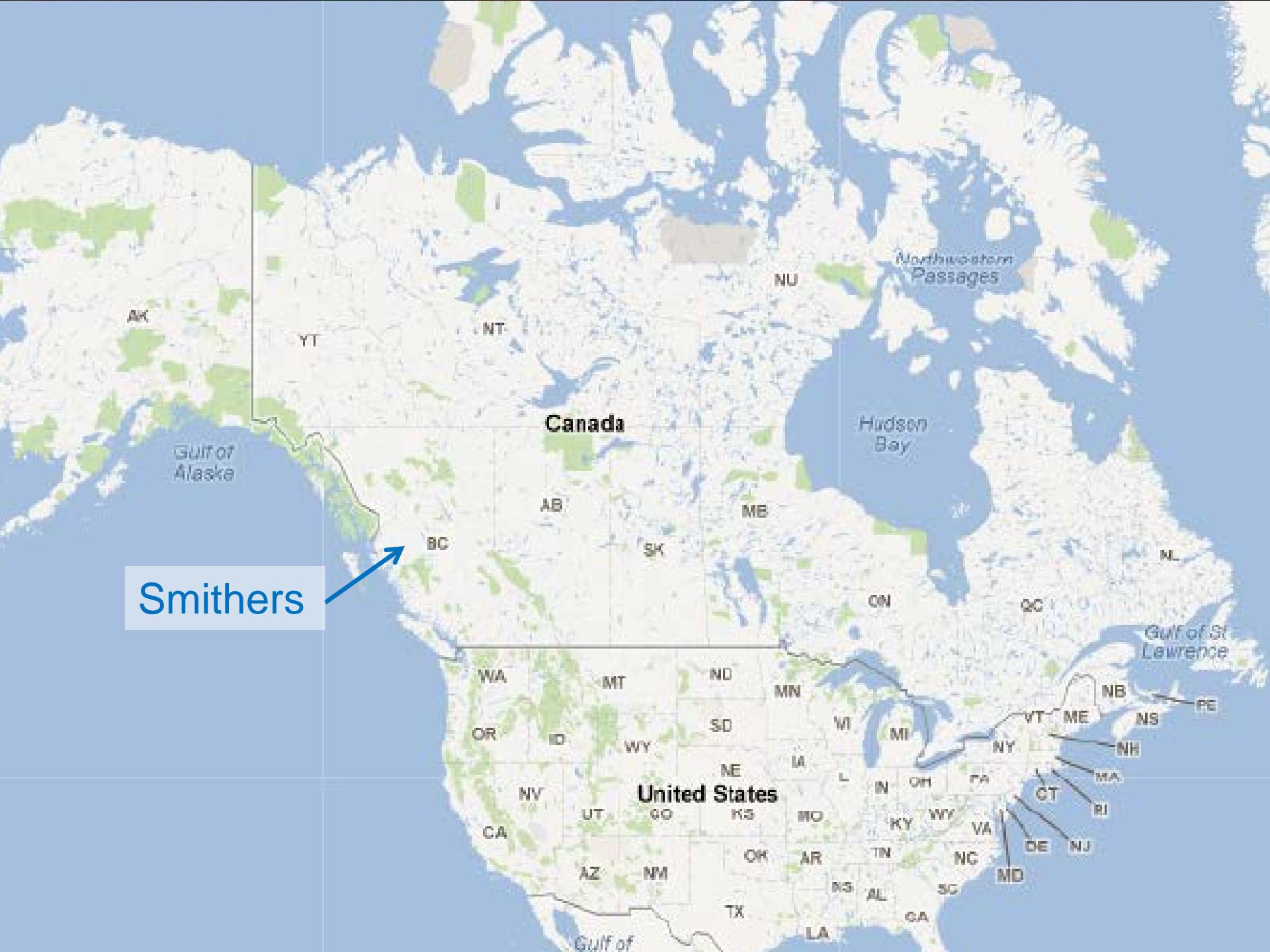


Background

CN Smithers Rail Yard

- In operation for more than 100 years
- Multiple former fueling and maintenance locations
- Large LNAPL plume (100,000 Litres) including diesel and bunker C
- 12,000 m² Site

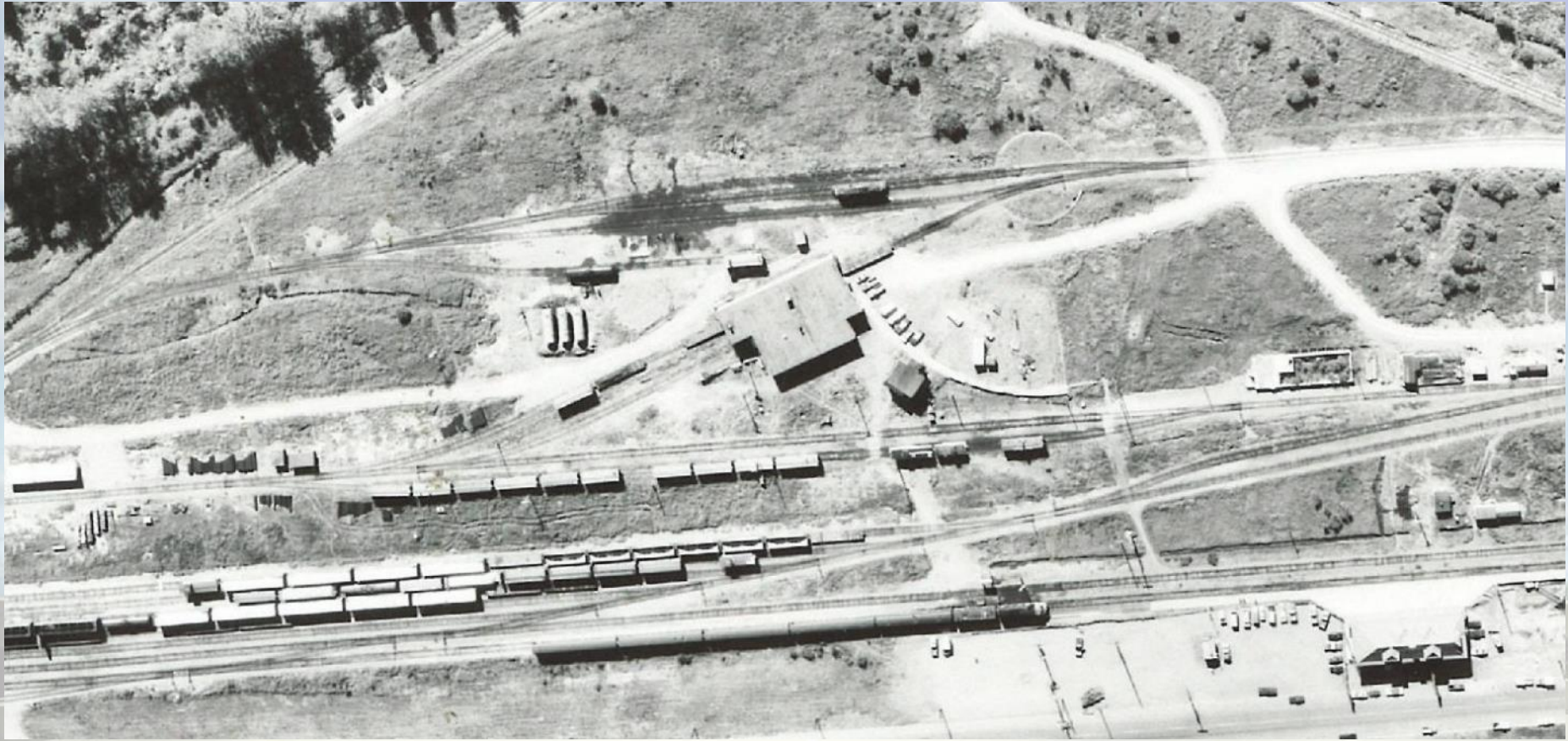




Aerial Photograph 1947



Aerial Photograph 1974



Fuelling Stand (1996)

Diesel Fuelling conducted on Site 1959 to 1997

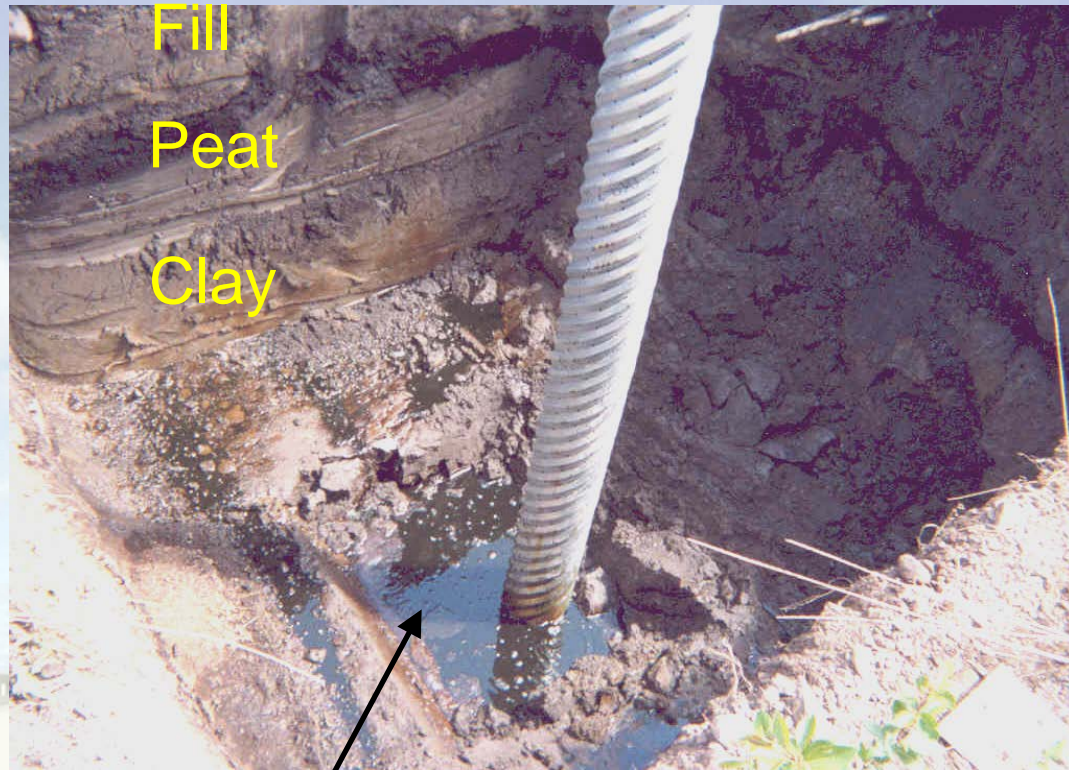


Site Description

Site Geology

Three Distinct layers:

1. Upper sand and gravel fill
2. Middle clay confining layer
 - varies in thickness and elevation
 - undulating clay layer
3. Lower sand unit
 - confined by upper clay layer
 - artesian type aquifer



Visible NAPL



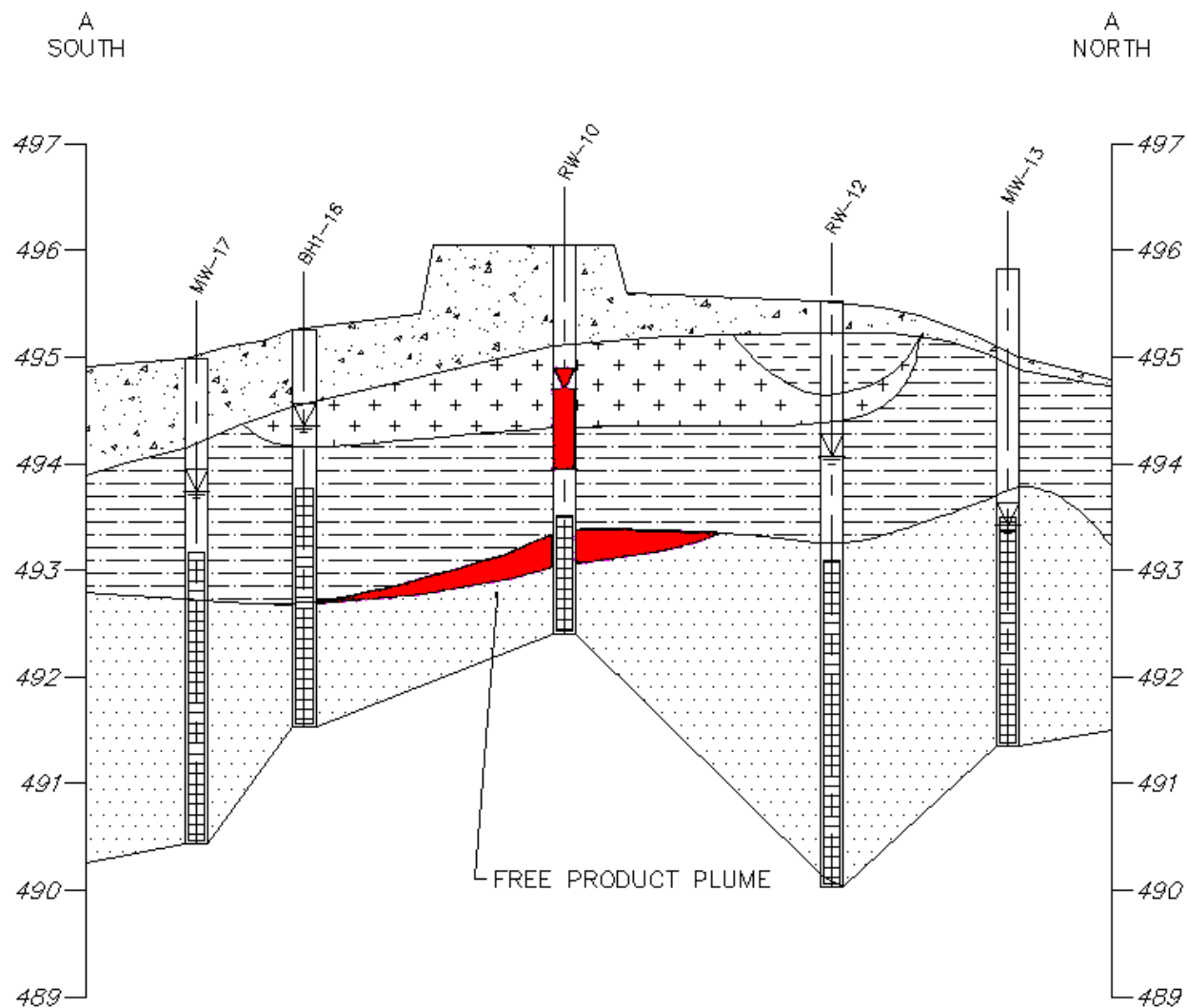
Site Description (cont.)

NAPL Migration:

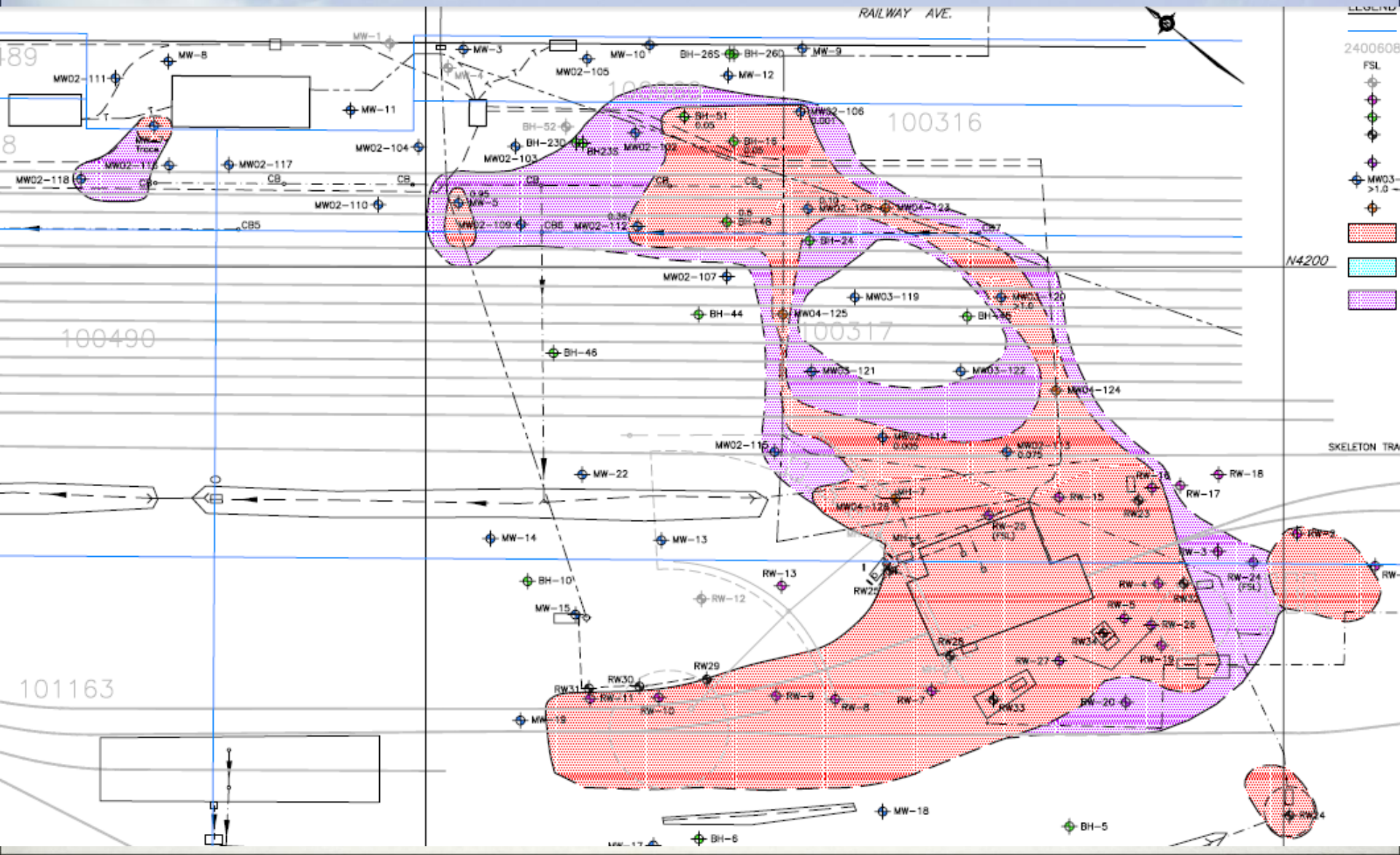
- Transported from surface through breaks within clay.
- Occurred during seasonal groundwater fluctuations.
- Forced upwards hydraulically by artesian aquifer.



Soil Cross Section



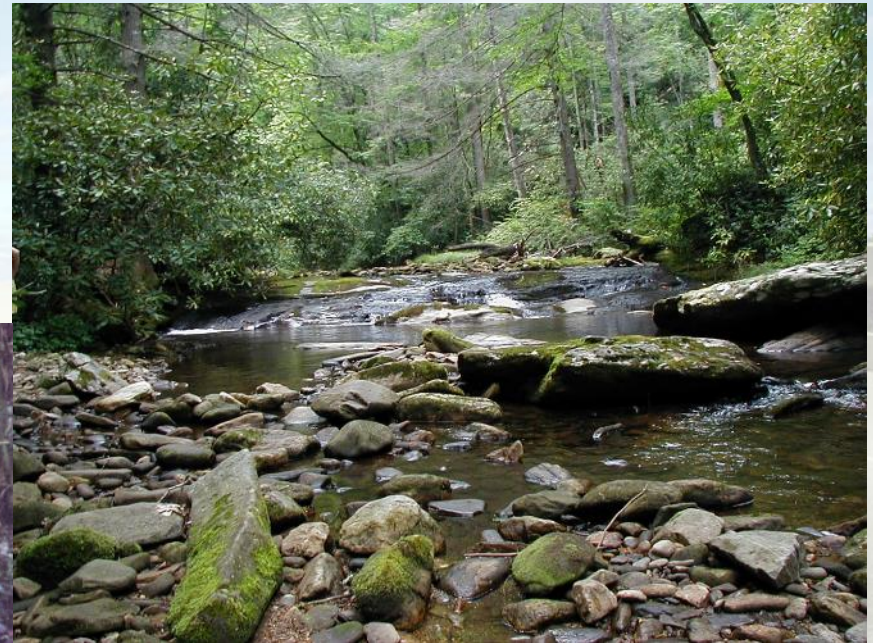
Extent of Hydrocarbon Constituents



Potential Receptors



- Chicken Lake Creek located at the western edge of Site. Surface drainage ditches drain to the creek.
- Drinking water wells located greater than 1.5 km from Site
- Site workers
- Migratory birds
- Wildlife
- Prevent Off-Site migration



Remedial Approach



- Recover available NAPL thus reducing potential for migration
- Contain dissolved phase constituents and protect sensitive areas
- Reduction of source area with exsitu soil remediation



NAPL Recovery System

Car Shop NAPL Recovery System (10 Locations)

- Installed in 2001
- Recovery well (100 mm)
- Product recovery skimmer
- Transfer pump
- Hydrocarbon tank
- Enclosure



NAPL Recovery System



Track Area NAPL Recovery

- Installed in 2007
- Low maintenance system to collect pooled NAPL within Rail Area
- Timer operated pneumatic pumps with oleophilic screens
- Collected NAPL pumped to a tank located outside of the track area



NAPL Recovery Results

- Nearly 40,000 Litres of NAPL collected
- NAPL plume volume reduction by 40%
- NAPL releases to surface water ditches no longer observed
- Extent of NAPL plume reduced
- Diminishing rate of returns



Implementation of a Barrier Wall

Groundwater Modeling

- Groundwater modeling was done to confirm the barrier wall's effect on migration pathway
- In well pump located upgradient of wall added to amplify the wall effect



Preventing Off-Site Migration

Barrier Wall Installation

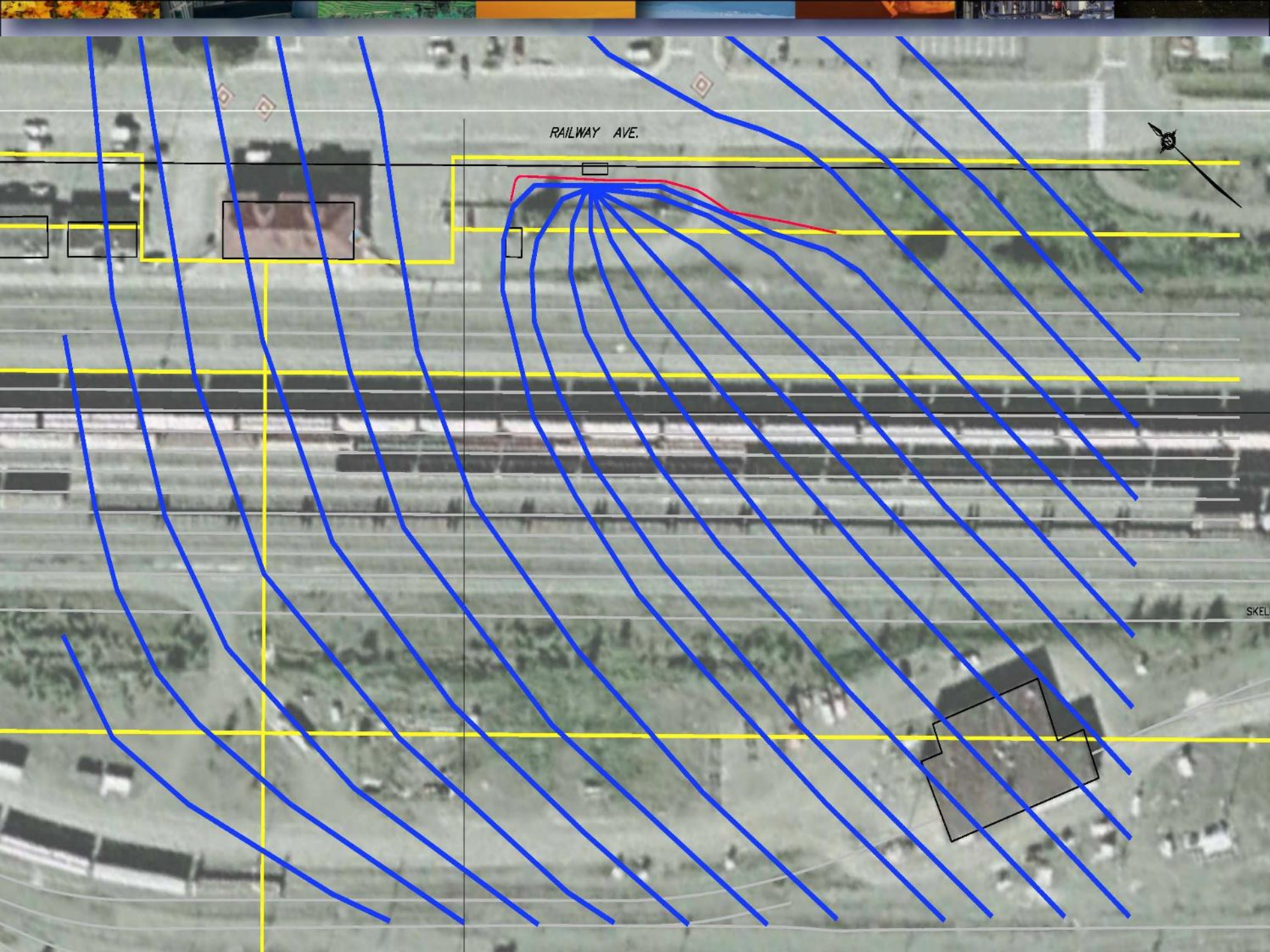
- Low ongoing maintenance
- No disturbance to rail traffic
- Proven technique to prevent off-site migration



Smithers Rail Yard



Barrier
Wall



RAILWAY AVE.

SKELETON

2012 and 2013 Remedial Excavation

- Removal of Source material
- 1,500 m³ of soil excavated
- Refurbishment of On-Site Biocells
- Access Restricted
 - Active railyard
 - Contamination under tracks, buildings, former structure foundations



Aerial Photograph

Biocells



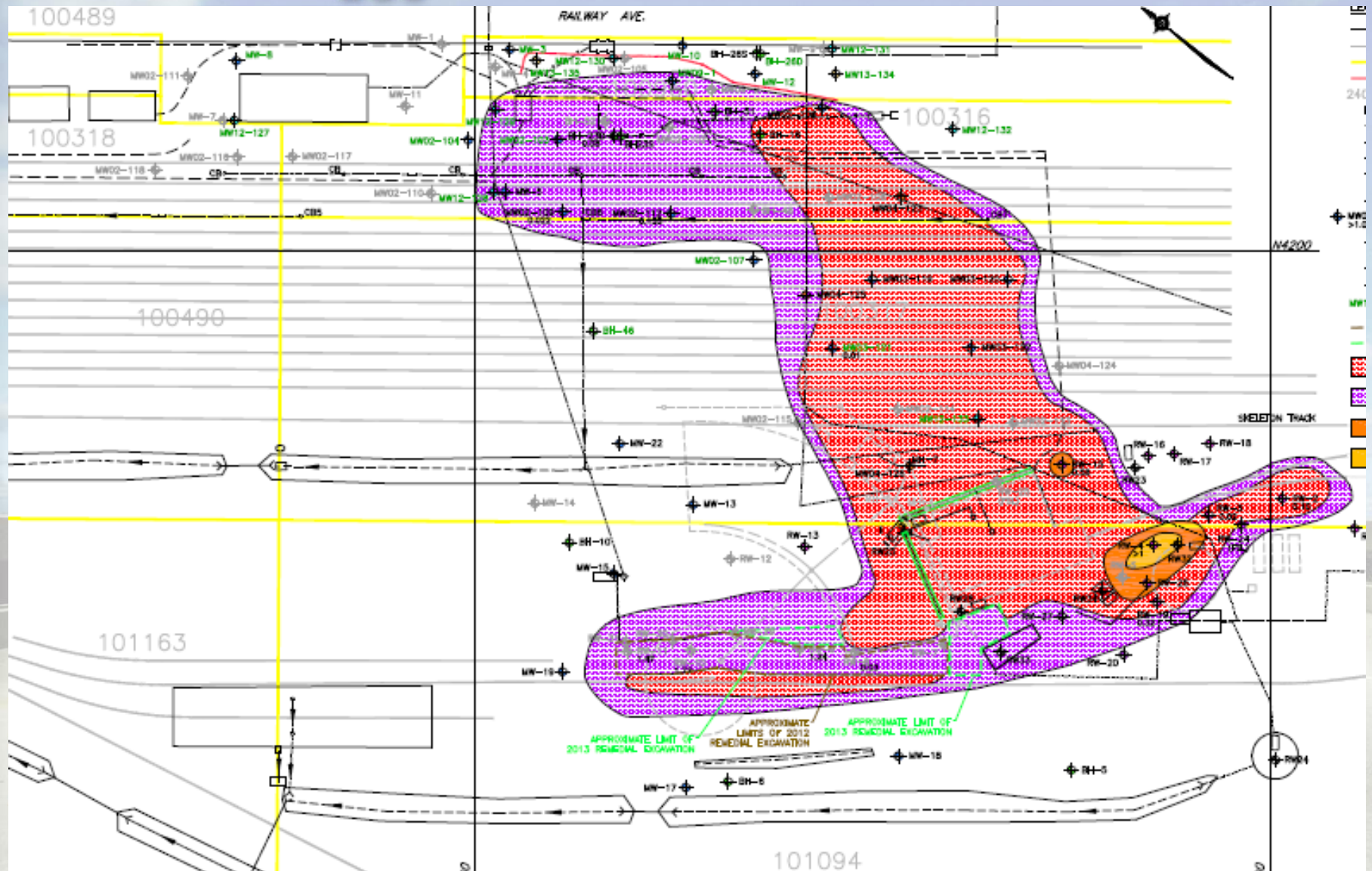
Exsitu Soil Remediation



- To date approximately 1000 m³ of soil has been remediated on Site within on-Site biocell to less than CSR IL standards
- 1500 m³ is soil is currently being remediated in on-Site biocells



Current Extent of Hydrocarbons



The Result...

END Game is in sight

- Free product is being diminished to being no longer considered mobile
- Hydrocarbon concentrations observed to be decreasing at most locations
- Containment of contaminants on Site
- Risk Managed Site



Acknowledgments



- Jack Stroet (operator) commitment and dedication for monitoring the system
- Jesse Berton for managing site operations
- David Brogliatto (CN) for the desire to remediate the Site in the most sustainable manner



Thank you, Questions?

Jason Christensen

jchristensen@keystoneenvironmental.ca

