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Practical Considerations for Source Area Treatment: Interim Measures

Dean Williamson, P.E.
CH2M HILL Constructors, Inc.
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Presentation Outline

- Advantages of In-situ Groundwater Source Area IMs Conducted at the Charleston Naval Complex (CNC)
  - Within the overall project environment (BRAC, Federal property transfer, RIP/OPS, GFP Contract)
  - Within RCRA Corrective Action Context
- Practical Considerations for In-situ Source Area Treatment Projects

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What is the Charleston Naval Complex (CNC) and the CNC Insured Environmental Contract?

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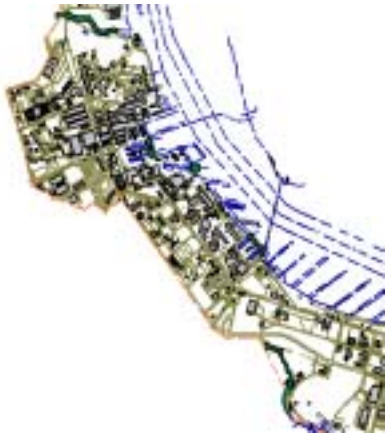

Navy's First Performance-Based Insured Fixed-Price Remediation Contract:

- investigations, remedial planning, and remedial action to close out over 170 RCRA and over 70 UST sites, plus Pb-based paint abatement, other work
- preparing property transfer documentation (FOST/EBS)
- O&M for remedial systems for 20 years
- investigation and remediation of newly discovered Navy-related sites for 20 years
- $65MM of combined Remediation Stop Loss and Environmental Impairment Liability insurance
- two year target schedule for property transfer

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CNC Insured Fixed Price Project Progress to Date

- Over half the RCRA and most UST sites have received NFA status; on track to have NFA or RIP/OPS for remaining sites in 2003
- ~65 percent of property already transferred to RDA or ready for transfer in 2002; remainder to transfer in 2003
- Nominated by SCDHEC/EPA as RCRA Showcase Pilot
  - viewed by regulators and Navy as a highly successful project and a model for innovative streamlining for RCRA Corrective Action programs
  - significant credit for project success goes to the regulators

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To date, 23 RCRA IMs Completed Including 6 For In-situ Groundwater Source Area Treatment

- Electrical Resistance Heating (ERH) at a Dry Cleaner (AOC 607)
- In-situ Chemical Oxidation (ISCO) at three sites - dichlorobenzenes (AOC 561,SWMU 196); DDD (SWMU 38)
- In-situ Chemical Reduction (ISCR) ZVI - hexavalent chromium (SWMU 25/70) and TCE (SWMU 166)

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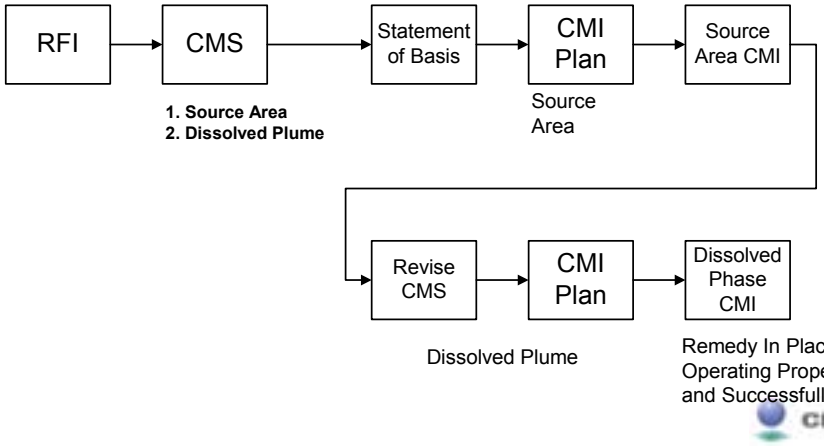
Why Interim Measures at the CNC?

Without an IM step, Source Area Treatment and Property Transfer are Delayed



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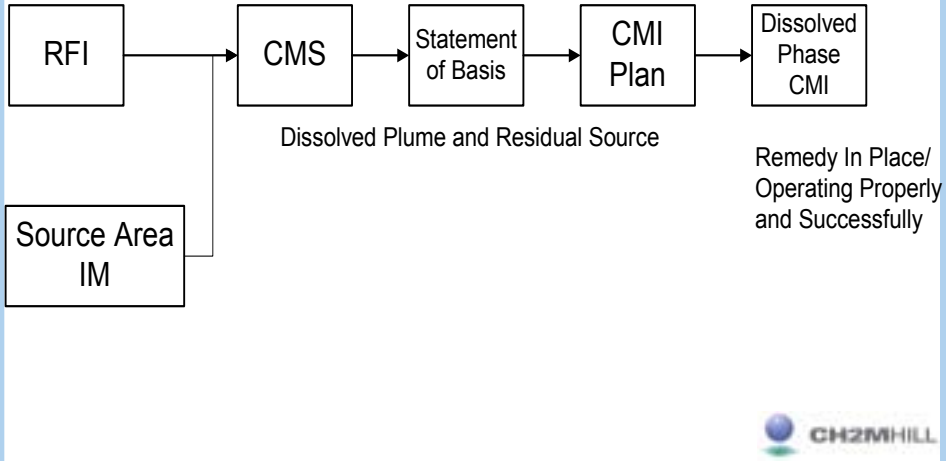
With Interim Measures Source Area Treatment, Remediation and Property Transfer are Accelerated



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A Few Practical Considerations for Implementing Successful Source Area Treatment IMs

- Safety First
- Importance of Effective Source Area Delineation and Valid Site Conceptual Model
- Understanding Project Delivery Process for Source Area Treatment IMs
- Effective Risk/Uncertainty Management

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Consideration No 1.- Safety is *always the first and most important consideration*

- **Protect site workers, community members, and the local environment**
- **Many of the potential hazards from in-situ technology delivery systems may be unfamiliar to stakeholders (energetic materials and conditions)**
- **Think about what could happen, anticipate impacts and how to prevent incidents, and design safety into your IM**

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Safety Considerations at ERH IM for AOC 607 Included Physical, Chemical, and Mechanical Issues

- Tenant Relocation
- Safety by Design (e.g., equipment interlocks)
- Security Fencing
- Air Emission controls and monitoring
- Electrical potential measurements (equipment and fence)
- Soil Vapor Monitoring
- (Hot) Groundwater Monitoring
- Daily inspections

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At AOC 607 - ERH Vapor Phase Equipment Performed Perfectly - no vapor emissions or subsurface vapor migration

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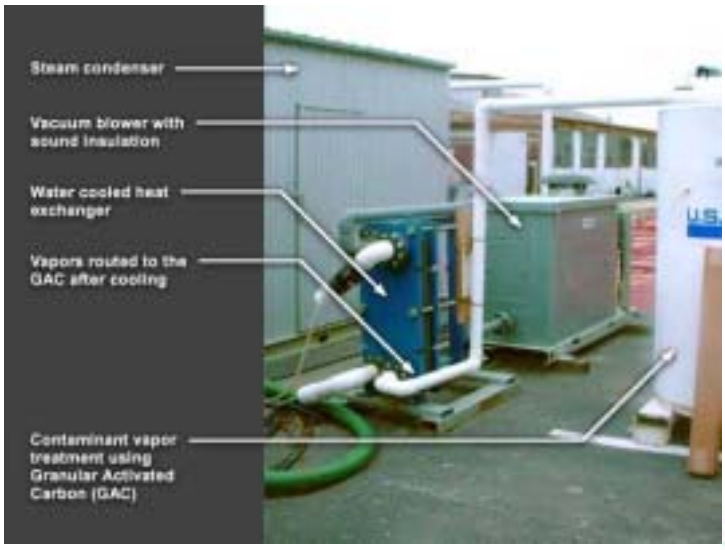

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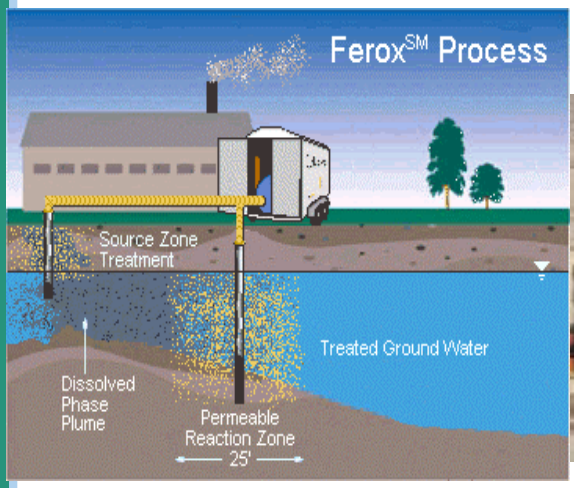
Safety Concerns For In-situ Chemical Reduction (Fer-Ox) Differed from ERH Safety Concerns



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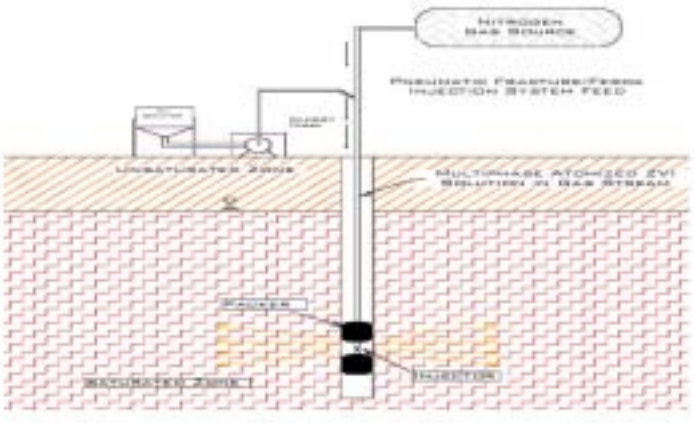
Fer-Ox Process Uses Pneumatic Fracturing to Deliver Various Chemicals Into the Subsurface



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In-situ Chemical Reduction at SWMU 25/70 Was Safely Implemented

Compressed gas and ZVI handling and use, underground utilities, pneumatic injection equipment, drilling

Site access restrictions, structural integrity of buildings/foundations,

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Safety Considerations for ISCO using Fenton's Reagent Include Several Additional Issues

Bulk chemical transport, storage, and handling, reagent injection, sampling, underground utilities, building foundation integrity

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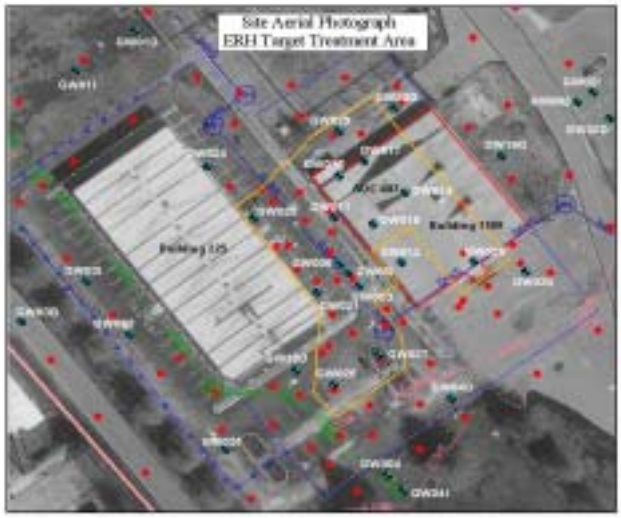
Consideration No 2. - Complete Source Area Characterization and Valid Site Conceptual Model

- High quantity of adequate data often more useful than a few high quality data points - ***different objects than for an RI or RFI***
- Design-related investigations at IM sites led to significant changes in Site Conceptual Model and IM Design



Visualization Software Helpful in Understanding Source Area Morphology

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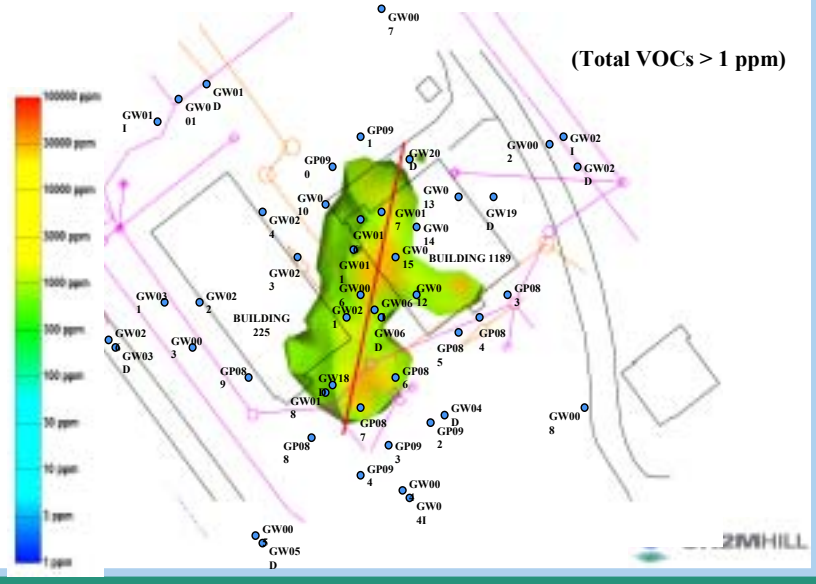
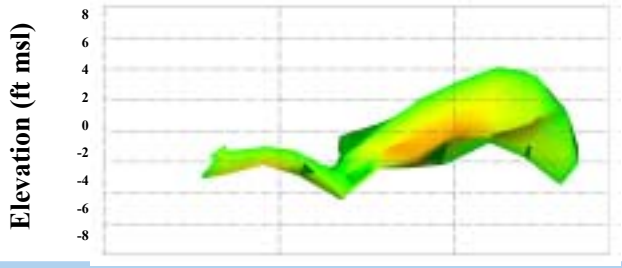


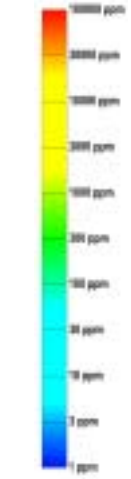
Valid Site Conceptual Model critical for determining best treatment approach

Consider release attributes, hydrogeology, source area topology, spatial distribution (vertical and horizontal), potential migration pathways

Example - AOC 607 PCE Concentrations Greatest Along Clay/Overlying Sediment Interface Near 11 ft bls

Northwest Cross Section





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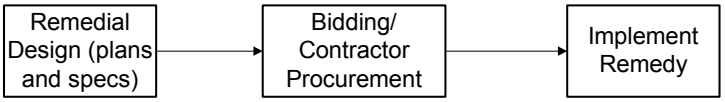
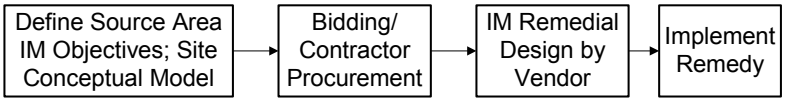
Consideration No 3. - Project Delivery Process is different than for conventional remediation projects



Project Delivery Process for Conventional Remediation



Typical Project Delivery Process for In-situ Source Area Interim Measure

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Considerations for Vendor Procurement for In-Situ Source Area Treatment Projects

- Typically not “constructing” something conventional, but procuring specialty (not “commodity”) services
- Potential Considerations for vendor procurement - experience, safety record, capabilities, interview/presentation
- Procurement Document quality and effective procurement process critical to overall project success

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Questions to Consider Before Entering Into Performance Based Contracting For Source Area Treatment

- How is performance to be measured - mass removal, dissolved phase concentrations, other metrics (temperatures achieved, reagents delivered)?
- How complete is site characterization? How will "changed subsurface conditions" impact performance warranty?
- What is the cost premium for obtaining a performance warranty from contractor? Is it worth it?
- Is performance warranty "enforceable" in the event of remedy failure?

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Consideration No 4. - Managing Risk and Uncertainty - Dealing with the Unexpected

- In-situ technologies are relatively immature; implementation requires skill, science, creativity; unexpected things happen
- Good contingency planning is critical - keeping asking "what if…" and "could this…" during design/planning steps
- Review anecdotal information from other projects
- Monitoring during implementation is critical
  - AOC 607 - subsurface temperature, subsurface vapors, VOCs in GW and recovered vapors, voltages, ambient air
  - ISCO projects - VOCs and CO2 in wells, mass of reagent delivered per well
  - ISCR projects - iron delivered, radius of influence of injection, ORP indicators, VOC and hexachrome concentrations over time

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Risk/Uncertainty Management - Keep, Share or Transfer?

- What uncertainties are you better off self-managing rather than transferring?
  - Site characterization uncertainties? DNAPL extent? Inadvertent DNAPL mobilization? Regulatory approval? Permitting?
- What uncertainties are appropriate for the vendor to be responsible for?
  - Performance warranty? Schedule? Subcontracted work critical to their performance?
- What uncertainties are better shared?
  - You decide

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Example of Process Monitoring During ERH Implementation: Temperature Rise at 11 ft bls

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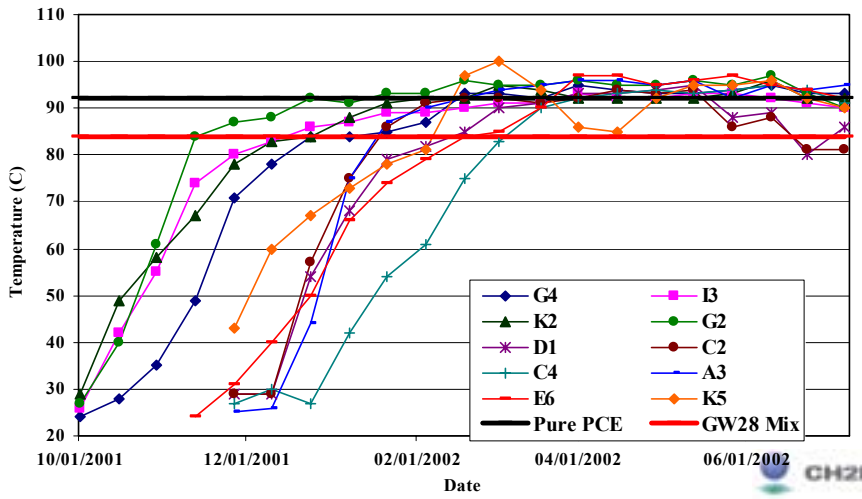

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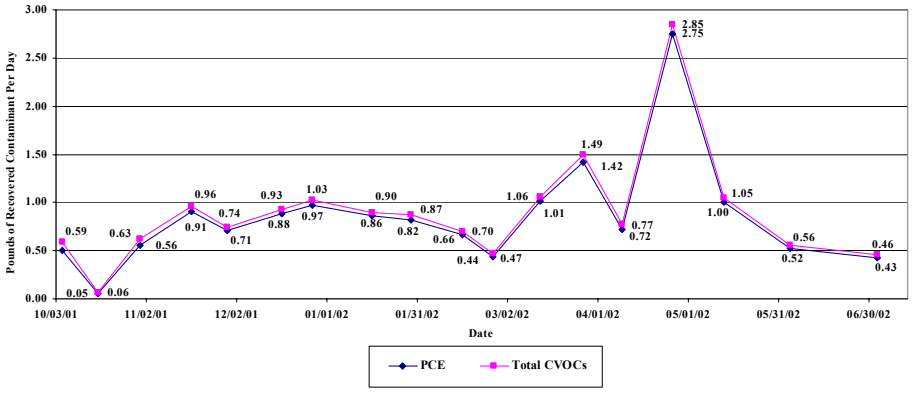
PCE Mass Recovery Rate Peaked when Groundwater at 11 ft bls Reached Target Temperature



Total CVOCs are a concentration summation of 1,1-DCE, trans-1,2-DCE, cis-1,2-DCE, TCE, PCE, and vinyl chloride

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Performance To Date and Lessons Learned Summary

- AOC 607 ERH - 79% VOC reduction (dissolved phase) versus 95% target; electrode spacing/ soil drying, acetone generation; no rebound so far
- SWMU 196 - ISCO - 82% VOC reduction (dissolved phase) versus 90% target; multiple phases of injection helped
- SWMU 25/70 - Fer-Ox - 70% hexachrome reduction, ZVI still active
- AOC 561 - ISCO - 95% VOC reduction (dissolved phase); small site

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Summary: Source Area Treatment IMs May Offer Significant Benefits

- Benefits at the CNC included expediting the RCRA Corrective Action process and Property Transfer Objectives (RIP/OPS)
- Practical Considerations for In-situ Source Area IMs Include:
  - Safety First
  - Delineate Source Area and Develop Valid Site Conceptual Model
  - Understand Project Delivery Process for Source Area Treatment Projects
  - Effectively Manage Business and Technical Risks and Uncertainties

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