



Area 1 Thermal Treatment Shutdown Summary

October 24, 2018

Velsicol Chemical Superfund Site

960605

Agenda

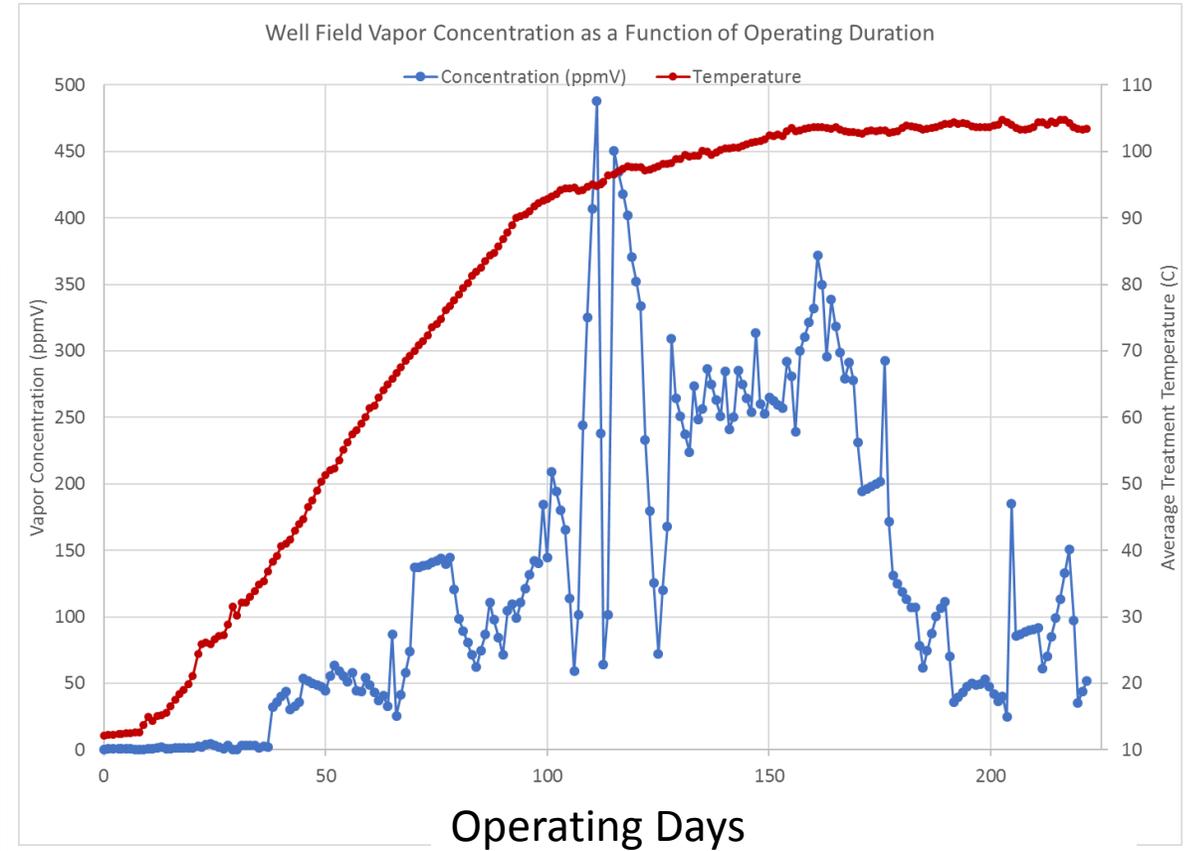
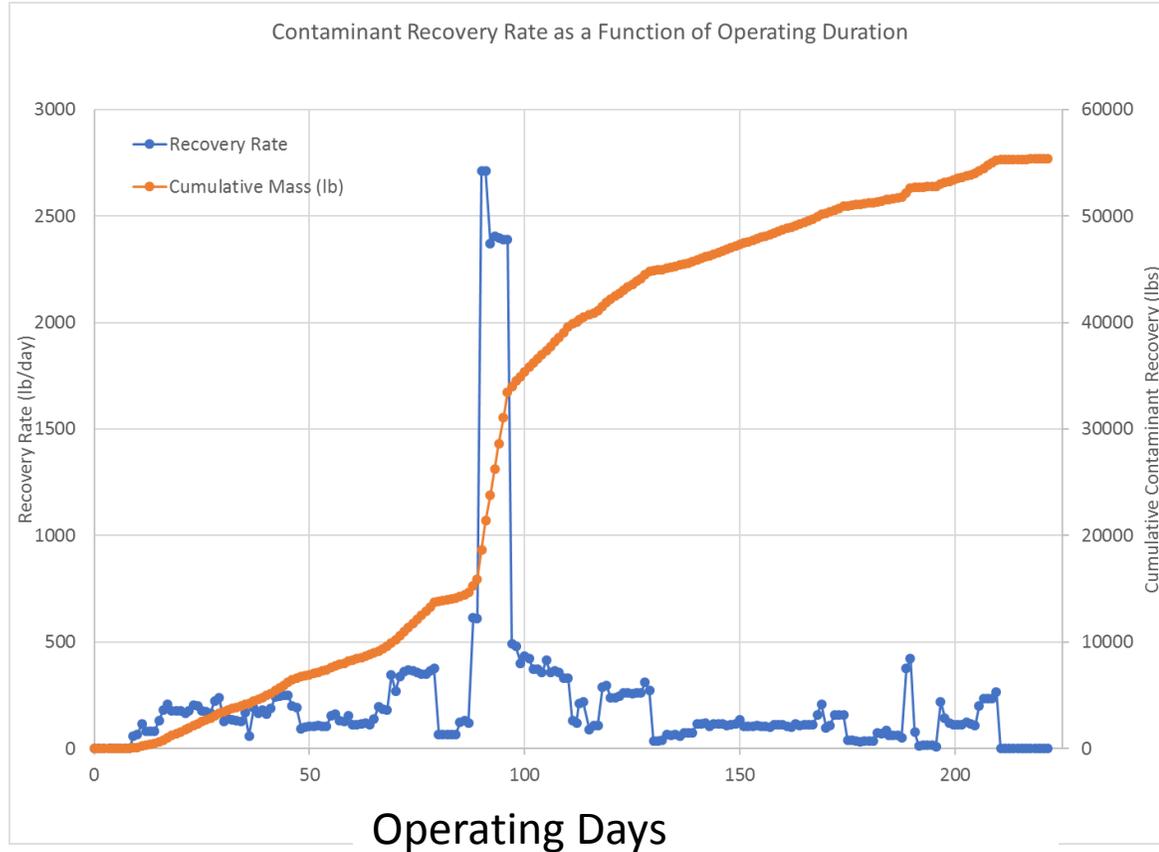
- Diminishing Returns Review
 - Temperature
 - Mass Removal
 - Energy Input
- Shutdown & Post-Heating Operations
 - Wellfield Measurements
 - Soil Borings
 - Post-Heating Fluid Extraction & Monitoring
- Cleanup Summary

Diminishing Returns – Evaluation Criteria

Three evaluation criteria for the ISTT performance standard in the Record of Decision:

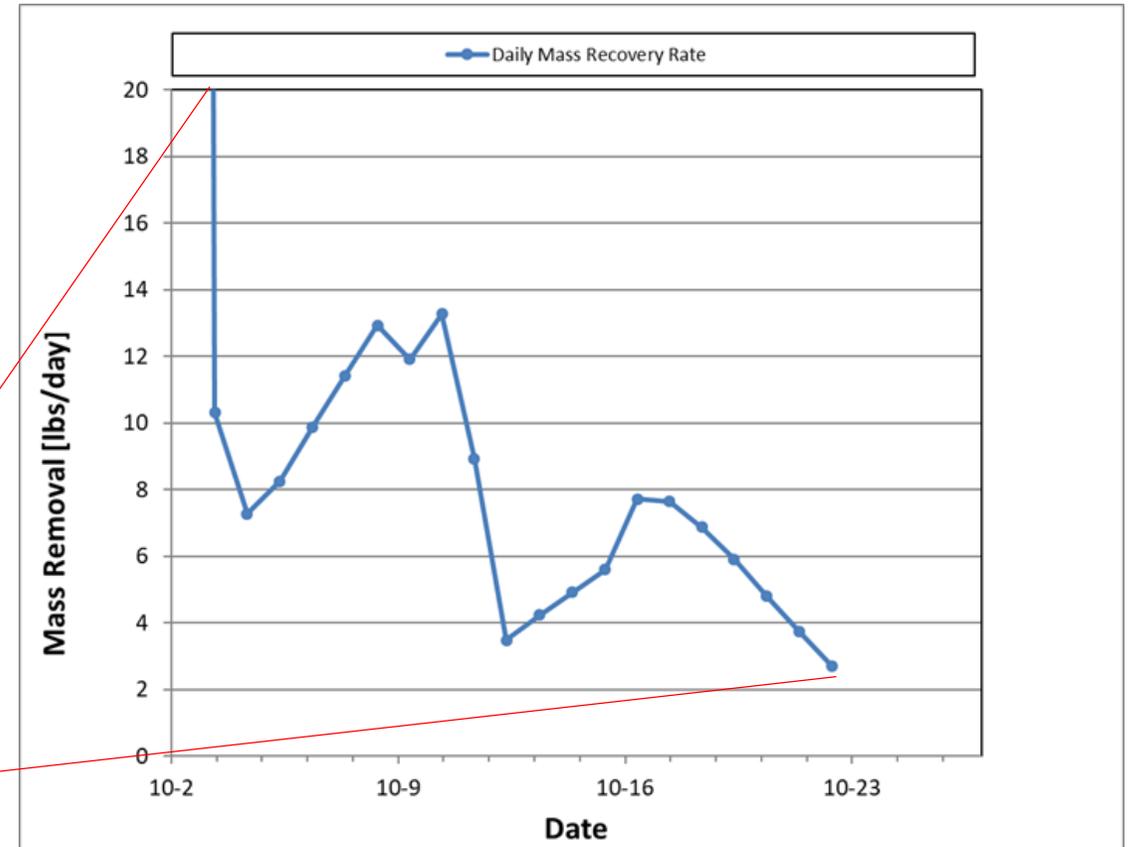
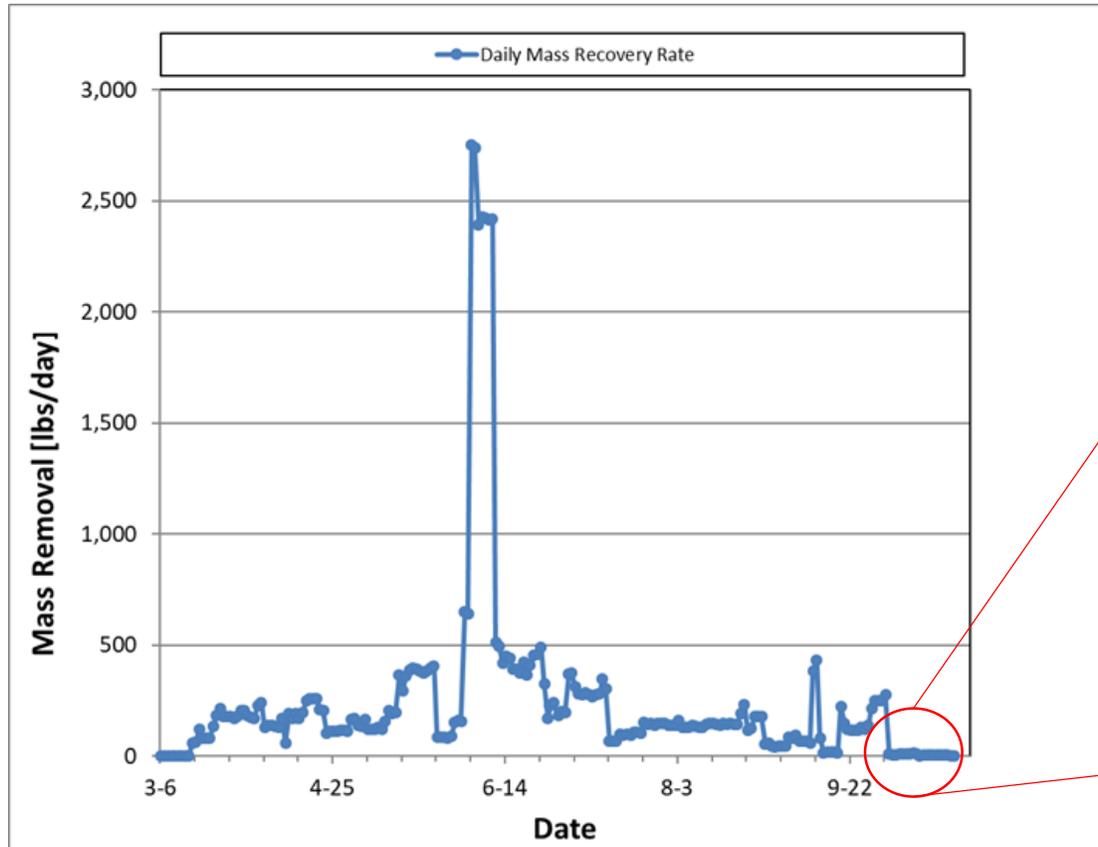
- (1) Treatment of the source area using ISTT has reached an asymptotic rate of COC recovery*
- (2) Additional input of subsurface energy will not increase COC mass removal rate*
- (3) Extended operation of the ISTT system offers no further reduction in DNAPL mobility and migration from shallow outwash*

Contaminant Recovery has Decreased with Time



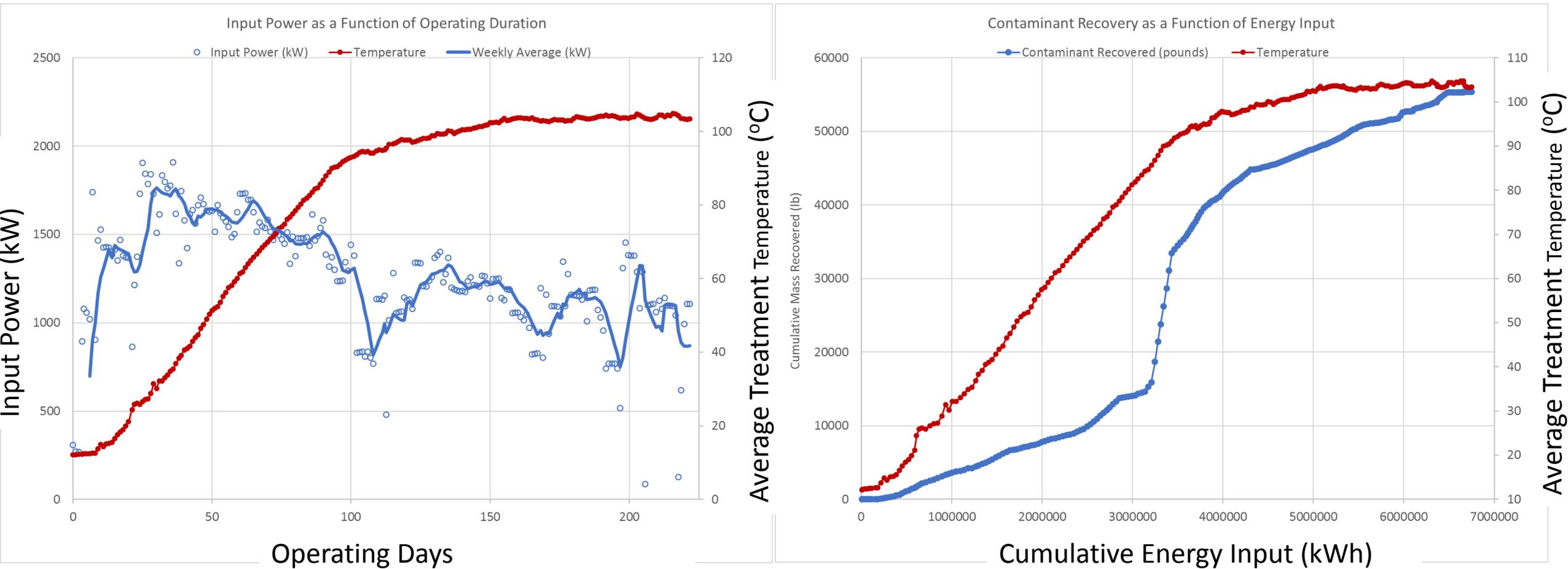
Key Point: With increasing time the total mass recovered has plateaued even though heating of the treatment zone remains above 100°C.

Mass Removal Evaluation



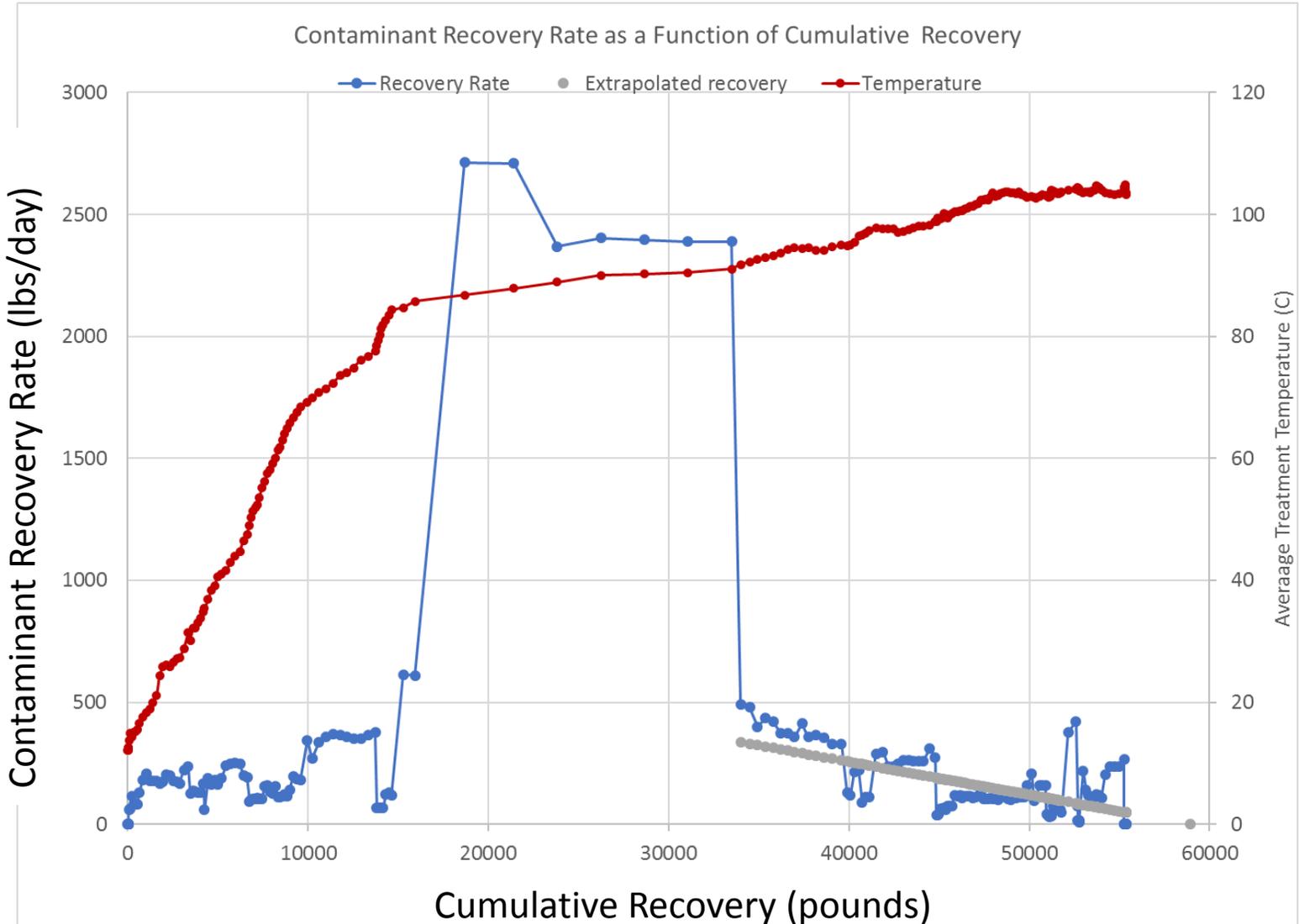
Key Point: Mass removal has diminished to ~0.1% of peak mass recovery (~2-5 pounds per day).

Energy Input Does Not Change Mass Removal Rate



Key Point: Continued heating will not significantly increase the total contaminant mass removed.

Extended Operations Provides No Further Reduction of NAPL Mobility and Migration



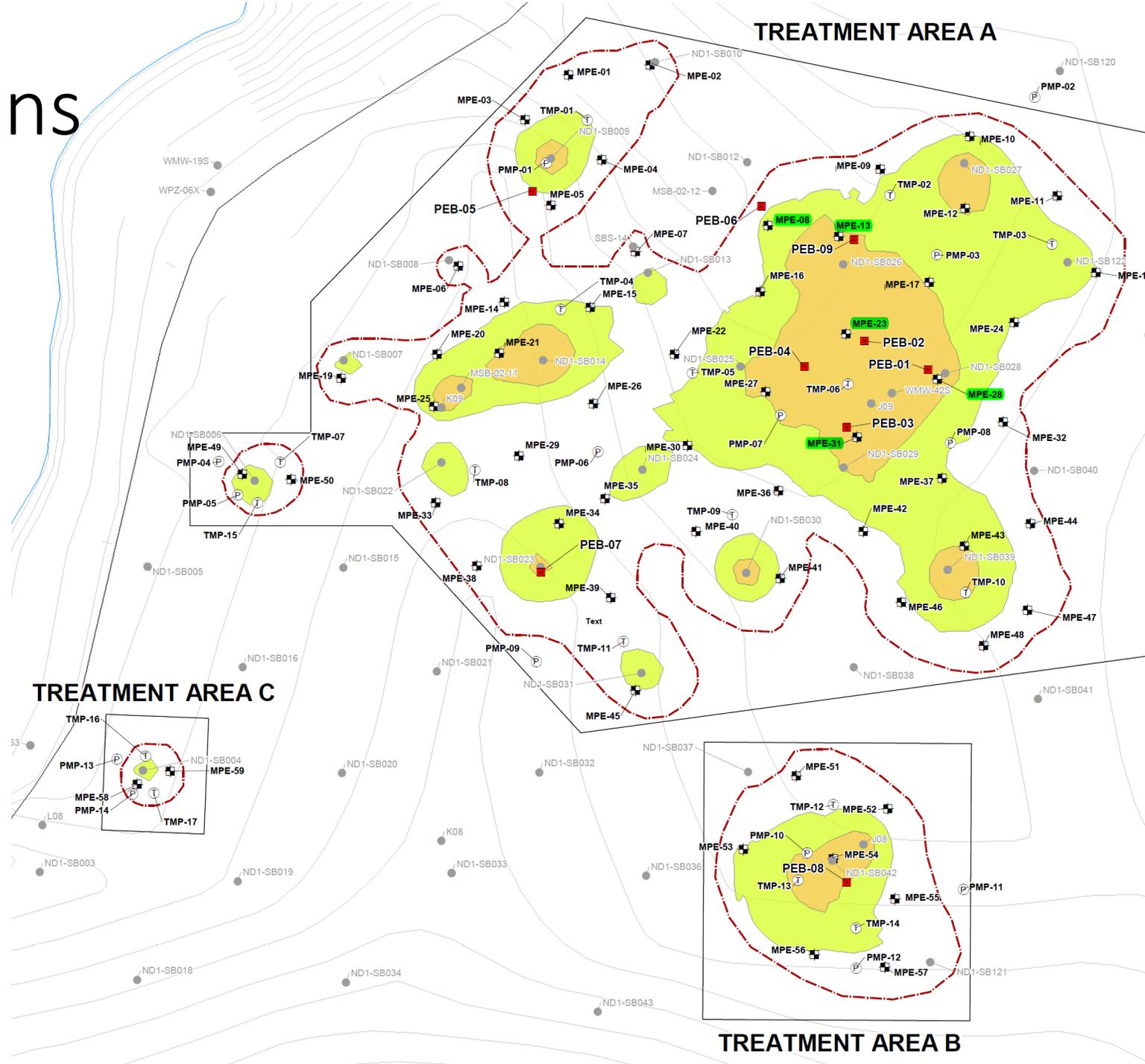
Key Point: Recovery rate analysis indicates contaminant reservoir is depleted.

Shutdown & Post-Heating Operations

- Preparation Activities
 - Wellfield Measurements
 - Soil Borings
- Heaters Off October 18
- Post-Heating Operations
 - Controlled cooldown
 - Continued vapor and liquid extraction
 - 21-day period with continued monitoring
- Expected Final System Shutdown November 8
- Thermally enhanced biological activity will be ongoing for years.
 - Promotes ongoing contaminant degradation.

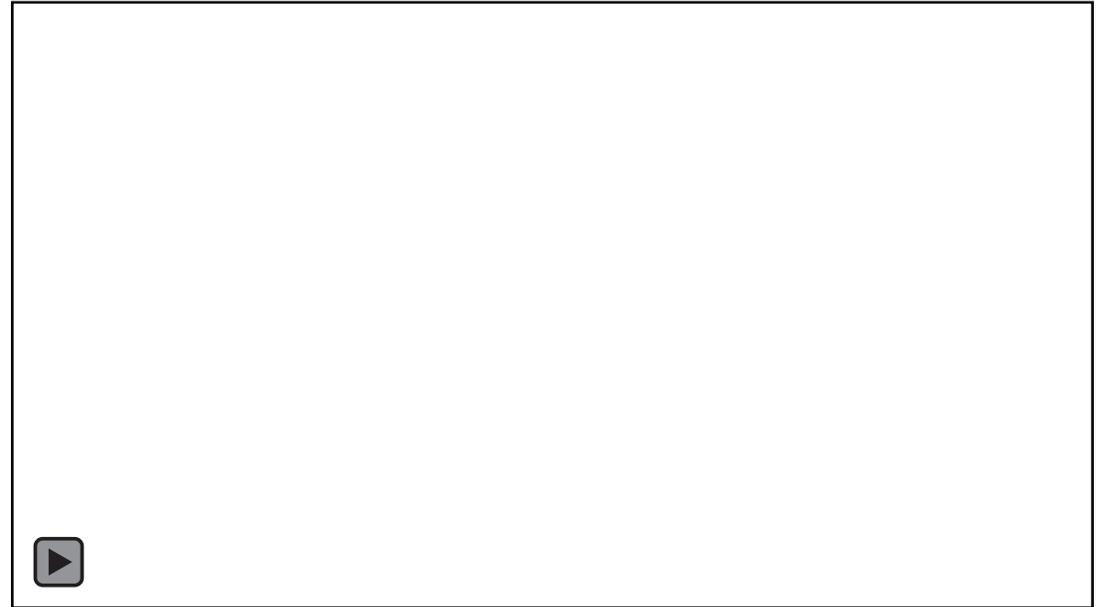
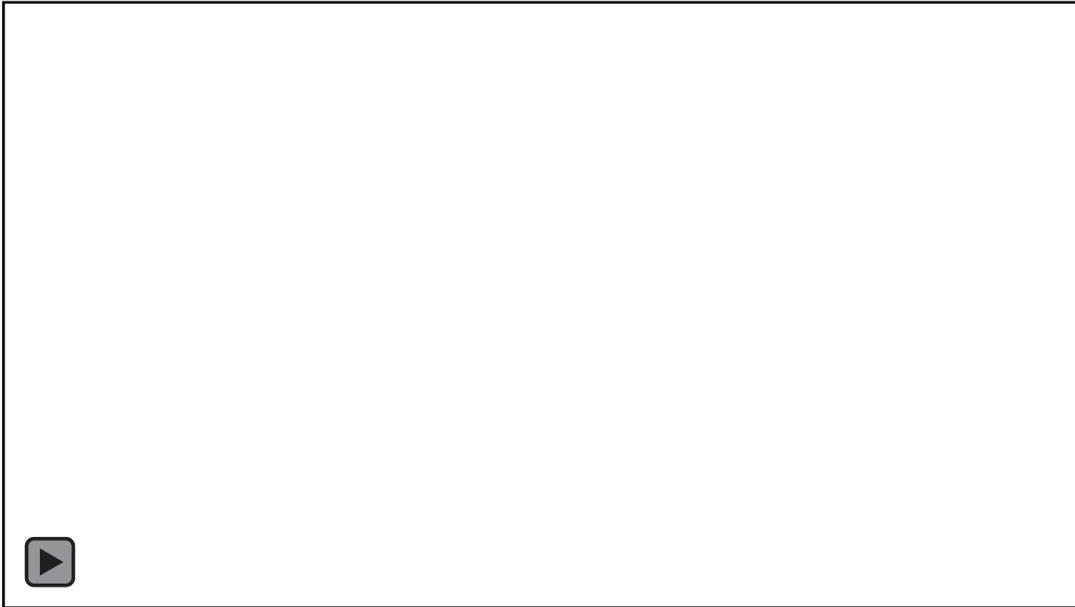
Wellfield Observations

- Wells checked for NAPL
 - 5 of 59 wells with LNAPL
 - Consistent with most contaminated zone
- Focused Extraction
 - LNAPL reducing over time
- October 23
 - 2 of 59 wells with LNAPL
- Extraction Continued
 - 17.3 gallons total
 - Solidifies at room temperature (asphaltic)



Observations:

- Residual asphaltic material is not mobile/liquid at ambient temperature.



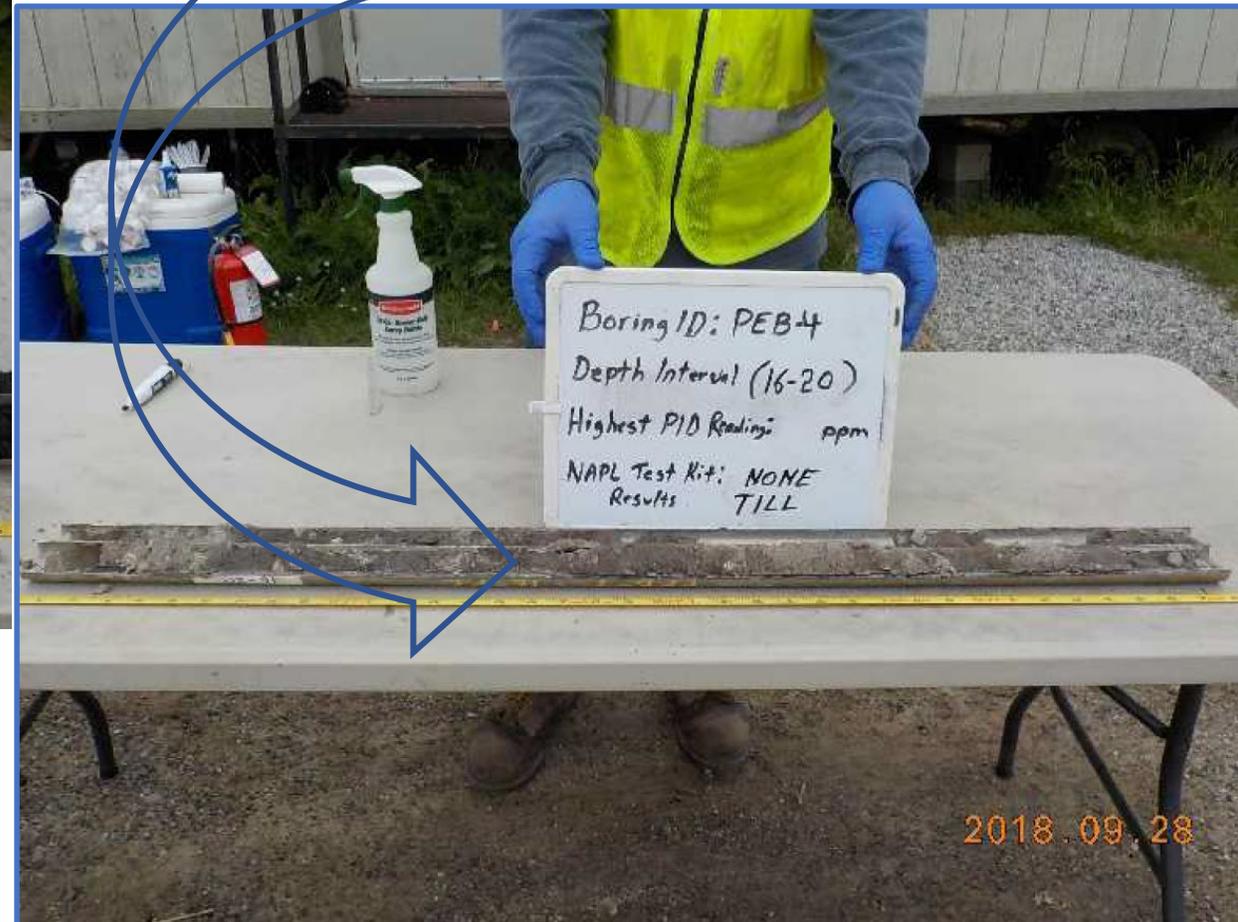
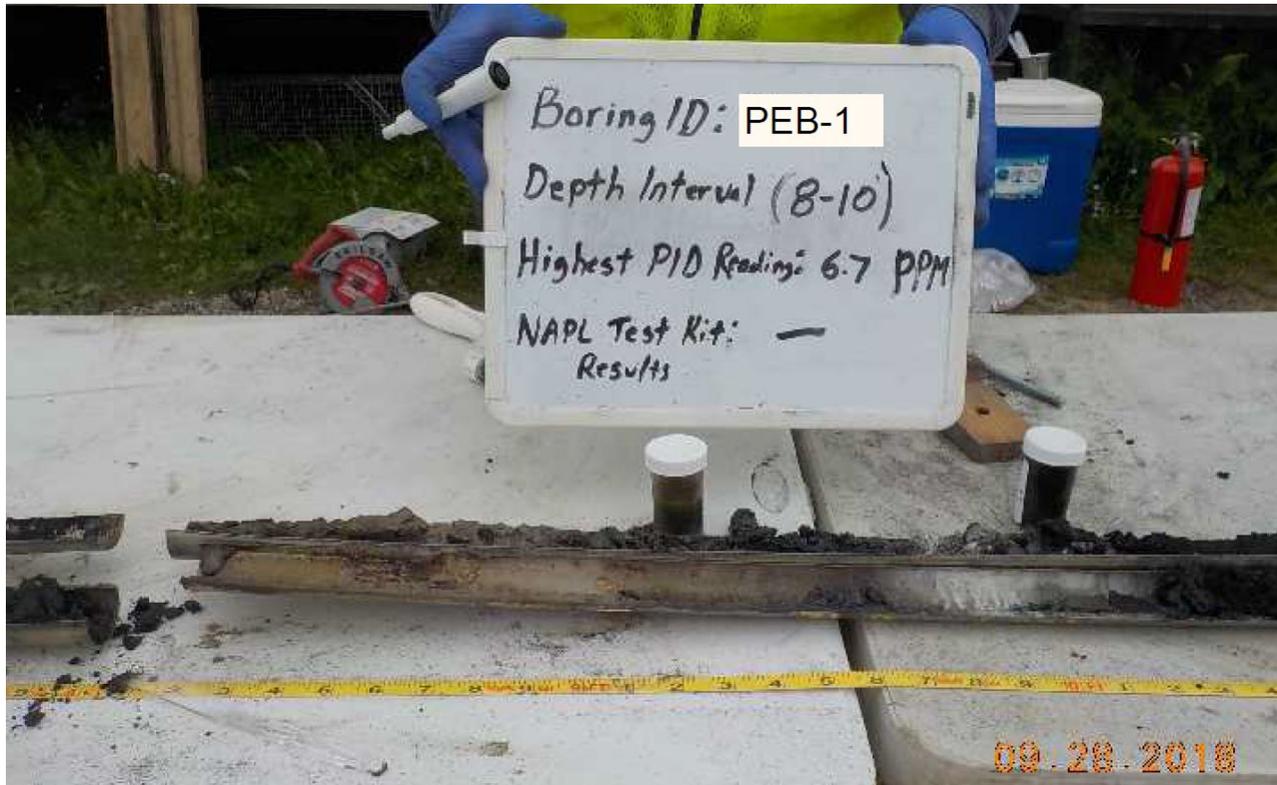
Soil Borings

- 9 Soil Borings
 - Focused on locations where LNAPL measured.
 - One sample obtained from each boring at depth with highest PID reading.
- No DNAPL observed
- Asphaltic residuals at water table interface
 - Liquified at treatment temperatures.
 - Solidifies at room temperature.
 - Immobile at ambient subsurface temperature.
- Asphaltic residuals being removed to extent possible
 - Removing material while temperature remains elevated.

Soil Boring Photos

Key Point:

- No DNAPL observed at Till interface.



Cleanup Summary

- More than 55,000 pounds contaminants removed
 - Over twice estimated design mass.
- Energy 9,700,000 kWh
 - Additional 25% promoting more robust treatment.
 - Maintained target treatment zone temperature ~103 °C.
- Treated over 5,700,000 gallons of contaminated groundwater
- Air Monitoring Program
 - Over 5,000 wellfield perimeter PID measurements with no detections.
 - Over 1,000 ambient air laboratory samples with no system related detections.
- Over 1 million data points monitoring system operation
 - 30,000 manually collected system operations data points.
 - 1,000 system vapor PID samples.
 - 400 wastewater and 160 vapor laboratory samples.



Questions
