RI Novelty – TCE Case Study
Rhode Island Department of Environmental Mgmt.
Office of Waste Management

NEWMOA TCE Vapor Intrusion Workshop
Providence, Rhode Island
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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
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

Site History

- One Acre Site developed in 1950s
  - Jewelry Manufacturing, 1958 – mid 1970s
  - Industrial Packaging Co., 1980s
- 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
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 tanks as TCE source

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
**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

**TCE Concentration – UIC Closures**

TCE Concentration, Impact of UIC Closures

NOTE: 3.5 Year Data Gap
Remedial Action #2 - ISCO

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

ISCO – Immediate Impact

TCE Concentrations - 3 Weeks Post-ISCO

- Injection - 4/26/2006
- GW Sampled 5/19/2006
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
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

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
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

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
The Next 2 Years (April 2011 – May 2013)

- System continues to operate at similar flow rates and vacuum
- Significantly less CVOC 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 CVOC removal in this time period occurred late summer 2012 when the water table was lower for a short time

SVE Impact to Groundwater

TCE Concentration in GW Wells - SVE

- GW TCE Concentration (ug/L)
- SVE System Start-Up
- SVE
- RIDEM GA TCE Standard - 5 ug/L

RI Novelty - Warwick, RI
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

Impact of 3 Different Remedial Actions

TCE Concentration in Site GW, 2001-2013

- UIC Closures - March 2001
- ISCO - April 2006
- SVE System Start-Up - November 2010

- KW-4/4R
- MW-5
- MW-6
- MW-7/7R
- RIDEM GA TCE Standard - 5 ug/L
Questions?

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