

RI Novelty – TCE Case Study

Rhode Island Department of Environmental Mgmt.
Office of Waste Management



NEWMOA TCE Vapor Intrusion Workshop
Providence, Rhode Island
April 13, 2015



RI Novelty - Warwick, RI

TCE in Rhode Island

- ▶ Current Groundwater Standards
 - GA – MCLs
 - GB – Developed in 1996 based on PELs at the time
- ▶ Currently working with RISEP to update the GB groundwater standards to reflect VI potential.
- ▶ Current TCE standards for soil and GW will be considered



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Case Study – RI Novelty

- ▶ Located on West Shore Road in the Conimicut section of Warwick, RI
- ▶ Mixed Residential & Industrial/Commercial
- ▶ Groundwater classified as GA; Suitable for human consumption without treatment



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Site History

- ▶ One Acre Site developed in 1950s
 - Jewelry Manufacturing, 1958 – mid 1970s
 - Industrial Packaging Co., 1980s
 - RI Novelty, Warehouse and Light Manufacturing, 1989 – 2001
- ▶ Site Building – 17,326 sq. ft., single story, slab on grade, concrete & brick
- ▶ Phase I identified several RECs:
 - Floor Drains, Dry Wells, Septic Tanks, and Septic Leaching Galley
- ▶ No Private Wells within 500' radius



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Site Investigations

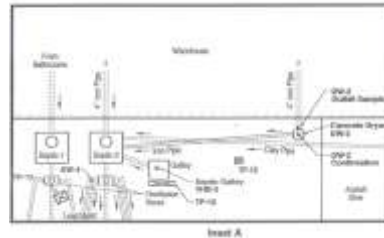


- ▶ GW – High levels of TCE near the septic tanks
- ▶ Soils contain TCE > GA Leachability criteria of 0.2 ppm
- ▶ No soil samples exceed RDEC for TCE
- ▶ GW flow – East/SE
- ▶ GW encountered at 5-7' bgs
- ▶ Investigations point to septic as TCE source



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UIC and Septic System Closure



- ▶ Septic 2 received waste from the floor drains and dry well
- ▶ March 2001 – Remedial Action #1:
 - Septics Emptied & Cleaned
 - Plating Room Dry Well – Cleaned & Closed
 - Concrete Dry Well – Cleaned & Closed
 - Floor Drains – Closed



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Additional Groundwater Data

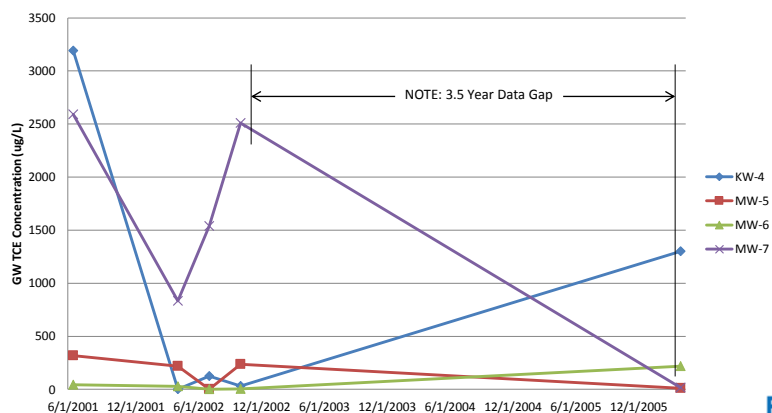
- ▶ GW Monitored Periodically in 2002
- ▶ KW-1, KW-2, & KW-3: ND for TCE
- ▶ KW-4 & MW-7 located in the suspected source area
- ▶ MW-5 & MW-6 considered to reflect downgradient impacts



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TCE Concentration – UIC Closures

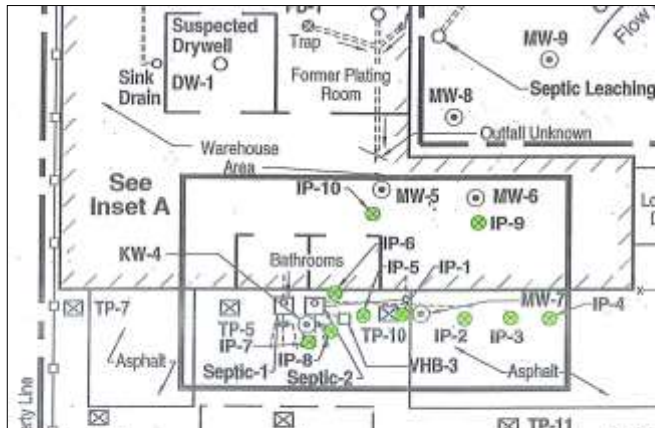
TCE Concentration, Impact of UIC Closures



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Remedial Action #2 - ISCO

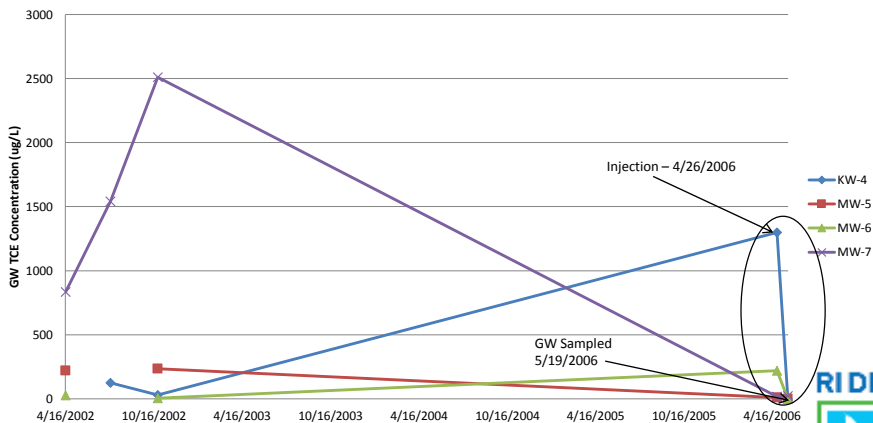
- ▶ 2006 – Propose to Inject 4300 gallons of 10% Permanganate Solution across 10 Injection Points



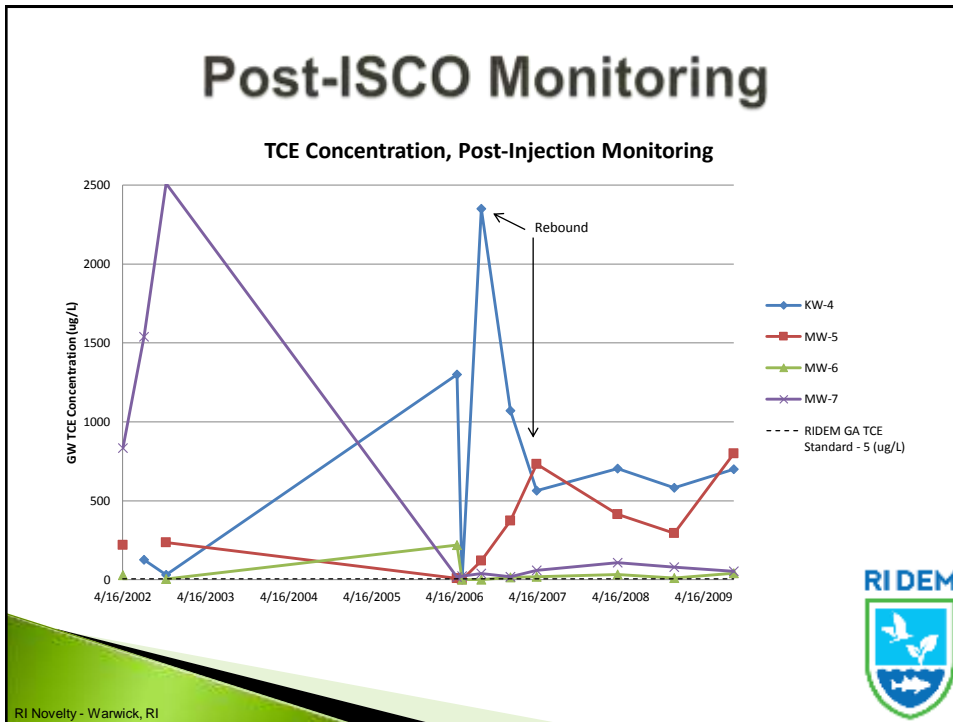
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ISCO – Immediate Impact

TCE Concentrations - 3 Weeks Post-ISCO



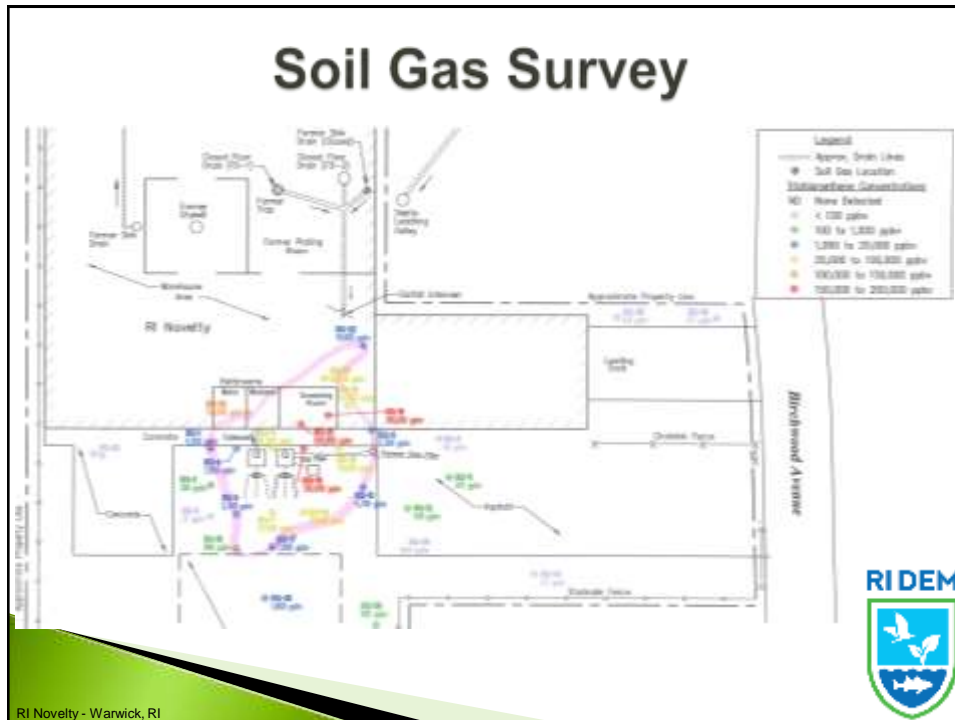
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Supplemental Site Investigation

- ▶ GW fluctuates a bit over the 4 years following ISCO while groundwater ultimately shows little to no improvement as a result of ISCO event
- ▶ Additional site investigation performed in 2009 in light of “possible improper storage of chemicals” by tenant
- ▶ Most comprehensive investigation to date
- ▶ Vapor Intrusion Potential discussed for the first time on this site





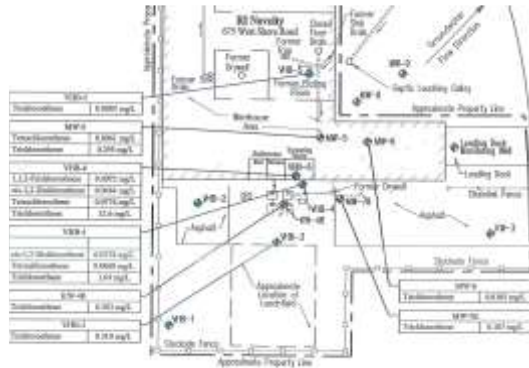
Soil Assessment

- ▶ Soils continue to exceed GA Leachability Criteria but remain below RDEC for TCE
- ▶ Closer examination of soil cores taken from the “source” area reveals dark, silty lenses
- ▶ Analysis shows that these small lenses contain much higher concentrations of CVOCs than the composite samples from which they came
 - Example: a one inch silty lens taken from the 2-4’ core in SB-1 contained TCE at 4.5 ppm, significantly higher than the 0.042 ppm TCE result from the same 2-4’ SB-1 section
- ▶ CVOCs being retained in these pockets

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Area of Impact Defined

- ▶ Groundwater sampled at various depths
 - Found that shallower GW samples (10-20' bgs) consistently exhibit higher TCE concentrations than deeper wells (25-40' bgs)
- ▶ New round of GW sampling plus soil gas data provide more comprehensive picture of the TCE impacted area
- ▶ Over 50% of impacted soil area likely underneath the building centered in the vicinity of screening room and Septic-2



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Remedial Action #3 - SVE

- ▶ November 2009 – January 2010 – Pilot study conducted to assess the effectiveness of implementing a soil vapor extraction system
- ▶ 2 Vent Wells; One inside, One outside
- ▶ Pilot test demonstrates significant rates of SVE and ROI at relatively low vacuums
- ▶ SVE wells beneath the building able to maintain negative pressures and reduce TCE concentrations in the vadose zone, thus mitigating the potential for VI

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SVE System Design

- ▶ Based on approx. soil pore volume of 1600 cubic feet (40' x 40' x 5' deep, porosity of 0.2)
- ▶ 6 interior SVE wells, 2-4' deep, approx. 15' apart connected via underground piping to SVE blower system
- ▶ 6 exterior stone filled extraction trenches up to 5' deep w/ perforated PVC at 4' bgs, connected to an exterior vault box w/ sampling port and then run to interior treatment shed containing a granular activated carbon system



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SVE – The First 6 Months

- ▶ System flows averaged 107 standard cubic feet per minute (scfm) at an average vacuum of 12" of water column (WC)
- ▶ Approximately 132 lbs (10.8 gal) of CVOCs removed – Calculated using the average combined venting rates and average influent CVOC PID readings
- ▶ However; groundwater does not show much fluctuation



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The Next 2 Years (April 2011 – May 2013)

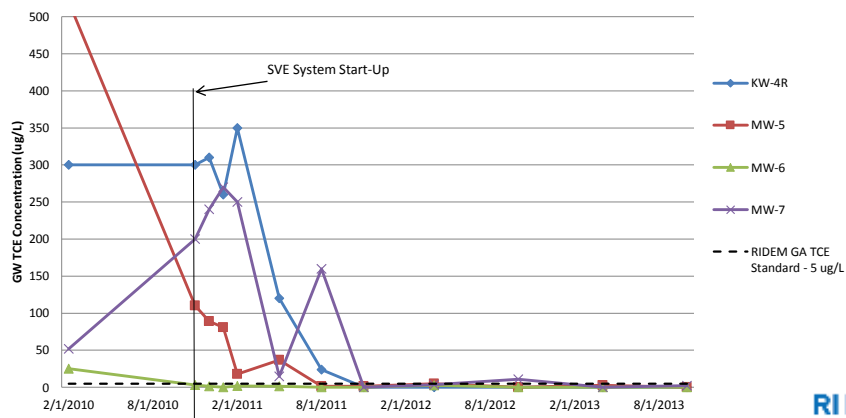
- ▶ System continues to operate at similar flow rates and vacuum
- ▶ Significantly less CVOOC removal – Approx. 12.6 lbs removed over the 2 year period
- ▶ Groundwater unseasonably high for the majority of the 2 year period leaving less of the unsaturated zone exposed for venting
 - About 2/3 of the CVOOC removal in this time period occurred late summer 2012 when the water table was lower for a short time



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SVE Impact to Groundwater

TCE Concentration in GW Wells - SVE



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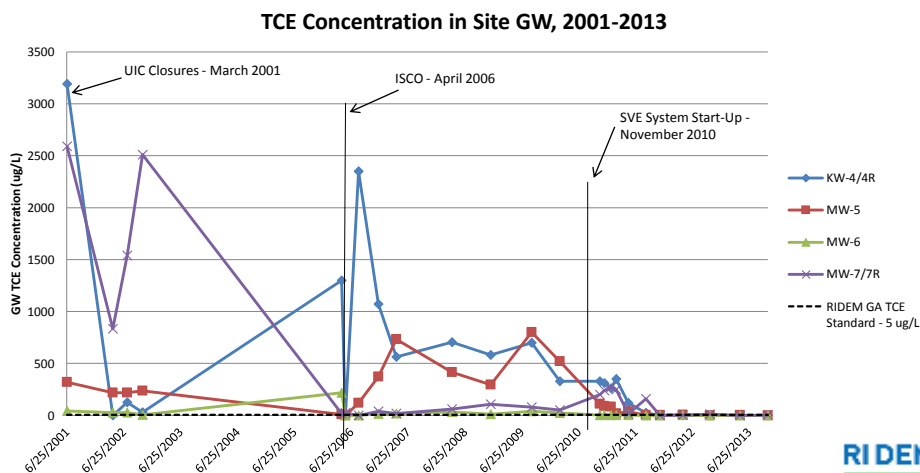
Present Site Status

- ▶ VI potential significantly reduced however sub-slab venting system will remain
- ▶ Very close to achieved compliance with RIDEM's GA groundwater standards
- ▶ Next Steps:
 - Shut-down interior SVE & continue exterior venting
 - Limited quarterly soil vapor sampling
 - Continue semi-annual & annual GW monitoring
 - Start GW sampling in accordance with closure guidelines



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Impact of 3 Different Remedial Actions



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Questions?

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