Workshop on Fate, Transport, and Remediation of Chlorinated Solvents in Fractured Sedimentary Rocks at the former Naval Air Warfare Center, West Trenton, NJ

Wednesday September 26, 10:20 am to 3:00 pm.

This workshop will present results of multidisciplinary investigations conducted by the U.S. Geological Survey (in cooperation with the U.S. Navy, Geosyntec Consultants, and ECOR Solutions) of trichloroethene (TCE) distribution, transport, and biodegradation in fractured mudstones underlying the former Naval Air Warfare Center (NAWC), West Trenton, NJ. Beginning in the 1950's, TCE was released to land surface in dissolved and pure phases, and has been observed in ground water as deep as 60 m. Natural microbial reductive dechlorination has partially transformed TCE to cis-1,2-dichloroethene (cDCE), vinyl chloride (VC), and ethene. A pump and treat system has operated for about a decade, but dissolved contaminant concentrations remain high (up to ~140 mg/L TCE, ~20 mg/L cDCE, and ~4 mg/L VC), suggesting that substantial contaminant mass remains in the low-permeability part of the rock. A bioaugmentation pilot study was conducted to investigate enhanced biodegradation of TCE and its daughter products.
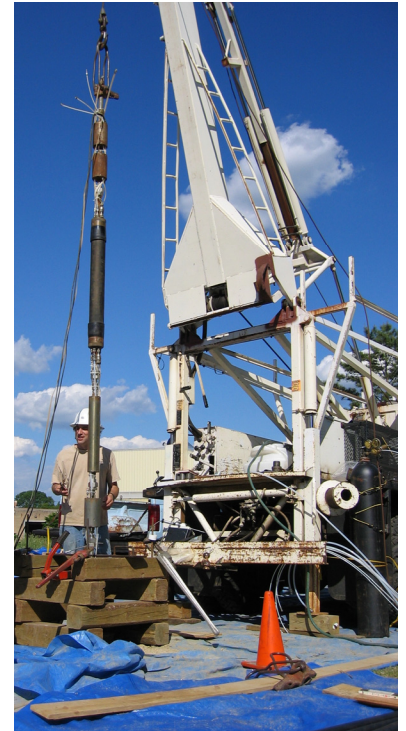
Oral and poster presentations, computer displays, rock core, and field equipment will be used to illustrate methods, results, and interpretation of field investigations at NAWC. Presentations will focus on three themes:

Finding flow and transport paths: Understanding the fate of chlorinated solvents in fractured rock and designing effective remediation strategies first requires a detailed understanding of the paths of fluid and chemical movement. At NAWC, results of hydraulic and tracer tests and geologic and geophysical characterization have been used together with flow modeling to identify these paths.

Monitoring contaminants, geochemistry, and microbiology: Innovative approaches to monitoring contaminant concentrations, water chemistry, and redox conditions have shown significant spatial variability of these constituents, reflecting the highly heterogeneous geologic and geochemical environment. This variability is a critical factor in designing remediation strategies.

Evaluating remediation effectiveness: Pump and treat has been relatively inefficient, in terms of contaminant mass removed per volume pumped. Bioaugmentation shows promise for increasing natural degradation rates and enabling complete transformation of TCE. Reactive transport modeling that synthesizes multidisciplinary subsurface data is being used to compare remediation strategies.

Workshop Schedule

Introduction

10:20 – 10:40 Oral presentation:
Multidisciplinary studies of flow, transport, and remediation   C.R. Tiedeman
at the former Naval Air Warfare Center

Finding flow and transport paths

10:40 – 11:00 Oral presentation:
Finding flow and transport paths   D.J. Goode

11:00 – 11:40 Poster presentations:
Mapping the 3D distribution of subsurface sedimentary strata   P.J. Lacombe, W.C. Burton
Delineating geologic heterogeneity with surface geophysics   K.J. Ellefsen
Using borehole flow logging to identify permeable fractures   J.H. Williams, C.D. Johnson
and local-scale hydraulic connections
Identifying site-scale hydraulic connections and properties   C.R. Tiedeman, D.J. Goode
through aquifer testing and flow modeling
Using tracer tests to discern transport paths and properties   A.M. Shapiro, P.A. Hsieh

Monitoring contaminants, geochemistry, and microbiology

11:40 – 12:00 Oral presentation:
Monitoring contaminants, geochemistry, and microbiology   A.M. Shapiro

12:00 – 1:20 **LUNCH: on your own**
(Note: Lunch time has changed from that printed in the Conference Program)

1:20 – 1:50 Poster presentations:
Monitoring the vertical variability of contaminants and   T.E. Imbrigiotta, C.R. Tiedeman
geochemistry using multi-level borehole packers
Characterizing the distribution of chlorinated solvents   D.J. Goode, A.M. Shapiro
in the rock matrix
Understanding the site-scale distribution of chlorinated   P.A. Hsieh
solvents in relation to the geologic framework
Characterizing natural biodegradation by monitoring redox   P.M. Bradley, F.H. Chapelle
conditions and microbiology

Evaluating remediation effectiveness

1:50 – 2:10 Oral Presentation:
Evaluating remediation effectiveness   F. H. Chapelle

2:10 – 2:40 Poster Presentations:
Estimating the contaminant mass removed by pump and   P.J. Lacombe
treat operations
Pilot-scale implementation of bioaugmentation to remediate   M.F. DeFlaun
chlorinated solvents
Monitoring natural biodegradation by analyzing light stable   K.M. Revesz
isotopes of different compounds
Using reactive transport modeling to compare remediation   G.P. Curtis
strategies

Wrap-Up and Discussion

2:40 – 3:00 **Workshop summary, audience questions, and discussion**   All workshop presenters