Management and Treatment of Complex Groundwater Contamination at DoD Installations

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DoD Cleanup Program Scope

- The Defense Environmental Restoration Program (DERP) addresses the impacts of releases of hazardous substances, military munitions, and building demolition and debris removal.
- Authorities: CERCLA, SARA, RCRA, and EO 12580.
- DoD budgets over $2 billion annually.
- There are 34,058 DERP sites at:
  - 1,729 Active installations
  - 234 BRAC installations
  - 2,691 FUDS properties
- Program supports military readiness by protecting human health and the environment, and access to critical resources vital to mission training and operations.
  - In 50 states, District of Columbia and U.S. Territories.
DERP Goals

• Select and implement remedies at all sites to be protective of human health and the environment and reduce risk

• DERP uses a prioritization system to address highest risk sites first

• Make well informed, intelligent, responsible remedy decisions:
  – Ensure adequate site characterization data is obtained
  – Consider current and reasonably anticipated land use
  – Evaluate risk scenarios and appropriate response actions to be protective
  – Consider time and points of compliance when selecting remedies
  – Consider regulatory and stakeholder concerns
  – Consider green and sustainable remediation scenarios
  – Implement fiscally responsible remedial solutions
Performance Goals

Goal: Achieve RIP/RC at Army, Navy, Air Force, and DLA sites by FY2014

DoD Response Complete

FY01-FY10: Actual
FY11-FY14: Projection
Historic IRP Cost-to-Complete Estimates*

* Includes installation project funding allocated to individual sites and does not include program management and other support costs.
Problematic GW Sites

• Technical Issues
  – Large (expansive) plumes with low concentrations
  – High concentration source areas where even very aggressive treatment has little effect on mass flux, site risk, or timeframe for remediation
  – Source term desorbing from low permeability layers at low concentrations for long periods
  – Karst/Fractured rock sites

• Regulatory Issues
  – MNA Perception is No Action
  – TI Waiver Inconsistencies across Regions and States
  – ARAR (i.e., MCL) applied at Remedial Investigation phase without site-specific risk assessment; can result in an unattainable goal where risk reduction plateaus.
Thoughts for Better Decision Making

• When practical, use treatment trains/adaptive site management
  – Reduce source terms
  – Mitigate plume migration
  – Transition from aggressive active treatment to more passive alternatives based on technology capabilities
  – MNA is a viable remedy option in some cases, particularly in latter stage
  – Monitor and maintain LUCs to prevent risk pathway
  – More discussion upfront on cleanup goals and long-term objectives

• Consider cost/benefit trade-off
  – Green and Sustainable Remediation Strategies
  – Is benefit defined as mass removal or reduced risk or beneficial reuse?
  – Which benefit should be the driver and when?
  – How should benefits be evaluated, quantified, and ranked?

• When is plume treatment not feasible? Should wellhead treatment be considered more often to balance resource requirements while ensuring safe drinking water?
Regulatory Initiatives Recognizing Technical Limitations

- ITRC initiatives on site management issues
- State designations regarding beneficial uses of groundwater
- Containment Zone policy in California
- Numerous state initiatives to address “low risk” sites (e.g., Region 2, CA-RWQCB)
Groundwater Contamination Issues Discussed in Several National Reports

- EPA, 2004, DNAPL Remediation: Selected Projects Approaching Regulatory Closure
- Environment Agency (England), 2003, Illustrated Handbook of DNAPL Transport and Fate in the Subsurface
- ITRC, 2002, DNAPL Source Reduction: Facing the Challenge
- ESTCP (Project ER-0832) - Alternative Endpoints and Strategies Selected for the Remediation of Contaminated Groundwater
Select DoD Groundwater Projects at ESTCP - SERDP

- Quantifying Life-Cycle Environmental Footprints of Soil and Groundwater Remedies for Green and Sustainable Remediation – January 2011 (ER-201127)

- Screening Tool for High-Resolution, Real-Time Mapping of Chlorinated Solvent DNAPL Architecture – January 2011

- Alternative Endpoints and Strategies Selected for the Remediation of Contaminated Groundwater – Dr. Rula Deeb

- Improved Understanding of Sources of Variability in Groundwater Sampling for Long-Term Monitoring Programs - Dr. Chuck Newell

- Novel Sensor for Real-Time Characterization and Monitoring of Chlorinated Hydrocarbons in Groundwater (ER-1605)

Source: www.serdp.org
• Future Options for Management in the Nation's Subsurface Remediation Effort
  – Ongoing project: September 2009 – December 2011

• Objective: To improve hazardous waste management at problematic sites where the presence of recalcitrant and/or poorly accessible contaminants is preventing site closure.
  – Size of the Problem
  – Current Capabilities
  – Correlating Source Removal with Risks
  – Future of Treatment Technologies
  – Better Decision Making
• Overview of ITRC Studies related to complex groundwater sites and DNAPL – Anna Willett (ITRC)

• Groundwater Plume Behaviors: Matrix Diffusion and Mass Discharge – Dr. Chuck Newell (GSI Environmental)

• Alternative Endpoints as Treatment Objectives – Dr. Rula Deeb (ARCADIS / Malcolm Pirnie)

• Importance of Hydrogeologic Characterization to treatment design – Ms. Claire Tiedeman (USGS)

• Development and Documentation of Exit Strategies leading to Site Closure / Response Complete – Joann Socash (Booz Allen Hamilton)
Questions?

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