Innovative Visualization, Modelling, and Optimisation Tools for Improving Remediation Efficiency

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Workshop to be presented at the CleanUp 2017 Conference (Melbourne, Victoria)
September 10, 2017 1-5 pm

Workshop Description

This course presents case studies to demonstrate how innovative software tools may be used to:

- Improve conceptual site models
- Estimate remediation timeframe
- Reduce remedial costs
- Optimize the long-term management and closure of complex sites.

Workshop case studies focus on contaminated sites with PFOS/PFOA, chlorinated solvents, hydrocarbons, and metals. Tools highlighted in this course include:

1. **Visual Bio** (FREE), radial diagram software uniquely designed to clearly demonstrate where contaminants are biodegrading in groundwater.

2. **NAPL Depletion Model** (FREE) for evaluating source zone natural and enhanced attenuation.

3. **In-Situ Remediation (ISR-MT3DMS)**, a flexible reactive transport model for improving remedial efficiency and evaluating the effects of back-diffusion. Specialized functionality for modeling MNA (e.g. abiotic), EISB (e.g. emulsified oil), ISCO, PlumeStop® Liquid Activated Carbon™, back-diffusion, colloidal and bacteria transport, contact time, mass flux, and unique visualization tools.

4. **Physics-Based Management Optimization (PBMO™),** an award-winning technology developed by Dr. Larry Deschaine of HydroGeoLogic for optimizing site exit strategies.

Visual Bio: Software for Visualizing MNA and Enhanced Bioremediation

Unique radial diagram software which reduces time and cost in evaluating where contaminant biodegradion is occurring. A single Visual Bio figure may replace up to 5-10 chemical isoconcentration figures.

Visual Bio also includes a simple graphical tool for quantifying relative redox conditions in groundwater, to aid in delineation of distinct groundwater zones with different biodegradation mechanisms and rates.
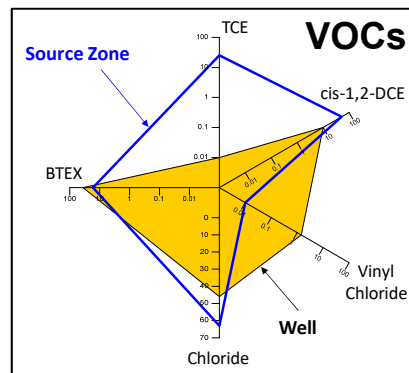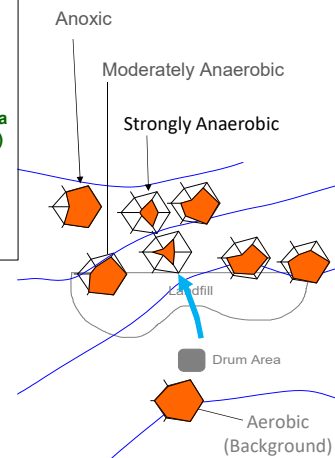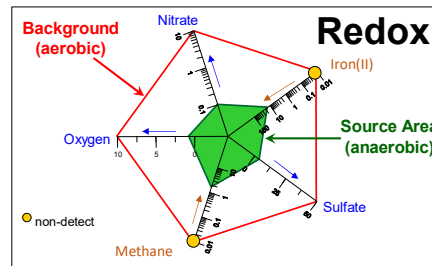
Size of redox radial diagram indicates relative oxidizing or reducing conditions.

VOC radial diagrams show source depletion and flow path biodegradation.

More information on Workshop

www.porewater.com/education.html
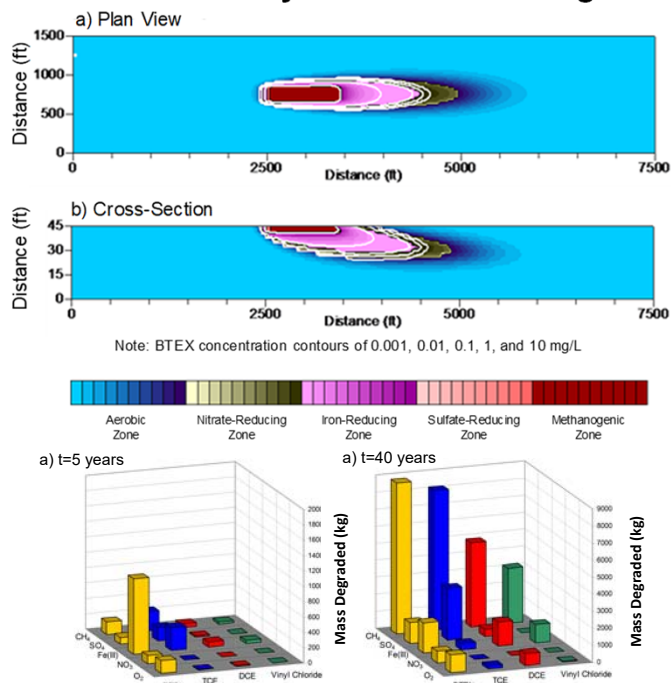www.cleanupconference.com/sessions/visual-bio/

FREE SOFTWARE
Visit **www.porewater.com** to download Visual Bio and the NAPL Depletion Model.

In-Situ Remediation (ISR-MT3DMS) Reactive Transport Model
- Scheduled for Release in Fall 2018 -

Featured Case Study: MNA at Plattsburgh AFB

a) Plan View

b) Cross-Section

Note: BTEX concentration contours of 0.001, 0.01, 0.1, 1, and 10 mg/L

Aerobic Zone | Nitrate-Reducing Zone | Iron-Reducing Zone | Sulfate-Reducing Zone | Methanogenic Zone

a) t=5 years   a) t=40 years

Advanced modeling features in ISR-MT3DMS

- Coupled oxidation-reduction reactions and rate-dependent mineral precipitation/dissolution
- Straight- and branched-chain pathways for oxidation, reduction, and co-metabolic degradation mechanisms
- Instantaneous, first-order, or second-order degradation rates dependent on substrate and inhibitor concentrations
- Flexible reaction framework for chlorinated solvents, hydrocarbons, metals, PFAS, and radionuclides
- 1-D local domains to enable back-diffusion modeling
- Colloidal transport of emulsified oil, Regenesis PlumeStop® Liquid Activated Carbon™, and bacteria
- Unique redox zone visualization and radial diagram tools
- Contact time calculator for remedy optimization

Featured Case Study: Regenesis PlumeStop® for PFOS and PFOA.
Porewater Solutions is collaborating with IRSL to model the injection of PlumeStop® which successfully remediated PFOS and PFOA plumes at a Canadian site.

Grant R. Carey, Ph.D., P.Eng. is President of Porewater Solutions, and is expert in mathematical modeling, chemical fate and transport, and NAPL characterization. Grant has a Ph.D. in Civil Engineering from the University of Guelph, and has worked on projects across the United States and Canada. Grant has also developed industry-leading modeling and visualization software including In-Situ Remediation (ISR-MT3DMS) for optimizing remediation and/or modeling diffusion-dominated transport, as well as Visual Bio, the NAPL Depletion Model, Vapor-2D, BioRedox-MT3DMS, and the Remediation ToolKit which includes SEQUENCE, BioTrends, and BioTracker. Grant is also an Adjunct Professor in the Department of Civil Engineering at the University of Toronto, where he is collaborating on research related to back-diffusion and NAPL remediation. Grant has published or delivered more than 90 technical papers and short courses, and was previously a trainer for ITRC web seminars on Mass Flux/Mass Discharge, and Remediation of Contaminated Sediments.

Deacon Larry M. Deschaine, PhD, PE, is a Complex Adaptive Systems and Optimization expert with over 30 years' commercial experience. A curious life-long learner, he began his formal academic career at the Massachusetts Institute of Technology (MIT) in 1980 and now has four degrees in three fields (engineering, science and theology). Dr. Deschaine earned Grand Prize distinction the 2017 American Academy of Environmental Engineers and Scientists competition in the Research Category. He attained a US Vice-Presidential Hammer Award from 2007 Nobel Laureate Albert A. Gore Jr. for business process optimization, and set five national records in sports. His award-winning PhD research produced a self-adaptive universal modeling algorithm which formally integrates human expertise, real world observations, physics, engineering and social models then automatically writes a descriptive equation of the system. The process delivers high fidelity models for use in "what-if" scenario planning and systematic optimization of complex environmental challenges.

Porewater Solutions (PWS) is recognized for its innovative and expert consulting services for contaminated sites and regional water resources, with specialization in mathematical modeling, environmental forensics, and litigation.
We typically work on complex projects where technical excellence is needed to provide our clients with cost-effective solutions. Our clients include multinational manufacturing organizations, law firms, and both large and small consulting firms. Porewater Solutions develops industry-leading modeling and visualization software tools which improve the characterization and remediation of complex sites. We also deliver high quality continuing education to professional engineers and scientists worldwide. Porewater Solutions invests in a comprehensive research and development program to ensure we offer state-of-the-art consulting services, software, and education products. This includes collaborating with university researchers, technology developers, and remediation contractors.

Self-Paced Courses Coming in 2018!

Starting in 2018, Porewater Solutions will be offering a wide range of multimedia courses which will be distributed on a USB for use anywhere, any time. Course topics will include NAPL, coastal hydrogeology, MNA, in-situ remediation, chemical fate and transport, beginner and advanced modeling techniques, environmental forensics, back-diffusion, and long-term management strategies for complex sites.