

Treatment Using Electrical Resistance Heating (ERH) of Source Area CVOCs at a Former Manufacturing Facility, Newtown, CT

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June 13, 2012

Overview

- Site Intro/Conceptual Site Model
- Remedial Approach
- Design and Construction
- Results and Lessons Learned
- Conclusions and Future Activities
- Questions

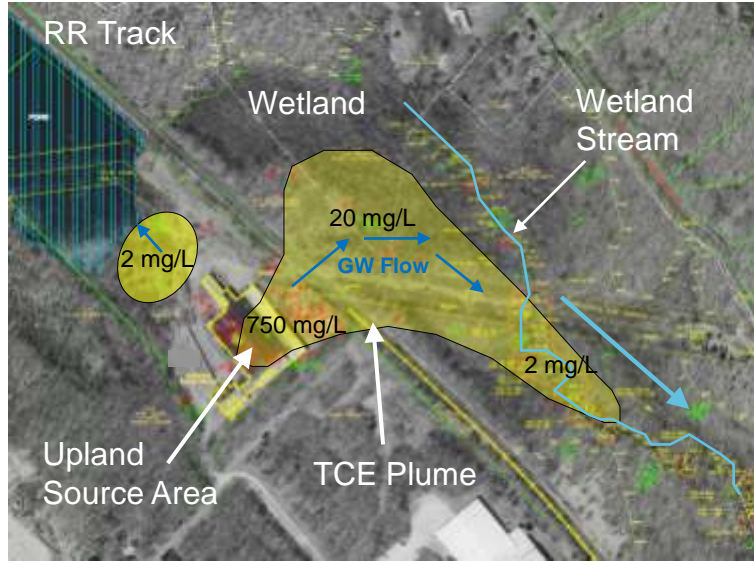
Site Intro

- Former metal tubing manufacturing facility operated from 1950's to 1986
- Site consists of 12 acre former facility and adjacent undeveloped woodlands/wetlands in suburban area
- Former facility parcel abuts an active railroad line
- Groundwater classification GA/GAA
- Chlorinated solvents from manufacturing process released to subsurface (TCE, other related compounds)

Conceptual Site Model

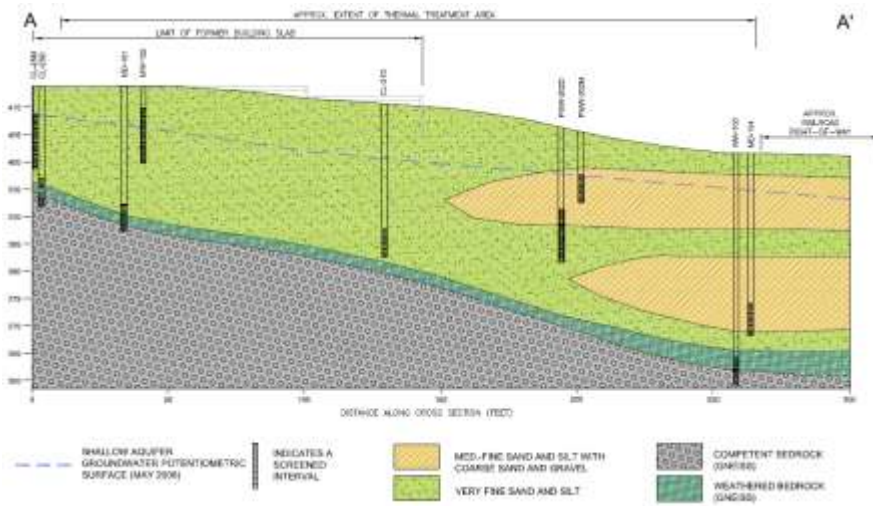
- Residual NAPL observed in former facility building slab area
- Source impacts observed in fine grained saturated soils (till), minor permeable drift zones and in weathered bedrock
- Two dissolved plumes: one smaller one to the northwest of the slab and a larger one northeast of the slab (off-site plume)

Conceptual Site Model – Plan View



Conceptual Site Model – Cross Sectional Views

Source Area



Remedial Approach

- Targeted soil removal performed to achieve residential direct exposure criteria (RDEC) in slab area
- SVE was performed on-site in the past with limited success
- A focused feasibility evaluation was performed as well as an in situ bioremediation pilot study for the on-site slab area
- Remedial strategy: in situ thermal for treatment of slab source area and in situ bioremediation (ERD) for the west of slab and off-site plumes
- Slab area treatment goal (760 ppb) modeled TCE levels that will not exceed surface water criteria off-site
- Technical Impracticability (TI) Waiver permit for the site and adjacent properties will be pursued

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Permitting / Approvals

- Remedial action plan (off-site thermal impacts a concern)
- CTDEP Wastewater Discharge/UIC Permit
- General Permits for Discharge of Wastewater to Surface Waters and Sanitary Sewer
- CT DEP air emissions permit applicability (permit exemption and non-applicability)
- Local inland wetlands and building permits
- Local and State noise ordinances
- Access agreements – railroad and utility company

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Remediation Project Overview



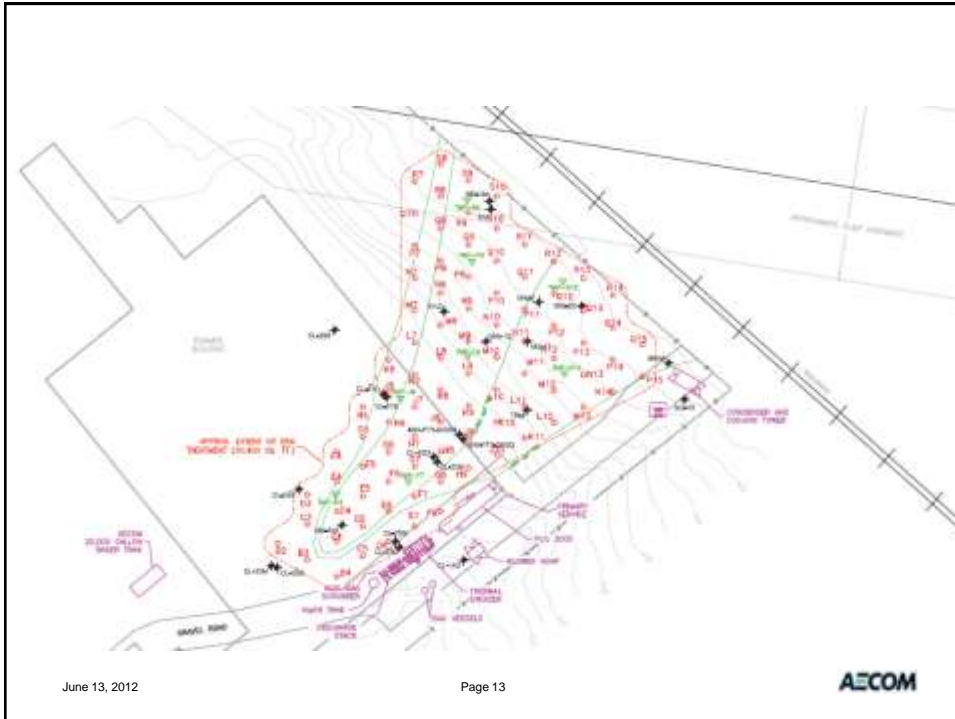
Design-Construction

ERH Design

- Grid (20 ft on center) of 89 steel electrodes to weathered bedrock (21 to 42 ft bgs)
- Co-located vapor recovery wells screened from 3 to 6 ft bgs
- 8 multi-depth temperature monitoring points (TMPs) with thermocouples every 5 feet in depth
- Design treatment duration of a minimum of 4 months with at least 30 days at 100 C to reach 760 ppb or less TCE (reduction of 99.9% or greater)

ERH Design

- Design of 4,330,000 kWh energy input
- 600 lbs TCE mass in subsurface slab area
- Thermal oxidizer with four backup 2,000 lb vapor carbon filters
- Three 2,000 lb liquid carbon filters for condensate/scrubber wastes
- Recycling of condensate for electrode re-wetting drip, if necessary





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Safety Procedures

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Hot Media Sampling Procedures

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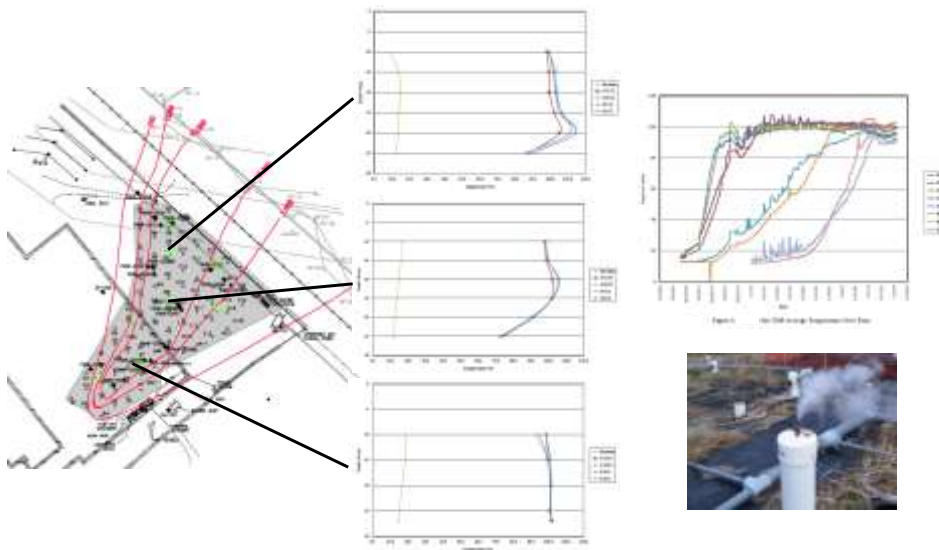
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Results/Conclusions

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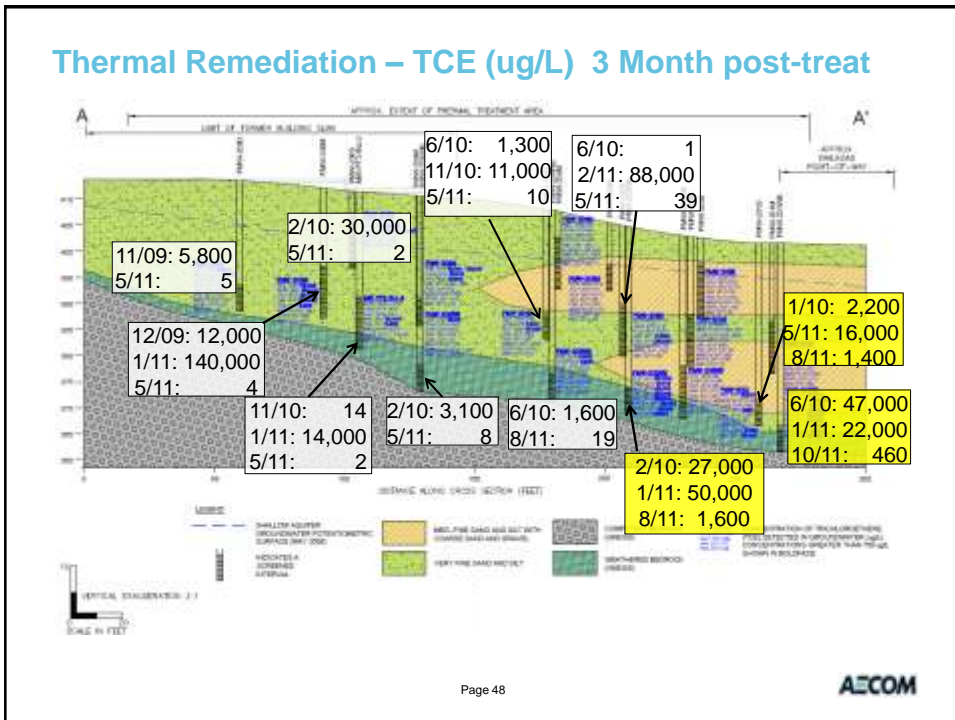
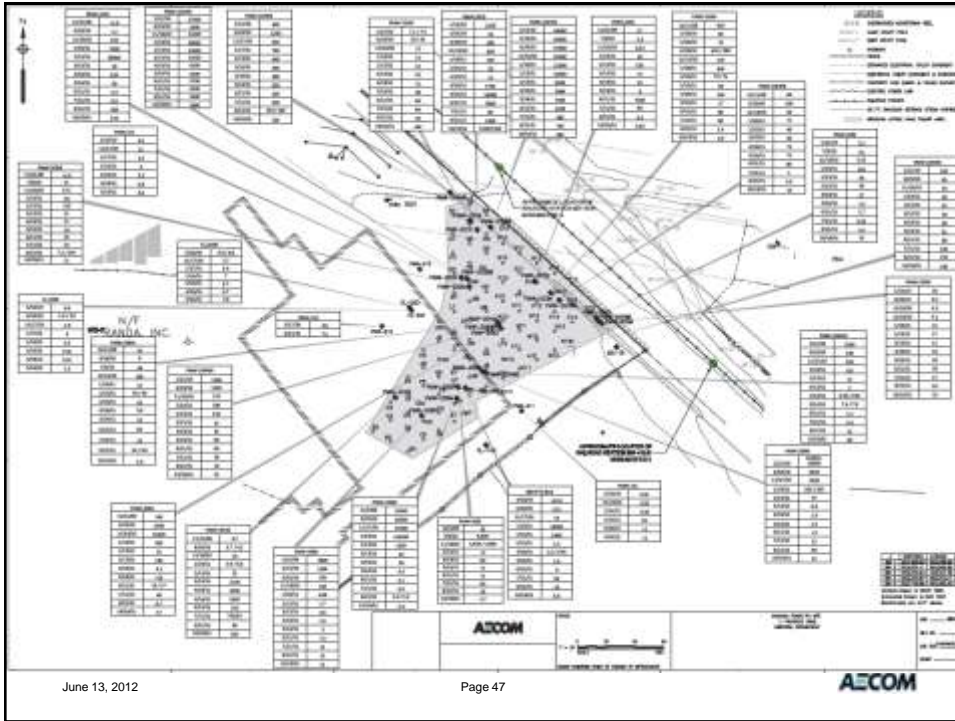


Thermal Remediation - Heating



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Thermal Remediation

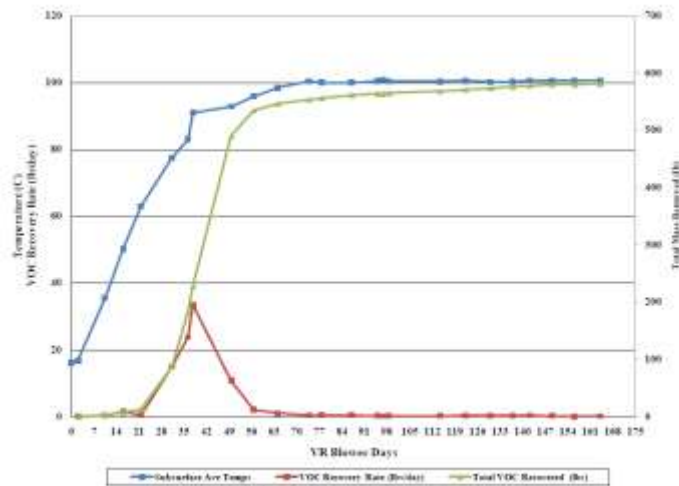


Figure 4. Site Temp, VOC Mass Recovery, and Rate Over Time

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Conclusions

- Temperatures rose above the boiling point of TCE and water throughout most of the treatment area (exception of the weathered bedrock where temperatures rose to 80 C)
- Very little heat appears to have migrated in groundwater off-site to the wetlands area (only MW-210WB reached 110 F for 1-2 months)
- TCE concentrations have significantly decreased in groundwater to date. 19 of 22 wells are now below the TCE cleanup goal
- The residual TCE mass is very low and the TCE mass flux has been reduced significantly and is below the TCE mass flux associated with the cleanup goal for the site

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Lessons Learned

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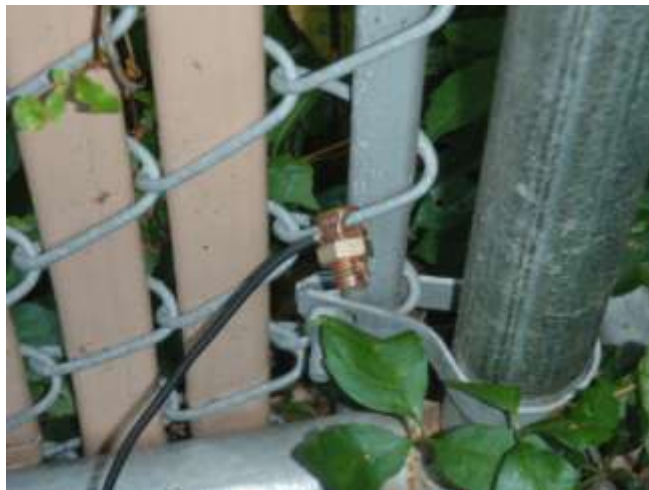
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Conclusions and Future Activities

- Thermal remediation
 - Fully heated zones were established
 - Treatment of weathered bedrock is challenging
 - Treatment of aqueous and soil phase CVOCs & residual DNAPL is being achieved and mass flux reduced
 - Stray voltage mitigated cost-effectively
 - “All-Inclusive” Cost: \$120/CY



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Conclusions and Future Activities

- Thermal remediation
 - Future activities include:
 - Continued monitoring for rebound and migration of heated groundwater
 - Abandonment of electrodes and TMPs
 - Post-remediation monitoring
 - Polishing with bio if necessary
 - Technical impracticability waiver zone permit

Acknowledgements

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Thank you!



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