

TECHNICAL PRESENTATIONS

Sessions and Panel

The technical program is composed of 65 sessions and 3 panels, which are grouped thematically into 8 tracks (A–H). See the Program at a Glance and the Poster Schedule tables (pages 6–8) for an overview of the session and panel titles and the days each will be conducted. Listed below are the presentations scheduled as of December 15, when this listing was compiled. Presentations are listed in alphabetic order by title. For each presentation, the author list appears in italics, and the name and affiliation of the person scheduled to give the presentation follows the author list. Each title beginning with an asterisk (*) is to be presented as a poster presentation. The program is subject to change.

A1. ENVIRONMENTAL TRANSPORT PROCESSES AND BIOAVAILABILITY OF PAHS: BRIDGING THE GAP BETWEEN SAMPLING, ANALYSIS, AND RISK

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Ryan L. Fimmen (Battelle)

Upal Ghosh (University of Maryland Baltimore County)

* Daubert vs. Emil Fischer vs. Merrill-Dow Pharmaceuticals. *G.K. Shkuda.*

Gregory K. Shkuda (Environmental Resources Management/USA)

* DGGE/qPCR Analysis of Sediments as Evidence of Natural Attenuation of Crude Oil in a Tropical Rainforest. *K.A. Morris, D. Ross, S. Peterson,*

H. Pirela, and R. Langstroth.
Kevin A. Morris (ERM/USA)

Ecological Risk and Bioavailability Assessment of a Crude Oil-Impacted Site in a Tropical Rain Forest. *S. Peterson, K.A. Morris, D. Ross, H. Pirela, R. Langstroth,*

S. Stout, and B. Liu.
Kevin A. Morris (ERM/USA)

* Expediting Natural Attenuation of Creosote-Contaminated Soil. *A. Sinkkonen, S. Kauppi, N. Hui, R. Strommer, and M. Romantschuk.*

Aki Sinkkonen (University of Helsinki/FINLAND)

* Extraction of Polycyclic Aromatic Hydrocarbons (PAHs) from Sand Using Vegetable Oil. *E.V. Lau, S. Gan,*

and H.K. Ng.

Ee Von Lau (The University of Nottingham Malaysia Campus/MALAYSIA)

Investigating Differential Binding of PCDD/Fs, PCBs, and PAHs, in Sediment Using Selective SFE. *S.B. Hawthorne, D.J. Miller, C.B. Grabanski, I. Windal,*

J. Davis, Y. Chai, M. Wilken, and G. Martin.

Steven B. Hawthorne (University of North Dakota/USA)

In-Well Tests to Determine Indigenous Naphthalene Biodegradation under Sulfate-Reducing and Methanogenic Conditions. *C.L. Dona, T. Georgian,*

C. Coyle, A. Peacock, G. Davis, J. Barker, K. Sublette, J. Wilson, and P. Bowlin.

Carol Lee Dona (U.S. Army Corps of Engineers/USA)

PAH Desorption from Field-Contaminated Soil to a Two-Dimensional Hydrophobic Surface as a Measure of Dermal Exposure. *J. Hu and M.D. Aitken.*

Jing Hu (University of North Carolina at Chapel Hill/USA)

Site-Specific Anthropogenic Background Cleanup Goal for PAHs. *G. Graening, L. Henry, and W. Sadler.*

Guy J. Graening (Brown and Caldwell/USA)

A2. ENVIRONMENTAL IMPACTS OF BIOFUELS

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Tom Higgins (Minnesota Pollution Control Agency)

David Tsao (BP Corporation North America, Inc.)

Anaerobic Biodegradation of Biofuels (Ethanol and Biodiesel) and Proposed Biofuels (*n*-Propanol, iso-Propanol, *n*-Butanol). *C. Adair and J.T. Wilson.*

John T. Wilson (U.S. EPA/USA)

* Application of California's Multimedia Risk Assessment to Biodiesel: Aquatic Toxicity, Biodegradation, and Subsurface Transport. *T. Ginn, T. McKone, D. Rice, K. Scow, M.L. Johnson, J. Miller, and J. Last.*

Timothy Ginn (University of California at Davis/USA)

Environmental Fate and Impacts of Biobutanol. *C. Schaefer, R. Steffan, and D. Tsao.*

Charles Schaefer (Shaw Environmental, Inc./USA)

Ethanol-Based Fuel Spills: Impact on Microbial Community Structure and Methane Production.*D. Nelson and P. Novak.*

Denice K. Nelson (University of Minnesota/USA)

Evaluation of Release of Gasoline with 10% Ethanol.*J.G. Freitas and J.F. Barker.*

Juliana G. Freitas (University of Waterloo/CANADA)

*** Guidance on the Remediation of Ethanol Fuel Releases: A Conceptual Model Approach.** *K. O'Reilly, B. Stafford, R. Kolhatkar, and T. Buscheck.*

Kirk T. O'Reilly (Exponent, Inc./USA)

*** How ITRC Provides Regulatory and Technical Guidance on Issues Related to the Use of Biofuels.***B. Gidley and B. Burns.*

William A. Burns (Florida Department of Environmental Protection/USA)

*** Impact of Ethanol on Natural Attenuation of BTEX: Extrapolation from Field Experiments.** *D. Mackay, E. Rasa, K. Scow, L. Foglia, and T. Ginn.*

Douglas M. Mackay (University of California-Davis/USA)

*** Infiltration of Ethanol-Blended Fuels and Subsequent Groundwater Contamination.** *H. McLeod, J.E. Smith, and J.W. Roy.*

Heather McLeod (McMaster University/CANADA)

Investigation of a Large-Scale Subsurface Biodiesel Release. *M. Toso.*

Mark Toso (Minnesota Pollution Control Agency/USA)

*** Investigation of High-Percentage Ethanol-Blended Fuel Releases.** *T. Higgins, M. Toso, and A. Sekely.*

Tom Higgins (Minnesota Pollution Control Agency/USA)

*** Isotopic Fingerprinting of Methane at Sites Contaminated by Ethanol Fuels.** *J.G. Freitas, B. Fletcher, R. Aravena, J.F. Barker, and V. Aquino Neto.*

Juliana G. Freitas (University of Waterloo/CANADA)

*** Modeling the Fate of Groundwater Contaminants That May Result from Leakage of Alternative Fuels.***K. Vuong, M. Goltz, J. Huang, and D.M. Mackay.*

Mark N. Goltz (Air Force Institute of Technology/USA)

*** A Pilot-Scale Investigation of Plume and Microbial Dynamics in Response to Continuous Injection of Ethanol-BTEX Mixtures.** *A.L. Monier, D.E. Gomez, P.J.J. Alvarez, Y. Zhang, Y. He, I. Mimonkina, and W.G. Rixey.*

William G. Rixey (University of Houston/USA)

*** The Potential Role of Carbon Isotopes in Characterization of the Origin and Fate of Biofuels.***R.P. Philp and T. Kuder.*

R. Paul Philp (University of Oklahoma/USA)

A3. APPLICATION OF COMPOUND-SPECIFIC ISOTOPE ANALYSIS IN FORENSIC ANALYSIS**Platform Papers Tuesday/Posters (*) Tuesday Evening****Chairs:** Timothy E. Buscheck (Chevron Energy Technology Company)

Paul B. Hatzinger (Shaw Environmental, Inc.)

Advances in Nontraditional Stable Isotope Analyses: Applications for Cr, Cu, Hg, Mo, Se, and Zn. *J. Sueker.*

Julie K. Sueker (ARCADIS/USA)

Applications of Compound-Specific Isotope Analysis of Vapor-Phase Samples. *P.W. McLoughlin and R.J. Pirkle.*

Patrick W. McLoughlin (Microseeps, Inc./USA)

*** CVOC Source Differentiation with CSIA in Groundwater and Soil Vapor.** *B. Eccarius, U. Desery, M.C. Leahy, and G. Demers.*

Bernd Eccarius (ERM/GERMANY)

Direct Demonstration of Bioremediation via Natural Abundance ¹⁴C Uptake by Bacteria. *G.F. Slater, B. Cowie, and B. Greenberg.*

Greg F. Slater (McMaster University/CANADA)

*** Do Good Things Come in Small Packages? Value in Small Sample Sets for Isotope Analyses.** *J. Sueker.*

Julie K. Sueker (ARCADIS/USA)

*** Dynamics of Chlorinated Ethenes in Groundwater Using Stable Carbon Isotopes.** *T. Saito, N. Tase, M. Tsujimura, T. Hama, M. Nakashima, and D. Sakamoto.*

Takeshi Saito (University of Tsukuba/JAPAN)

*** Investigating Forensics and Remediation Using Chlorine Compound-Specific Isotope Analysis.***P.W. McLoughlin and R.J. Pirkle.*

Patrick W. McLoughlin (Microseeps, Inc./USA)

Isotope Fractionation in Physical Remediation—A Case Study of MTBE Volatilization. *T. Kuder, P. Philp, and J. Allen.*

Tomasz Kuder (University of Oklahoma/USA)

*** Isotopic Characterization for TCE Plume Discrimination and Monitored Natural Attenuation.***E. Tyler and C. Almestad.*

Edward K. Tyler (Kleinfelder, Inc./USA)

*** Leaking Underground Gasoline Storage Tank Forensics—A Case Study.** *Y. Wang.*

Yi Wang (ZymaX Environmental Forensics/USA)

New Developments in Forensic Evaluation of Contaminant Sources and Microbial Degradation Pathways Using CSIA. *B. Sherwood Lollar, J. McKelvie, M. Elsner, S. Mancini, T. Johnson, M. Simpson, A. Simpson, E. Edwards, J. Gossett, L. Jennings, J. Spain, and E. Cox.* Barbara Sherwood Lollar (University of Toronto/CANADA)

A New Method for Cost-Effective Component-Specific Stable Chlorine Isotope Analyses. *K. Sakaguchi-Soder, R. Busse, C. Schuth, J. Jager, and H. Scholz-Muramatsu.* Kaori Sakaguchi-Soder (Darmstadt University of Technology/GERMANY)

* **Reactions of 1,2-Dibromoethane in FeS-Hydrogen Sulfide System: Kinetics and Isotope Fractionation.** *T. Kuder, Y. He, J.T. Wilson, J. Allen, and P. Philp.* Tomasz Kuder (University of Oklahoma/USA)

* **Stable Carbon Isotope Fractionation for Chlorinated Ethenes and Ethanes at a New Jersey Field Site.** *T. Buscheck, T. Hoelen, T. Kuder, and P. Philp.* Timothy E. Buscheck (Chevron Energy Technology Company/USA)

* **Stable Isotope Analysis to Determine Groundwater Benzene and PAHs Source.** *J. Gabry, P. Everds, L. Dudus, and M. Parker.* Jon C. Gabry (Tetra Tech EC, Inc./USA)

* **Stable Isotope Analysis to Evaluate Fate and Transport of Chlorinated Hydrocarbons in a Karst Aquifer.** *C. Beal, K. Bradley, R. Edwards, K. Rice, and G. Sanchez.* Robert W. Edwards (Noblis/USA)

Use of Compound-Specific Isotope Analysis to Distinguish between Vapor Intrusion and Indoor Sources of VOCs. *T. McHugh, K. Gorder, R. Philip, T. Kuder, J. Odencrantz, and H. O'Neill.* Thomas E. McHugh (GSI Environmental/USA)

Use of Geochemical Data and Compound-Specific Isotope Analysis (CSIA) for Assessing the Fate of Chlorinated Compounds in a Regional Plume. *R. Aravena, R. Jerez, B. Parker, J. Cherry, and D. Hunkeler.* Ramon Aravena (University of Waterloo/CANADA)

Photo: Chateau Julien Wine Estate



* = poster presentation

A4. PERCHLORATE SOURCE IDENTIFICATION, DETECTION, AND REMEDIATION

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Bruce C. Alleman (Brown and Caldwell)
W. Andrew Jackson (Texas Tech University)

Chlorine-36 as a Tracer of Perchlorate Origin.

N.C. Sturchio, M. Caffee, A.D. Beloso, L.J. Heraty, J.K. Bohlke, P.B. Hatzinger, A. Jackson, B. Gu, J.M. Heikoop, and M. Dale.
Neil C. Sturchio (University of Illinois at Chicago/USA)

Determination of Perchlorate Sources in Groundwater: Case Studies from Different Regions in the U.S.

P. Hatzinger, J.K. Bohlke, S. Mroczkowski, N.C. Sturchio, L. Heraty, A. Beloso, B. Gu, W.A. Jackson, and B. Rao.
John K. Bohlke (U.S. Geological Survey/USA)

* **Effects of Biofilm Attachment, Sulfite Deoxygenation, and Oyster Shell Buffer on Perchlorate Reduction Using a Novel Sulfur-Oxidizing Bacterial Consortium.** *A. Boles, S.J. Ergas, K. Nusslein, R. McKeever, T. Conneely, and N. Gamini.*

Amber Boles (University of Massachusetts Amherst/USA)

* **Gaseous Electron Donor Injection Technology Application for In Situ Bioremediation of Perchlorate in Vadose Zone Soil.** *H. Lai, P. Evans, H. Cai, A. Lopez, W. Weaver, and H. Amini.*
Han Lai (CDM/USA)

* **In Situ Biotreatment of Perchlorate for Groundwater Source Control.** *T. Leo, L. Lehmicke, K. Coons, W. Schlappi, B. Meyers, and B. Anderson.*
Timothy Leo (Montgomery & Associates/USA)

Isotopic Fractionation Resulting from Biodegradation of Perchlorate. *P. Hatzinger, J.K. Bohlke, N.C. Sturchio, B. Gu, and W.A. Jackson.*
Paul B. Hatzinger (Shaw Environmental, Inc./USA)

* **LC-MS/MS Analysis of Perchlorate in Aqueous and Soil Samples.** *J. Wang, R. Shober, and C. Neslund.*
Chuck J. Neslund (Lancaster Laboratories, Inc./USA)

* **Mechanism of Perchlorate Formation with UV and Ozone in Relation to the Isotopic Composition of Natural Perchlorate.** *B. Rao, W.A. Jackson, J.K. Bohlke, P.B. Hatzinger, B. Gu, and N.C. Sturchio.*
Balaji Rao (Texas Tech University/USA)

*** Perchlorate Adsorption onto Granular Activated Carbon and Subsequent Desorption via Sodium Borohydride.** *J. Santos and M. Guroi.*
Jerome Santos (Shaw Environmental & Infrastructure, Inc./USA)

Stable Isotopic Signature of Natural Perchlorate: Implications to Site Assessment. *W.A. Jackson, J.K. Bohlke, B. Gu, P.B. Hatzinger, B. Rao, and N.C. Sturchio.*
W. Andrew Jackson (Texas Tech University/USA)

*** Use of a Genetic Algorithm to Increase Degradation Rates of Perchlorate by Single Strains and Consortia.** *K.H. Kucharzyk, R.L. Crawford, M. Ederer, T.F. Hess, and A.J. Paszczynski.*
Katarzyna H. Kucharzyk (University of Idaho/USA)

A5. INNOVATIVE SITE ASSESSMENT TOOLS AND TECHNIQUES

Platform Papers Tuesday/Posters (*) Tuesday Evening
Chairs: Michael J. Truex (Pacific Northwest National Laboratory)
Peter J. Bennett (AMEC Geomatrix, Inc.)

Application of Geochemistry and Molecular Biological Tools at a Southeast Asia Groundwater Remediation Site. *T. Buscheck, T. Pearn, R. Kolhatkar, E. Praekulvanich, D. Mackay, K. Sublette, and T. Kuder.*
Timothy E. Buscheck (Chevron Energy Technology Company/USA)

*** Broadening the Application of New Analytical Tools for Remedy-Focused Site Assessment and Performance Monitoring.** *M. Burns, J. Simon, D. Starr, and P. Groff.*
Matthew Burns (WSP Environment & Energy/USA)

*** Contaminant Storage in Heterogeneous Media: Development of Predictive Tools.** *M. Crimi, K. Fowler, G. Jiang, and X. Fu.*
Michelle L. Crimi (Clarkson University/USA)

Detailed Site Investigation Possibilities Using the FLUTe Hydraulic Conductivity Profiling System. *U.S. Dannwolf, P.J. Dennedy-Frank, C. Keller, and K. Schnell.*
Uwe Dannwolf (RiskCom/GERMANY)

*** Determination of the Source of Chloride Impact to Groundwater Using the Hydraulic Profiling Tool.** *J.L. Binder and S.R. Hoffine.*
Jeffrey L. Binder (Burns & McDonnell Engineering Company/USA)

High-Resolution Profiling of Aquifer Permeability and Contaminant Mass. *N. Welty, D. Rogers, and J. Quinnan.*
Nicklaus Welty (ARCADIS/USA)

Improving Subsurface Characterization by Integrating Hydrologic Data with Geophysical Data. *R. Suribhatla, C.M. Mok, and D. Kaback.*
Raghavendra Suribhatla (AMEC Geomatrix/USA)

Isotopic Analysis of Carbon Sources and Degradation Pathways in Soil Vapor and Groundwater. *S.O. Helgen and J.E. Vondracek.*
Steven Helgen (Integral Consulting, Inc./USA)

*** Monitoring of In Situ Chemical Oxidation (ISCO) Treatment with Time-Series Geophysical Surveys, Savage Municipal Water Supply Superfund Site, Milford, New Hampshire.** *P.T. Harte, R. Mongeon, R. Goehlert, B. Nowack, T.E. Smith, and J.R. Degnan.*
Bette Nowack (Weston Solutions, Inc./USA)

*** Permeability Testing of a Sealed Steel Sheet Pile Wall for a Contaminated Site.** *R.E. Saichek and J.W. Schulenberg.*
Richard E. Saichek (U.S. Army Corps of Engineers/USA)

*** Practical Use of Flexible Liner Transmissivity Profiling Results.** *C. Keller.*
Carl Keller (Flexible Liner Underground Technologies (FLUTE)/USA)

*** Testing Pipeline Integrity Using Amplified Geochemical Imaging Technology.** *J.W. Hodny, A.H. Silliman, and H.S. Anderson.*
Jay W. Hodny (W.L. Gore & Associates, Inc./USA)

*** Thiessen Area and Mass Calculator for Assessment of Plume Dynamics.** *K. Gorder and C. Holbert.*
Kyle A. Gorder (U.S. Air Force/USA)

*** A Two-Dimensional Model to Estimate Sequential Daughter Product Rate Constants in Advection-Dominated Zones.** *D.K. Burnell, J.W. Mercer, and L.S. Sims.*
Daniel K. Burnell (GeoTrans, Inc./USA)

Use of Environmental Tracers to Confirm Connections between Aquifers. *G. Colgan, S. Hill, T. Isakson, C. Schwabenlander, J. Weigel, and S. Smith.*
Gary Colgan (CH2M HILL/USA)

*** Wide-Area, Nonintrusive Characterization Technique at Munitions Disposal Site.** *H. O'Neill and J.E. Odencrantz.*
Harry O'Neill (Beacon Environmental Services, Inc./USA)

A6. DATA ENHANCEMENTS USING INNOVATIVE APPROACHES TO CONTAMINANT MONITORING

Platform Papers Wednesday/Posters (*) Wednesday

Chairs: Amy Dindal (Battelle)

David Clextion (Tidewater, Inc.)

*** Assessing Mercury Contamination in Soil and Ambient Air Using Passive Vapor Sampling.** *J.E. Whetzel and D. D'Apolito.*

James E. Whetzel (W.L. Gore & Associates, Inc./USA)

*** A Comparison of Active and Passive Soil Gas Sampling Techniques for Assessing VOC Soil Contamination.** *K.J. Baltz and J.E. Dottellis.*

Kelly J. Baltz (Golder Associates Inc./USA)

*** Development and Test of a New Passive Multilevel Groundwater Sampling System.** *H. de Jonge, M. Moller, M. Terkelsen, S. Damgaard Nielsen, and J. Albinus.*

Mads Terkelsen (Capital Region, Denmark/DENMARK)

*** Estimation of Bioavailability of Naphthalene in Soils with Solid-Phase Microextraction.** *K.-C. Chu, H.-C. Liu, J.-M. Hung, C.-S. Hwu, and C.-J. Lu.*

Hsiang-Chao Liu (National Chung Hsing University/TAIWAN)

*** Implementation of High-Resolution Triad Site Investigations on Four Continents: Lessons Learned.**

R.J. Fiacco, M. Singer, C. Coladonato, R. Arcuri, L. Robert, P. Valle, B. Eccarius, K. Jones, P. Aucamp, S. Pitkin, D. Wanty, S. Sacco, and V. Hulley.

R. Joseph Fiacco (ERM/USA)

Improving the Accuracy and Usefulness of the MIP Using Carbon-Traps. *J.R. Gee.*

John R. Gee (GeoTrans, Inc./USA)

*** In Situ Microcosms to Quantitatively Compare MNA, Biostimulation, and Bioaugmentation.** *A. Biernacki, B. Baldwin, G. Davis, D. Ogles, P. McLoughlin, and K. Sublette.*

Anita Biernacki (Microbial Insights, Inc./USA)

Interpretation of More Than 1,000 MIP Logs: Lessons Learned. *R.J. Fiacco, J. Allen, M. Duquoc, M. Singer, C. Coladonato, P. Valle, B. Eccarius, M. Rossi, D. Wanty, and S. Sacco.*

R. Joseph Fiacco (ERM/USA)

Investigation-Scale Evaluation of Multi-Incremental Sampling Methodology. *S. Spengler, M. Neal,*

R. Yamauchi, R. Aoki, A. Lutey, E. Lau, J. Silberman, D. Mead, and C. Norman.

Steven Spengler (Element Environmental/USA)

*** Low-Cost, Unobtrusive, Rapid and Sustainable Technology for Site Assessment and Performance Monitoring of Remediation Systems: Israeli Experience.**

H. Rauch, G. Robinson, J.E. Odencrantz, and H. O'Neill.

Harel Rauch (Ludan Environmental Co., Ltd./ISRAEL)

*** Passive Soil Gas Survey to Locate Source of Tetrachloroethene (PCE) Dissolution in Groundwater.**

W.D. Harms, A.K. Sansone, and B.J. Binkley.

Willard Harms (URS Corporation/USA)

*** Quantifying the Volatilization of Trichloroethylene from Shallow Subsurface Environments via Trees and Soil Surface.** *B. Doucette, H. Klein, B. Bugbee, J. Chard,*

B. Plaehn, and K. Gorder.

William J. Doucette (Utah State University/USA)

Re-Evaluating MIPs—Limitations Based on Comparison with Whole-Core and Vertical Profile Sampling.

J. Quinnan, E. Killenbeck, and N. Welty.

Joseph Quinnan (ARCADIS, Inc./USA)

Sustainable, Low-Profile Investigation Technique Finds Numerous Contaminant Sources of Groundwater Contamination: Bronx Borough, New York City Example. *H. O'Neill and J.E. Odencrantz.*

Joseph E. Odencrantz (Beacon Environmental Services, Inc./USA)

*** Use of a Membrane Interface Probe for Plume Core Characterization in Highly Stratified Aquifers.**

B. Bjorklund, D. Lind, A. Chemburkar, and J. Fiacco.

Brian Bjorklund (ERM/USA)

Using MIP Technology for Accelerated Delineation and Treatment of Tetrachloroethene in Groundwater—A Case Study. *L. Kleinecke, K.S. Gerber, and P.A. Martinez.*

Lawrence Kleinecke (Versar, Inc./USA)

Using Triad Approach to Address Data Gaps in a Residential Setting, Half Moon Bay, California.

J.D. Boyer and J.G. Ritchie.

James G. Ritchie (ARCADIS, U.S., Inc./USA)

A7. IMPROVEMENTS IN VERIFICATION OF MONITORED NATURAL ATTENUATION

Platform Papers Thursday/Posters (*) Wednesday

Chairs: Brian B. Looney (Savannah River National Laboratory)
Dana L. Swift (North Wind, Inc.)

Bioavailable Organic Carbon and the Natural Attenuation of Chlorinated Solvents. *M. Widdowson, L. King, E. Mendez, R. Barton, J. Novak, F. Chapelle, J. Parker, M. Singletary, and C. Lebron.*
Mark A. Widdowson (Virginia Polytechnic Inst & State Univ/USA)

Causes of Variability in Groundwater Monitoring Data. *T. McHugh, C. Liu, and C. Newell.*
Thomas E. McHugh (GSI Environmental/USA)

*** Characterization and Monitored Attenuation of Perchlorate in the Llagas Subbasin, Santa Clara County, California.** *M. Taraszki, W. Chamberlain, R. Jackson, and R. McClure.*
Michael Taraszki (MACTEC Engineering and Consulting, Inc./USA)

*** A Decision Framework for Applying Attenuation Processes to Metals and Radionuclides.** *D. Goswami and C. Spreng.*
Dib Goswami (Washington State/USA)

*** Development and Testing of Real-Time PCR Primers for Quantifying Aerobic, Vinyl Chloride-Degrading Microorganisms in Dilute Groundwater Plumes.** *Y.O. Jin and T. Mattes.*
Yang Oh Jin (The University of Iowa/USA)

*** Development of a Model for Enhanced Attenuation of Chlorinated Hydrocarbons in Groundwater at an Inactive Landfill at Edwards AFB.** *J.P. Siegal, M. Millett, J. Sun, and R. Hobbs.*
Joan P. Siegal (AECOM/USA)

*** Evaluation of the Effectiveness of the Monitored Natural Attenuation Applied in the Brazilian Sites Contaminated by Chlorinated Compounds.** *J. Camillo, S. Agena, S. Loebmann, and M.C. Spilborghs.*
Juliana Camillo (ERM Brasil/BRAZIL)

*** Exploring Field-Scale Degradation of Multiple Contaminants Using Reactive Surrogates.** *A. Peacock, G. White, B. Zinni, S. Boyle, S. Gupta, J. Savarese, N. Alla, and G. Davis.*
Aaron D. Peacock (Haley & Aldrich, Inc./USA)

Large and Dilute Plumes of Chlorinated Solvents: Natural Attenuation in a "Hostile" Environment? *B.B. Looney, M.H. Lee, and K.M. Vangelas.*
Brian B. Looney (Savannah River National Laboratory/USA)

The Maturation of Large Plumes: Implications Concerning Natural Attenuation Estimates. *S.T. Potter, F.C. Payne, J.A. Quinnan, and J. Erickson.*
Scott T. Potter (ARCADIS/USA)

Natural and Enhanced Degradation of Perchlorate and TCE in Groundwater. *J. Warner, B. Bjorklund, D. Brown, M. Leahy, and P. Galvin.*
James B. Warner (ERM/USA)

*** Natural Attenuation of Chlorinated Solvents in a Subterranean Estuary: Part 1—Physical and Geochemical Processes.** *W. Locke, J. Gasper, N. Durant, L. Smith, D. Himmelheber, J. French, C. Barr, T. Champion, and M. Pound.*
William Locke (Integral Consulting, Inc./USA)

*** Naturally-Occurring Aerobic Biodegradation in the Unsaturated Zone Results in Rapid Benzene Depletion.** *G.R. Brubaker, J. Williams, and T. Moore.*
Gaylen R. Brubaker (AECOM/USA)

*** A Practical Method to Evaluate Groundwater Plume Stability.** *J.A. Ricker.*
Joe A. Ricker (Premier Environmental Services, Inc./USA)

Scenarios: A Guide for Conceptual Model Development and Communication at Sites Considering MNA for Chlorinated Solvents. *K. Vangelas, B.B. Looney, M.J. Truex, and C.J. Newell.*
Karen M. Vangelas (Savannah River National Laboratory/USA)

Using $\delta^{13}\text{C}$ -Labeled Compounds within Microbial Biological Tools (MBTs) to Define Transitions in Remedial Strategies, from Chemical Oxidation Treatment to Biostimulation Back to MNA. *E.J. Raes, K.L. Sublette, A. Peacock, G. Davis, and D. Ogles.*
Eric J. Raes (Engineering & Land Planning Associates, Inc./USA)

A8. LONG-TERM MONITORING STRATEGIES

Platform Papers Thursday/Posters (*) Wednesday
Chairs: Charles J. Newell (GSI Environmental, Inc.)
Julie K. Sueker (ARCADIS)

*** Adaptive Long-Term Monitoring at BP Environmental Restoration Sites.** *M.J. Zavislak, J.E. Dustman, and D. Beckmann.*
Matthew Zavislak (Summit Envirosolutions, Inc./USA)

*** Assessing Plume Stability for Groundwater Monitoring Optimization.** *M. Vanderford.*

Mindy Vanderford (GSI Environmental Inc./USA)

Automated Environmental Monitoring, Data Visualization, and Critical Resource Management.

M.L. Kram, R.E. Beighley, H. Loaiciga, and K. Nasser.

Mark L. Kram (Groundswell Technologies, Inc./USA)

Comparability of a Passive Sampling Method to Conventional Sampling Methods for Long-Term Monitoring. *P. Gellner, J.P. Miller, H. Olsen, B. Grunewald, and E. Dettenmaier.*

Paula A. Gellner (MWH Americas/USA)

*** Long-Term Effects of Passive Soil Vapour Extraction (PSVE).** *A.G. Christensen, N. Muchitsch, H. Jannerup, C. Fabricius, C.B. Jensen, H. Ostergaard, P. Johansen, and O. Kiilerich.*

Henrik Jannerup (Region Zealand/DENMARK)

*** Long-Term Impacts of Relying on Extraction Well Measured Radius of Influence versus Capture Zone Analysis on Contaminant Plume Migration.** *J.R. Dickson and R. Stenson.*

James R. Dickson (CTI and Associates, Inc./USA)

Long-Term Monitoring Optimization Using Summit Monitoring Tools. *C.B. Davis, R. Greenwald, W. Jian, K. Harre, T. Chaudhry, B.S. Minsker, and M. Zavislak.*

Karla Harre (U.S. Navy/USA)

Low-Flow Purging and Sampling in a Stratified Aquifer: Purge Stability and Attainment of Flow-Weighted Averages. *S.L. Britt and L.V. Parker.*

Sanford L. Britt (ProHydro, Inc./USA)

*** Natural Bioattenuation of Chlorinated Compounds in Groundwater: A Monitored Natural Bioattenuation Success Story.** *D. Crouch, J.D. White, B. Butler-Veytia, and B. Medler.*

Belinda Butler-Veytia (URS Corporation/USA)

*** Other Considerations at Contaminated Sites: Evaluating and Addressing Landfill Gases.** *F.W. Blickle, B. Holly, and D. Gatrell.*

Frederick W. Blickle (Conestoga-Rovers & Associates/USA)

Simplifying Groundwater Sampling: Implications for Long-Term Monitoring Strategies. *C. Newell, T. McHugh, D. Adamson, and M. Rysz.*

Charles J. Newell (GSI Environmental, Inc./USA)

*** Statistical Metrics for the Identification of Interdependant Analytes.** *T. Downey, B. Caldwell, R. Britto, M. Geraghty, and R. Arnseth.*

Tiffany N. Downey (Tetra Tech, Inc./USA)

Tailoring LTM Optimization Strategies for Large and Small Groundwater Sampling Networks. *P. Goodrum, T. Negley, K. Peterburs, and G. Reeder.*

Philip Goodrum (ARCADIS/USA)

*** Use of Domestic Wells for Long-Term Perchlorate Monitoring in the Llagas Subbasin, Santa Clara County, California.** *M. Taraszki, W. Chamberlain, R. Jackson, and R. McClure.*

Michael Taraszki (MACTEC Engineering and Consulting, Inc./USA)

Use of Historic Groundwater Data in Developing a Long-Term Monitoring Strategy. *J. Sueker, M. Gefell, J. Holden, P. Goodrum, and B. Thompson.*

Julie K. Sueker (ARCADIS/USA)

Use of Long-Term Monitoring Data to Better Understand Plume Behavior at Gasoline Retail Sites.

R. Kamath, M.P. Le, A.J. Ryan, T.E. McHugh, and J.A. Connor.

Roopa Kamath (GSI Environmental Inc./USA)

*** When and Where to Sample Groundwater: Arriving at an Optimal Monitoring Plan Using GTS Software.**

P. Hunter, K. Cameron, and R. Stewart.

Philip M. Hunter (U.S. Air Force/USA)

Photo: Monterey County CVB



B1. RISK-BASED AND PERFORMANCE-BASED CLEANUP

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Arul Ayyaswami (Terra Sure/Gannett Fleming, Inc.)
Nanjun V. Shetty (AECOM)

Advanced Diagnostics for Cost Management and Expedited Closure. *S.S. Koenigsberg.*
Stephen S. Koenigsberg (ENVIRON International Corporation/USA)

*** Application of Risk Assessment Methods for Chlorinated Ethene Soil Contamination at an Experimental Site.** *A. Haarstrick, B. Nortemann, and T. Greis.*
Tillman Greis (Technische Universitat Braunschweig/GERMANY)

Brownfield Development through Environmental Liability Transfer. *S. Bangels, J. Goossens, and Y. Van Der Zwahlen.*
Stefan Bangels (RSK Benelux/BELGIUM)

*** A Case Study of Emerging Methodologies of Quantifying Natural Resource Damages at Chlorinated Solvent-Contaminated Sites.** *D.J. Russell and S. Sacripanti.*
David J. Russell (AECOM/USA)

*** Developing Remediation Levels to Address Ecological Risk at the United Heckathorn Superfund Site.** *B. Sample, C. Irvine, K. Gustavson, J. Spahn, and S. Lin.*
Bradley E. Sample (CH2M HILL/USA)

Expediting Brownfield Redevelopment by Combining Innovative In-Site Remedial Technologies with GFPR Solutions. *L.M. Rebele and C.-Y. Yen.*
Leo Rebele (TerraSure Development, LLC/USA)

Guaranteed Remediation Contracting via Electrical Resistance Heating = Remediation Certainty. *T. Warner.*
Timothy Warner (TRS Group, Inc./USA)

*** How the Recession Has Impacted Site Management.** *R. Tabachow, R.M. Lowe, and E. Roberts.*
Ross Tabachow (Excalibur Group, LLC/USA)

Integration of Advanced Site Characterization and Delivery Tools to Manage Costs of Fixed Price Remediation. *E. Cooper, F. Stolfi, and T. Hanna.*
Eliot D. Cooper (Vironex, Inc./USA)

*** On-Site Destruction of Thionyl Chloride and Other Chemicals at a Methamphetamine Super Lab in Southeast Asia.** *D. Graves, R. Bruce, and L.K. Yik.*
Duane Graves (Geosyntec Consultants, Inc./USA)

*** Short-Listing of Petroleum-Contaminated Sites for Remediation Using a Risk-Screening System.** *D. Al-Chrabally, M.-A. Mutairi, and K. Vangala.*
Krishna Vangala (Kuwait Oil Company/KUWAIT)

*** Soil Remediation on 2010 Shanghai World Expo Site.** *X. Li, Q. Li, and X. Cheng.*
Xiaoping Li (Shanghai Academy of Environmental Sciences/CHINA)

The Use of Fixed-Price Remediation in Brownfield Redevelopment. *E. Morales.*
Ed Morales (Envirofinance Group, LLC/USA)

B2. REMEDIATION COST AND TECHNOLOGY SELECTION

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: Jack G. Peabody (Regenesis)
Jennifer L. Weidhaas (North Wind, Inc.)

*** Assessing the Risk of Technology Failure with In Situ Treatment.** *R.A. Brown and E.S. Seger.*
Richard A. Brown (ERM, Inc./USA)

*** Attainment of Water Quality Objectives with In Situ Anaerobic Bioremediation and Bioaugmentation.** *S.J. Osborne.*
Stephen J. Osborne (Furgo West Inc./USA)

*** Building and Operating a Large Treatment System in a Residential Area.** *J. Wingate, D. Bush, R.M. Caraway, and J. Hartley.*
John Wingate (OTIE Solutions/USA)

Case Study of Remediation of Buried Bulk Benzoyl Peroxide. *S.R. Nelson, W. Mullin, R.I. Chapin, and J. Moody.*
Steve R. Nelson (City of Austin Public Works Dept./USA)

*** Case Study: In Situ Remediation and Common Constraints to Comprehensive Data Analysis and Decision-Making.** *J.E. Studer and G. Low.*
James E. Studer (ChemRem International LLC/USA)

Evaluating LNAPL Remedial Technologies for Achieving Project Goals. *L. Barkau, P.S. Trowbridge, and E. Nichols.*
Lily Barkau (Wyoming Department of Environmental Quality/USA)

Panel Discussion. Setting Cleanup Objectives: State Regulator Experiences from Across the Nation (An ITRC Panel)
Monday/Track B

Moderator: Anna Willett (Director, ITRC)

Panelists:

Lily Barkau (Sr. Project Manager, Wyoming Department of Environmental Quality)
Paul Hadley (Hazardous Substances Engineer, DTSC, California Environmental Protection Agency)
George Nicholas (Supervising Geologist, New Jersey Department of Environmental Protection)
Tom O'Neill (Site Remediation Program, New Jersey Department of Environmental Protection)
Michael Smith (Waste Management Division, Vermont Department of Environmental Conservation)

From small spills to megasites, all parties agree that setting cleanup objectives for groundwater remediation at contaminated sites is a critical step. However, the process of setting cleanup objectives can be protracted, difficult, or, in some cases, counter-productive. Cleanup objectives must be protective of human health and the environment, but also must be clearly defined and attainable. Constructive discussions on setting cleanup objectives among all parties involved can be beneficial, but such discussions often are skipped. In the worst case, lack of attention to setting cleanup objectives can impede the remediation process and stifle the use of innovative approaches.

This panel of state environmental regulators from across the nation will facilitate a dynamic exchange of information about setting cleanup objectives. The goal of the panel discussion is to enable audience members and panelists to learn from each other and be exposed to diverse viewpoints, so that the status quo for environmental cleanup can be improved. A high level of audience participation is expected. Some questions to get the discussion started and which our panelists will consider are:

- Who should participate in setting cleanup objectives?
- What pressures and considerations come into play when setting cleanup objectives, especially when new or innovative situations exist?
- What are attributes of "good" cleanup objectives? What are characteristics of "poor" cleanup objectives?
- What does "attainable cleanup objective" mean? What does "extent practical" mean?
- Are "poor" cleanup objectives really the cause of failure? If so, have "good" cleanup objectives led to success?

The Interstate Technology and Regulatory Council (ITRC) is uniquely positioned to host a panel on setting cleanup objectives. Nearly all of its Technical Teams have had to consider the impacts of innovative environmental technologies, processes, and approaches for setting cleanup objectives. More information on ITRC can be found at www.itrcweb.org.

*** Evaluating the Economic Benefit of DNAPL Source Remediation.** *G.R. Carey and E.A. McBean.*
Grant R. Carey (Porewater Solutions/CANADA)

*** The Evaluation of LNAPL-Specific Thickness to Assist Remedy Selection at Fort Campbell Army Airfield.** *R. Kurth, L. Zeng, S. Smith, M. Manley, and J. Rains.*
Lingke Zeng (Shaw Environmental, Inc./USA)

In Situ Chemical Oxidation and Enhanced Anaerobic Biodegradation of a PCE Plume. *D.G. Dixon, D. Sutherland, and C. Glenn.*
David Dixon (Treadwell & Rollo/USA)

Investigation, Risk Assessment, and Remediation Strategy for a Danish Site Contaminated with a Complex Mixture of Pharmaceutical Wastes. *M. Christophersen, J.F. Christensen, T. Jorgensen, J. Dall-Jepsen, L. Nissen, N. Durant, and L. McKinnon.*
Torben Hojberg Jorgensen (Ramboll Danmark A/S/DENMARK)

*** Numerical Modeling for Remediation Strategies in a Chlorinated Solvents-Impacted Site.** *A. Gigliuto, C. Righetti, and R. Vaccari.*
Andrea Gigliuto (AECOM/ITALY)

*** Overview of Metals Treatment Technologies in Soil, Sludges, and Water: 1990-2010.** *J.A. Jacobs.*
James A. Jacobs (Environmental Bio-Systems, Inc./USA)

*** Performance Results for a Constructed Wetland Treatment of Chlorinated Solvents, Benzene, and Tert-Butyl Alcohol.** *J.L. Boone, R. Jaros, P.A. Stefan, and D. Deemer.*
John L. Boone (ERM/USA)

*** Reductive Dechlorination of Vinyl Chloride in a Shallow Brackish Hawaiian Coral Aquifer.** *P. Randall and D. Fraim.*
Patrick Randall (EnviroSolve Corp./USA)

Remedial Technology Selection and Performance Evaluation for a Chlorinated Ethene Site in Florida. *P.S. Darr, C.F. Tabor, J. Daniel, and J. Craig.*
Paul S. Darr (S.M. Stoller Corp./USA)

*** Risk Communication—What's in Our Toolbox?** *M. Rosman, J. Olsen, and J. Flyvbjerg.*
Mia Rosman (Capital Region of Denmark/DENMARK)

Site Closure via In Situ Aerobic Bioremediation of Petroleum Hydrocarbons in Port Coquitlam, BC Canada. *P. Lowery and J. Peabody.*
Philip Lowery (Next Environmental/CANADA)

*** Stakeholder-Focused Remediation: A Case Study.** *M.A. Miesfeldt.*
Mark A. Miesfeldt (RMT, Inc./USA)

Use of Probabilistic Tools to Improve Remedial Decision Making. *P.J. Favara.*
Paul J. Favara (CH2M HILL/USA)

*** Using a State-of-the-Practice Review to Assess the Applicability of In Situ Thermal Technologies at Sites.** *J. Triplett Kingston and M. Basel.*
Jennifer Triplett Kingston (Haley & Aldrich, Inc./USA)

*** Why Not Use Real Numbers for the FS? A Case Study.** *W.C. Hardison.*
Wayne C. Hardison (Haley & Aldrich, Inc./USA)

B3. MASS FLUX/DISCHARGE AS A REMEDIATION PERFORMANCE METRIC

Platform Papers Tuesday/Posters (*) Monday Evening
Chairs: Kenneth J. Goldstein (The Louis Berger Group)
Michael D. Annable (University of Florida)

*** Flux and Risk Assessment Tools—Prioritizing Pesticide Point Sources in a Catchment Area.** *K. Richter Hantzi, H. Kern-Jespersen, I. Holm Olesen, L. Dissing, K. Rudolf Hansen, M. Birch Larsen, and N. Tuxen.*
Katerina Richter Hantzi (Capital Region of Denmark/DENMARK)

Flux-Based Site Evaluation for Predicting Source Strength Functions. *M.D. Annable, J.W. Jawitz, K. Hatfield, A.L. Wood, M.C. Brooks, and P.S.C. Rao.*
Michael D. Annable (University of Florida/USA)

Flux-Informed Decision Making. *J.A. Quinnan, F.C. Payne, E.M. Nichols, and S.T. Potter.*
Joseph Quinnan (ARCADIS, Inc./USA)

*** Mass Flux Measurements of Arsenic in Groundwater.** *T.R. Lee, S.D. Acree, R.R. Ross, and R.T. Wilkin.*
Tony R. Lee (U.S. EPA/USA)

Quantification and Uncertainty of Mass Discharge from TCE-Contaminated Sites and Relation to Source Remediation. *P.L. Bjerg, M. Trolborg, M. Santos, and P.J. Binning.*
Poul L. Bjerg (Technical University of Denmark/DENMARK)

*** Using GIS to Track Solute Mass Flux Distribution for Groundwater Remediation Systems.** *J. Rosen and J. Gallinatti.*
Jamey B. Rosen (Geosyntec Consultants/CANADA)

VOC Mass Flux from Secondary Source Zones: The Role of Fracture Aperture and Spacing. *R. Dearden, G. Wealthall, D. Noy, M. Lelliott, and R. Wilson.*
Rachel Dearden (British Geological Survey/UK)

B4. SITE CLOSURE AND EXIT STRATEGIES, INCLUDING ALTERNATIVE ENDPOINTS

Platform Papers Tuesday/Posters (*) Tuesday Evening
Chairs: Rula Anselmo Deeb (Malcolm Pirnie, Inc.)
Laurie Haines (U.S. Army Environmental Command)

*** Accelerated Site Characterization and Large-Scale Groundwater and Soil Vapor Remediation.** *M.B. Hall, M.D. Chendorain, C.N. Glenn, M.A. Chamberlain, and P.G. Smith.*
Matthew Hall (Treadwell & Rollo, Inc./USA)

Achieving Site Closure of a 1,1,1-TCA Plume Using In Situ Bioremediation. *B. Cote, T. Ladaa, and R. Larkin.*
Brian Cote (Shaw Environmental & Infrastructure, Inc./USA)

Alternative Endpoints and Alternative Remedial Strategies for Groundwater Cleanup: A Review of Case Studies. *R.A. Deeb, E.L. Hawley, L. Kell, R. O'Laskey, and M.C. Kavanaugh.*
Rula Anselmo Deeb (Malcolm Pirnie, Inc./USA)

*** Case Studies: Closure Strategies to Achieve Cleanup and Reuse of Former Industrial Sites.** *J. Raphael, P. Newman, R. Casselberry, and S. Cook.*
Jessica Raphael (CH2M HILL/USA)

*** Combination of Remedial Technologies and Design Flexibility Reduces Costs and Time to Closure.** *K.D. Dyson, P.J. Palko, M.W. Miner, and G. Heron.*
Kevin D. Dyson (Panther Technologies, Inc./USA)

DNAPL Source Excavation with Electron Donor Injection for Chlorinated Hydrocarbon Remediation. *W.A. Wright, J. Langenbach, C. Neumann, and M.J. Deliz.*
William A. Wright (Tetra Tech NUS/USA)

*** Evolution of the Treatment Train Remedial Approach at a Florida Drycleaner Site.** *M. Lodato, R. Thompson, and W. Linn.*
Michael Lodato (Geosyntec Consultants, Inc./USA)

*** Improving Groundwater Remediation through Performance-Based Environmental Management, Former Fort Ord, Monterey County, California.** *M. Taraszki, E. Ticken, and D. Eisen.*
Michael Taraszki (MACTEC Engineering and Consulting, Inc./USA)

Influence of Matrix Diffusion from Low-Permeability Lenses within Source Zones on the Contaminated Aquifers Cleanup Time. *C.J. Newell and A. Seyedabbasi.*
Charles J. Newell (GSI Environmental, Inc./USA)

*** Lean for Consensus Building—A Case Study Applied to Portfolio Management.** *P.M. Tornatore, S.L. Boyle, S.T. MacIntyre, and J.M. Baker.*
Paul M. Tornatore (Haley & Aldrich, Inc./USA)

Multiphased Program to Achieve Regulatory Closure and Redevelopment of a Complex Brownfield Property. *T. Feng, M. Vazquez, W. Hague, and B. DeHghi.*
Terry H. Feng (CH2M HILL/USA)

*** Phased Remediation with Interim Characterization of a Trichloroethene Source Area and Dissolved Plume.** *J. Langenbach, R. Daprato, T.A. Peel, and M. Deliz.*
Jim Langenbach (Geosyntec Consultants/USA)

*** Privatization of MEC Remediation on a Military Superfund Site Former Fort Ord, California.** *K. Reimer, C. Spill, M. Houlemard, L. Temple, and Jeff Swanson.*
Kristie Reimer (LFR, an ARCADIS Company/USA)

*** Reopened, Expedited Treatability Testing and Remediation Move Closed Site Toward Closure, Again.** *J.A. Jacobs, A. Adini, and D. Rao.*
James A. Jacobs (Environmental Bio-Systems, Inc./USA)

*** Strategy for Shutdown of a Biobarrier Treatment System and Closure at an MTBE-Contaminated Groundwater Site at MCB Camp Pendleton.** *P. Chang, C. Zimmerman, J. Sminchak, D. Clexton, T. Sahagun, and B. Patel.*
Pamela L. Chang (Battelle/USA)

*** Surgical Site Closure—Integrating Natural Attenuation and Focused Source Treatment.** *S.P. Sittler and B. Poling.*
Steve Sittler (ARCADIS/USA)

*** Treatment Train Applied to a Large TCE Plume.** *C.L. Sprinkle, S. Schultz, C. Hudson, and T.L. Clendenin.*
Craig L. Sprinkle (CH2M HILL/USA)

*** Use of Carbon Stable Isotope Analysis as a Tool for Accelerating Site Closure.** *A. Westrich and P. Sharma.*
Ahnna Westrich (Camp, Dresser, and McKee, Inc./USA)

*** Use of Multiple Technologies to Address Contamination at a Former Fire Training Area: Progress to Date.** *A. Tingle, T. Ladaa, R. Mayer, B. McInturff, C. Jerrard, and R. Zaruba.*
Anthony R. Tingle (Shaw Environmental, Inc./USA)

Use of Technical Impracticability (TI) Waivers at Superfund Sites. *H. Levine.*
Herbert Levine (U.S. EPA/USA)

World's Largest Thermal Remediation Project Case Closed—Site Delisted. *C.L. Eaker and R. Weidner.*
Craig L. Eaker (Southern California Edison Company/USA)

B5. CASE STUDIES IN ACHIEVING MCLs AT CHLORINATED SOLVENT SITES

Platform Papers Wednesday/
Posters (*) Tuesday Evening

Chairs: Michael Kavanaugh (Malcolm Pirnie, Inc.)
Curtis C. Stanley (Shell Global Solutions)

Achieving MCLs at Chlorinated Solvent DNAPL Sites Using Thermal Remediation. *E.L. Davis.*
Eva L. Davis (U.S. EPA/USA)

*** Assessing the Partitioning Kinetics for Tracers Used to Quantify DNAPL Source Zone Architecture Metrics.** *R.E. Ervin and C.A. Ramsburg.*
Rhiannon Ervin (Tufts University/USA)

Back Diffusion Control on Chlorinated Solvent Plume Behavior in Fractured Sedimentary Rock. *A. Gilmore, S. Chapman, and B. Parker.*
Beth L. Parker (University of Guelph/CANADA)

*** Case Study—Free-Hydrocarbon Recovery with Dual Pumping at an Active Rail Yard.** *D.M. Stordahl, M. Hills, M. Smith, and A. Reynolds.*
Darrel M. Stordahl (CDM/USA)

Decision Guide for Selecting Remedies for Chlorinated Solvent Releases. *T. Sale and C. Newell.*
Tom Sale (Colorado State University/USA)

Dissolution of Multicomponent DNAPL. *J. Stening.*
James Stening (Orica Australia Pty Ltd./AUSTRALIA)

*** Downgradient Monitoring of Large-Scale DNAPL Remediation at Site 89 MCB Camp Lejeune.** *C. Bozzini, D. Cleland, R. Lowder, and T. Grim.*
Christopher Bozzini (CH2M HILL/USA)

Evaluating Natural Source Zone Depletion at Sites with LNAPL. *E.M. Nichols and C.D. Stone.*
Eric M. Nichols (ARCADIS U.S., Inc./USA)

*** Evaluation of DNAPL Dissolution Kinetics within a Bench-Scale Fracture Network.** *K. Christensen, P. Altman, J. McCray, and C. Schaefer.*
Kaneen E. Christensen (Colorado School of Mines/USA)

*** Former CFC's Unit Remediation—Choosing the Right In Situ Reagent.** *P. Hrabak, M. Cernik, P. Kvapil, and L. Lacinova.*
Pavel Hrabak (TUL/CZECH REPUBLIC)

Getting to MCLs—Case Studies in Aquifer Restoration. *S.S. Suthersan and F.C. Payne.*
Suthan S. Suthersan (ARCADIS, Inc./USA)

*** Metabolic Biodegradation of Lower Chlorinated Ethenes.** *K.R. Schmidt and A. Tiehm.*
Kathrin R. Schmidt (Water Technology Center (TZW)/GERMANY)

*** Successful Triad Implementation and Use of MBT in Remediation Strategies.** *S. DeGross, T. Shields, C.L. Perry, L. Battaglia, and W. Davis.*
Shane DeGross (Richard Brady and Associates/USA)

What is the Benefit of Partial Source Depletion?
S.K. Farhat and C.J. Newell.
Shahla K. Farhat (GSI Environmental, Inc./USA)

B6. REMEDY OPTIMIZATION STRATEGIES

Platform Papers Thursday/Posters (*) Wednesday

Chairs: Douglas C. Downey (CH2M HILL)
Sriram Madabhushi (Booz Allen Hamilton)

*** Biostimulation to Optimize Remediation of Chloroform-Impacted Groundwater.** *E. Suchomel, D. Gandhi, L. Van Tassell, and N. Bice.*
Eric J. Suchomel (Geosyntec Consultants/USA)

*** Case Study for the Design of an Optimum Multi-Well Soil Vapor Extraction Network.** *J. Otter and A. Lizzi.*
Jeff Otter (AECOM/USA)

Development of a Conceptual Site Model Using Phased Implementation of High-Resolution Data Collection. *S.M. Coan, V.S. Mankad, and P.K. Sharma.*
Sean M. Coan (Camp Dresser & McKee, Inc./USA)

*** Focused Conceptual Model Development for Recovery Optimization of a CVOC Containing LNAPL.** *M. Zenker, B. Ray, and M. Michels.*
Matthew Zenker (AECOM/USA)

Groundwater Remedy Optimization Strategy at a CERCLA Site under Redevelopment. *D.S. Lieberman.*
Derek S. Lieberman (Ahnta Engineering Services/USA)

Optimization Pump-and-Treat to Closure. *B. Giroux, J. Scott, and A. Boettner.*
Brian K. Giroux (McGinley & Associates/USA)

*** Optimizing a Conceptual Site Model to Optimize the Conceptual Remediation Model.** *P. Dijkshoorn.*
Pieter Dijkshoorn (ERM Belgium/BELGIUM)

Periodic Redesign in Remedial System Operation. *R.A. Brown and E.S. Seger.*
Richard A. Brown (ERM, Inc./USA)

Rebound of TCE Breakdown Products in Groundwater as a Result of Insufficient Source Area Remediation. *J.R. Dickson and R. Stenson.*
James R. Dickson (CTI and Associates, Inc./USA)

Stronger, Faster, Wiser: Use of Multi-Increment Sampling Strategies to Improve Site Investigations. *R. Brewer and J. Brodersen.*
Roger Brewer (Hawaii Department of Health/USA)

*** Sulfur Hexafluoride Tracer Used in Performance Monitoring and Optimization of Oxygen-Enhanced Sparging System.** *M. Klemmer, J. Smith, F. Payne, K. Wilson, and R. Whiting.*
Mark R. Klemmer (ARCADIS US/USA)

Ten Years of Remediation Progress at a Chlorinated Solvent Site in the Southeastern United States. *K.H. Oma, M.M. Megehee, A.R. Huskey, and W.J. Raines.*
M. Maria Megehee (Brown and Caldwell/USA)

*** Three-Phase Approach to Soil Vapor Extraction Case Study: Efficient Use of Refrigerated Condensation for Recovery of Chlorinated Solvents.** *S. Vancheeswaran, A. Montgomery, J. Scott, L. Kessel, and C. Winell.*
Lowell G. Kessel (Envirologek/USA)

*** Treatment of Chlorofluorocarbons (CFCs) in Soil Vapor Using Cryogenic Refrigeration Technology: Implications for Remedial Technology Optimization.** *T.H. Feng, L. Kessel, and C. Winell.*
Terry H. Feng (CH2M HILL/USA)

*** Understanding the Source: A Critical Factor in Achieving Remedial Success.** *J. Langenbach, T.A. Peel, J. Applegate, S. Starr, M.J. Deliz, R. Kline, and G. King.*
Jim Langenbach (Geosyntec Consultants/USA)

*** Upgrade and Optimization of a Pump-and-Treat System Using Membrane Filtration Technology.** *S. Lang, J.F. Strunk, R. Wenzel, and J.M. Gueren.*
Scott Lang (CH2M Hill/USA)

Use of Groundwater Modeling for Optimization of Remedial Design. *N. Raykhman.*
Natalia Raykhman (CH2M Hill/USA)

Use of Value Engineering to Optimize a Multimillion-Dollar Soil and Groundwater Remedy at a Superfund Site. *M. Perlmutter, J. Minchak, J. Sterling, P. Johnson, and S. Appaji.*
Michael W. Perlmutter (CH2M HILL/USA)

B7. AIR FORCE ENVIRONMENTAL RESTORATION PROGRAM: OPTIMIZATION FROM REMEDY-IN-PLACE TO RESPONSE-COMPLETE

Platform Papers Thursday/Posters (*) Wednesday

Chairs: Javier Santillan (U.S. Air Force)
Jon Horin (Noblis)

Best Practices for Performance-Based Management of Environmental Restoration Programs. *J.T. Gibbs, J. Santillan, J. Horin, and P. Callier.*
James T. Gibbs (Brown and Caldwell/USA)

*** Improvements in Verification of Monitored Natural Attenuation.** *B. Alleman and J. Santillan.*
Bruce C. Alleman (Brown and Caldwell/USA)

*** Long-Term Monitoring Optimization Strategies.** *K. Bradley, J. Anthony, and J. Santillan.*
Kathleen Bradley (Noblis/USA)

Numerical Evaluation of SVE as One Component of an RPO for Groundwater Remediation. *R. Porges, V. King, T. Fox, and A. Katyal.*
Robert Porges (SAIC/USA)

Overview of the Air Force Environmental Restoration Program—Optimization Program. *J. Horin and J. Santillan.*
Jon Horin (Noblis/USA)

Remedial Optimization Evaluation of North OU1/Site 19 at Edwards Air Force Base. *K.H. Oma, B.C. Alleman, S. Chowdhury, L. Kingston, R. Miller, and J. Santillan.*
Kenton Oma (Brown and Caldwell/USA)

The Role of Risk Assessment in Remedial Process Optimization. *R.C. Porter and S. Brock.*
Ronald C. Porter (Noblis, Inc./USA)

Streamlining Site Restoration Process Using Environmental Restoration Program Optimization Tools. *S. Madabhushi and J. Santillan.*
Sriram Madabhushi (Booz Allen Hamilton/USA)

*** The Use of Logical Decision Thresholds in the Development of Aggressive and Achievable Exit Strategies.** *J. Gibbs and J. Santillan.*
James T. Gibbs (Brown and Caldwell/USA)

C1. NET ENVIRONMENTAL, SOCIAL, AND ECONOMIC BENEFITS OF GREEN AND SUSTAINABLE REMEDIATION

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Michael E. Miller (CDM)
Paul W. Hadley (California Dept of Toxic Substances Control)

*** Architect of Sustainability: Nikola Tesla's "Green" Legacy.** *B.J. Harding.*
Barry J. Harding (AECOM/USA)

Economic and Sustainable Remediation: How to Balance the Needs of Society, Environment and Business. *P.E. Hardisty.*
Paul E. Hardisty (WorleyParsons/AUSTRALIA)

*** Estimating Cross-Media Pollution to Determine the Sustainability of Groundwater Remediation.** *D. Chambers, A. Leavitt, L.M. Smith, S. McLaughlin, and C. Dumas.*
Deni Chambers (Northgate Environmental Mgmt, Inc./USA)

Evaluating Ecosystem Service Changes Associated with Sediment PCB Remediation—A Decision-Making Case Study. *J.P. Nicolette and J. Margolin.*
Joseph P. Nicolette (ENVIRON/USA)

Implementation of Sustainable Remediation at a Former Refinery Site—Opportunities for "Win-Win" Solutions for all Stakeholders. *W. Hufford, E.J. Larson, and S. Fiorenza.*
Stephanie Fiorenza (BP America/USA)

*** Integrating Risk Assessment and Design for Sustainable Remediation: Wichita, Kansas.** *J.M. LaVelle, P.D. Anderson, D.L. Brown, and R.L. Olsen.*
James M. LaVelle (CDM/USA)

*** The Sustainability Movement.** *G. Glanders.*
Geoffrey Glanders (August Mack Environmental, Inc./USA)

Sustainable Remediation: Definitions, Practices, and Controversies. *M.E. Miller and C.B. Baker.*
Michael E. Miller (CDM/USA)

C2. METRICS AND TOOLS FOR GREEN AND SUSTAINABLE REMEDIATION

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Ralph Nichols (Savannah River National Laboratory)
Paul J. Favara (CH2M HILL)

* **BalanceE³—Quantifying Sustainability in a Common Currency for Remedy Selection and Corrective Action Optimization.** *J. Gattenby, K. Beil, A. Troschinetz, and P.-B. Ung.*

Jessica Gattenby (ARCADIS U.S., Inc./USA)

A Decision-Support Tool When Selecting a Sustainable Remediation Strategy. *K. Sorensen, C.B. Jensen, M. Terkelsen, K. Weber, N. Wodschow, G. Lemming, C.Z. Munk-Andersen, and O. Killerich.*
Kim Sorensen (The Capital Region of Denmark/DENMARK)

* **Estimating of Remediation Costs and Sustainability Metrics Using the AFCEE Sustainable Remediation Tool with RACER™.** *D. Ruppel, J. Claypool, D. Woodward, E. Becvar, D. Downey, B. Woodard, C. Newell, and T. Swann.*

Doug Ruppel (AECOM/USA)

Improved Remedy Evaluation Using Life Cycle Analysis. *T.M. Krieger, D.E. Ellis, and P.B. Butler.*
Todd M. Krieger (DuPont/USA)

Optimizing Remediation Systems Using the Sustainable Remediation Tool (SRT). *C.J. Newell, T.N. Swann, E. Becvar, D. Ruppel, D. Woodward, L.M. Beckley, A.U. Rahman, D. Downey, P. Favara, and B. Woodard.*
Charles J. Newell (GSI Environmental, Inc./USA)

Quantitative Evaluation of the Environmental Footprint of LUST Cleanups. *E. Magnan, M. Martinson, and S. Linder.*
Eric Magnan (U.S. EPA/USA)

Sustainable Environmental Remediation: Battelle SiteWise™ Tool. *M. Bhargava, R. Sirabian, R. Darlington, D. Schlea, and J. Lipps.*
Mohit Bhargava (Battelle/USA)

* **Sustainable Infrastructure: An Integrated WISE Approach.** *A. Paolucci, C. Silver, and M. Bhargava.*
Angela M. Paolucci (Battelle/USA)

* **Sustainable Remediation Appraisal: A Simple, Rapid, Multicriteria Evaluation Procedure.** *P. Nathanail.*
Paul Nathanail (University of Nottingham/UK)

Using the Life-Cycle Assessment Methodology to Identify Sustainability Metrics and Estimate Impacts. *P.J. Favara, T.J. Simpkin, and A.S. Fisher.*
Paul J. Favara (CH2M HILL/USA)

C3. INCORPORATING GREEN AND SUSTAINABLE REMEDIATION INTO REMEDY SELECTION AND DESIGN

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: David S. Woodward (AECOM)
Carol Lee Dona (U.S. Army Corps of Engineers)

Calculating the Environmental Footprint of Sediment Remediation Technologies. *E. Germiniani, A. Battaglia, and J. Ryan.*
Erika Germiniani (AECOM/ITALY)

* **Case Studies Implementing EPA's Six Core Elements of Green Remediation.** *A. Rosecrance, L. Pabst, and B. Landale.*
Ann Rosecrance (Conestoga-Rovers & Associates/USA)

Estimating the Environmental Footprints of Cleanup Remedies—Pilot Study. *K. Scheuermann, S. Armann, and C. Pachon.*
Karen Scheuermann (U.S. EPA/USA)

Incorporating Green and Sustainable Remediation into the Remedy Selection Process at a Navy Site in Alameda Point. *R. Sirabian, M. Parker, D. Robinson, M. Bhargava, and R. Darlington.*
Russell R. Sirabian (Battelle/USA)

Optimization of Air Sparging System Design to Reduce Carbon Footprint Concerns. *D. Tomlinson and S. Fiorenza.*
Derek W. Tomlinson (ERM/USA)

Predictions and Reality: Quantified Sustainability Evaluation of TCE Source Area Remediation Using EPA Performance Metrics. *A. Dvorak, J. Peale, E. Bakkom, J. Mueller, and F. Lakhwala.*
Amy Dvorak (Maul Foser & Alongi, Inc./USA)

Use of the Sustainable Remediation Tool to Support Feasibility Studies. *D. Downey, B. Woodard, P. Favara, E. Becvar, D. Ruppel, D. Woodward, C. Newell, and T. Swann.*
Douglas C. Downey (CH2M HILL/USA)

Panel Discussion. Cost and Value of GSR: Making the Business Case Tuesday/Track C

Moderator: David Ellis (DuPont Engineering)

Panelists:

Paul Hardisty (WorleyParsons)
Richard Mach (U.S. Navy, Office of Deputy Assistant
Secretary of the Navy)
Paul Nathanail (University of Nottingham)
Thomas K. O'Neill (New Jersey Dept of Environmental
Protection; ITRC GSR Team Leader)
Carlos Pachon (U.S. Environmental Protection Agency)

Although the application of sustainability in investigation and remediation decisions is becoming widespread, there still are some who question the business value of sustainability. The concerns expressed are usually that sustainable remediation might be either more difficult to permit and implement, or more costly than existing practices. A group of panelists with a wide variety of experience will address these questions from the business, operational, and policy points of view.

C4. SYSTEM OPTIMIZATION FOR IMPACT MITIGATION

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Richard B. Wice (Shaw Environmental
and Infrastructure, Inc.)

David J. Becker (U.S. Army Corps of Engineers)

*** Comparison of the Environmental Sustainability of Different Thermal Technologies for Soil Remediation.**

F. Cestelli Guidi, E. Germiniani, and A. Battaglia.

Flavia Cestelli Guidi (AECOM/ITALY)

Going Green—Hill AFB's Basewide Focus on

Sustainability. *S. Arens, T. Mehraban, H. Olsen, and
B.L. Hall.*

Stacey Arens (MWH Global/USA)

How "Green" Can We Get With Remediation? A Life- Cycle Comparison between a Conventional P&T Approach vs. a "Green" Technology to Treat a PCE Plume. *J.K. Nguyen.*

James K. Nguyen (Brown and Caldwell/USA)

*** Implementation of Green and Sustainable
Remediation Principles in the EPA Region 9 Superfund
Program.** *U.P. Singh and J. Hartley.*
Udai P. Singh (CH2M Hill/USA)

*** Improved Sustainability and Operating Costs for Chlorinated Solvent and 1,4-Dioxane Removal.**

S. Ferron and J. Hatton.

James W. Hatton (AECOM/USA)

Improving the Sustainability of Source Removal.

*R.S. Baker, T. Burdett, S. Griepke Nielsen, U. Hiester, and
V. Schrenk.*

Ralph S. Baker (TerraTherm, Inc./USA)

Sustainability Evaluations at Navy Restoration Sites.

T. Chaudhry and K. Harre.

Tanwir Chaudhry (Consultant/USA)

Sustainability Incorporation into Remedial System Evaluations: Comparison of the Use of Two Tools.

C.L. Dona, C. Coyle, D. Becker, and M. Bailey.

Carol Lee Dona (U.S. Army Corps of Engineers/USA)

Sustainable Investigations Support Sustainable Remediation. *B. Butler, G. Gregory, P. Hadley, P. Ruttan, C. Orwig, and D.E. Ellis.*

P. Brandt Butler (URS Corporation/USA)

Sustainable Ex Situ Bioremediation Alternative to Conventional Pump-and-Treat Systems. *F.R. Symmes, J. Pardue, M. Worthy, J. Charbonnier, and M. Last.*

Frederick R. Symmes (Weston Solutions, Inc./USA)

*** Sustainable Remediation via Fuel Recovery and Reuse at Superfund Petroleum-Contaminated Site Using Cryogenic Stage Cooling and Condensation.**

L. Kessel and C. Winell.

Lowell G. Kessel (Envirologex/USA)

*** Transitioning to Sustainable Attenuation-Based**

Remedies. *K. Vangelas, B.B. Looney, B. Riha, R. Kamath,
D. Adamson, C.J. Newell, and K. Wilson.*

Karen M. Vangelas (Savannah River National Laboratory/
USA)

Treatment System Reuse at Two West Virginia Superfund Sites. *C. Koerner, E. Kenney, L. France, A. Iacobone, and L. Johnson.*

Chris Koerner (CDM/USA)

C5. USE OF ON-SITE RENEWABLE ENERGY

**Platform Papers Wednesday/
Posters (*) Tuesday Evening**

Chairs: Erica S.K. Becvar (U.S. Air Force)
Beth Moore (U.S. Dept of Energy)

*** Alternative Energy Applications at Navy Sites.**

I. Rivadineyra.

Issis Rivadineyra (U.S. Navy/USA)

*** Assessment of On-Site Renewable Energy Potential.**

D.E. Dahle.

Douglas E. Dahle (National Renewable Energy Laboratory/
USA)

Cogeneration in Mountain View, California.

N. Kong, D. Laski, K. Johnston, J. Burns, and P. Nielsen.

Nathan W. Kong (Shaw Environmental, Inc./USA)

Considerations for Applying Renewable Energy to

Environmental Remedies. *D. Sutton and J. Borgersen.*

Douglas J. Sutton (GeoTrans, Inc./USA)

Decision and Design Tool for Alternative Energy Use in

Site Remediation. *J. Tunks, D. Downey, and E. Becvar.*

John Tunks (CH2M Hill/USA)

**Environmental Impacts Associated with Manufacturing
of Solar and Wind Power Alternative Energy Systems.**

J. Santillan, M. Joshi, M.S. Heaston, and D.S. Woodward.

Javier Santillan (U.S. Air Force/USA)

Green Remediation via an Enhanced In Situ

Bioremediation Solar Powered System. *R.C. Daprato,*

J. Langenbach, R. Santos-Ebaugh, R. Kline, and T. Peel.

Rebecca C. Daprato (Geosyntec Consultants/USA)

**Lessons Learned from Renewable Energy-Based
Groundwater Remediation Systems.**

A.C. Elmore.

Andrew C. Elmore (Missouri University of Science and
Technology/USA)

*** Revealing Characteristics of Color Removal and
Electricity Generation Using Indigenous Azo Dye**

Decolorizers. *M.-M. Zhang, B.-Y. Chen, C.-T. Chang,*
W.-M. Chen, and Y. Ding.

Bor-Yann Chen (National I-Lan University/TAIWAN)

*** Screening Tool to Assess Renewable Energy Options.**

C. Silver, M. Bhargava, and B. Boczek.

Cannon F. Silver (Battelle/USA)

*** Solar-Powered Bioreactor for Trichloroethene Source
Reduction at Travis AFB.** *D. Downey, T. Young, E. Becvar,*
M. Ravichandran, G. Anderson, and L. Duke.
Douglas C. Downey (CH2M HILL/USA)

**Wind Energy and Remediation at the Massachusetts
Military Reservation.**

R. Forbes.

Rose Forbes (U.S. Air Force/USA)

C6. PROGRAMMATIC CONSIDERATIONS FOR GREEN AND SUSTAINABLE REMEDIATION

Platform Papers Thursday/Posters (*) Tuesday Evening

Chairs: Russell R. Sirabian (Battelle)
Carlos S. Pachon (U.S. EPA)

**Appropriate Consideration of Worker Risk when
Factoring Sustainability into Remedy Decisions.**

E. Quinn and D. Goldblum.

Elizabeth Quinn (U.S. EPA/USA)

*** Army Green and Sustainable Remediation:**

Implementation and Policy. *C.L. Dona, M. Bailey,*

K. Roughgarten, and C. Harrover.

Carol Lee Dona (U.S. Army Corps of Engineers/USA)

**Case Studies Lessons Learned—Foundation for
Sustainability Indicator Prioritization Methodology**

Development. *K. Holland, L. Kessel, and J. Squire.*

Karin Holland (Haley & Aldrich/USA)

*** Development and Implementation of the Wisconsin
Initiative for Sustainable Cleanup (WISC) Program.**

R. Strous, M. Giesfeldt, G.J. Brooks, J. Weinbauer,

D.S. Woodward, and J. Ryan.

Robert Strous (Wisconsin Department of Natural
Resources/USA)

Green and Sustainable Practices on Army

Environmental Remediation Sites. *K. Roughgarten,*

C.L. Dona, and C. Harrover.

Kevin Roughgarten (U.S. Army/USA)

**Green vs. Sustainable Remediation: Where is the
Debate Heading?**

P.W. Hadley and D.S. Woodward.

Paul W. Hadley (California Dept of Toxic Substances
Control/USA)

NASA Jet Propulsion Laboratory CERCLA Program

Sustainability Initiatives. *K.A. Fields and S.W. Slaten.*

Keith A. Fields (Battelle/USA)

Navy's Approach to Sustainable Environmental Remediation. *K. Harre, T. Chaudhry, I. Rivadineyra, and R. Sirabian.*
Karla Harre (U.S. Navy/USA)

Sustainability Framework for Remediation at Manufactured Gas Plants. *A. Demorest, S. Reackhof, K. Shaddy, N.-W. Chang, and K. Holland.*
Ana Demorest (CH2M Hill/USA)

C7. INTERNATIONAL PERSPECTIVE FOR GREEN AND SUSTAINABLE REMEDIATION

Platform Papers Thursday/Posters (*) Tuesday Evening

Chairs: David E. Ellis (DuPont Engineering)
Curtis C. Stanley (Shell Global Solutions)

Benchmarking Sustainable Remediation Decision-Support Tools for Use in a Tiered-Assessment Framework. *J.W.N. Smith and C.C. Stanley.*
Jonathan W.N. Smith (Shell Global Solutions/UK)

Evaluation of Sustainable Remediation Strategies at Italian National Interest Sites. *A. Battaglia, E. Germiniani, and P. Belfanti.*
Alessandro Battaglia (AECOM/ITALY)

Photo: Monterey County CVB



Green Remediation on Italian Contaminated Sites of National Interest. *G. Armiento, S. Cappucci, F. De Lia, L. Falconti, R. Levizzari, M. Massimo, F. Rapisarda, and E. Rolle.*
Sergio Cappucci (ENEA, Casaccia/ITALY)

SuRF-UK: A Framework for Evaluating Sustainable Remediation Options and Its Use in a European Regulatory Context. *P. Bardos, B.D. Bone, R. Boyle, D. Ellis, F. Evans, N. Harries, and J.W.N. Smith.*
Jonathan W.N. Smith (Shell Global Solutions/UK)

Sustainable Remediation of Land and Groundwater Contamination in Australia. *P. Nadebaum.*
Peter Nadebaum (GHD Pty Ltd/AUSTRALIA)

C8. SUSTAINABILITY IN SITE REUSE/REVITALIZATION

Platform Papers Thursday/Posters (*) Tuesday Evening

Chairs: Alessandro Battaglia (AECOM)
Deborah R. Goldblum (U.S. EPA)

Biofuel Feasibility Study at an Eco-Industrial Park. *L. Jones and D. Jones.*
Leslie Jones (U.S. EPA/USA)

Maximizing Sustainable Aspects of Brownfield Redevelopment: An Urban Case Study. *M. Watt, T. Raine, J. Beattie, M. Koberle, B. Carlson, and M. Burlingame.*
Maria Watt (CDM/USA)

Replacing Pump-and-Treat with Sustainable Remediation. *J. Buss and L. Licht.*
James A. Buss (RMT, Inc./USA)

Soil Remediation and Groundwater Energy: A Local and Regional Approach. *R. Pelgrum, P. Dols, H. Slenders, J. Schreurs, and B. van Denter.*
Rudi Pelgrum (ARCADIS/THE NETHERLANDS)

*** Sustainability Best Management Practices for a Former Wood-Treating Superfund Site.** *S. Bozeman, L. Almaleh, C. Butler, and T. Turner.*
Scotti H. Bozeman (Black & Veatch/USA)

*** Sustainable Remediation in Brownfield Development U.S. Patent and Trademark Office, Alexandria, Virginia.** *R. Huguenard and L. Clingenpeel.*
Robert P. Huguenard (CDM/USA)

*** Use of Enhanced Bioremediation and Other Green Remediation Strategies in Brownfields Site Cleanup.** *J. Foxwell, M. Stevens, and H. Clough.*
John Foxwell (Ash Creek Associates/USA)

DI. IN SITU CHEMICAL OXIDATION: RECENT ADVANCES

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Eric D. Hood (Golder Associates Ltd.)

Prasad K. Kakarla (In-Situ Oxidative Technologies-ISOTEC)

"Advanced Mixed Oxidation and Inclusion" Technology: Inclusion Behavior of PAHs, PCBs, and Ozone. *R. Ball, T. Weymouth, and J. Elsenbeck.*

Raymond G. Ball (EnChem Engineering, Inc./USA)

*** Bench-Scale Comparison of Catalyst, Peroxide and Alkali Activation of Sodium Persulfate.** *Y. Chin and P. Kakarla.*

Yan Chin (In-Situ Oxidative Technologies (ISOTEC)/USA)

*** Bench-Scale Evaluation of Aerobic, Anaerobic, and In Situ Chemical Oxidation of Phenol in Groundwater.**

T. King, S. Damon, and T. Slater.

Trevor King (Langan Engineering & Environmental Svcs./USA)

A Bench-Scale Treatability Study of Five Chemical Oxidants for Treatment of PAH-Contaminated Sediments.

D. Cassidy, J. Gryzenia, and D. Hampton.

Daniel P. Cassidy (Western Michigan University/USA)

Case Study—CHP Treatment of a TCE DNAPL Plume.

P.E. Cross and D. Baird.

Paul E. Cross (CDM/USA)

*** Comparison of Ozone and Alkaline Hydrolysis Testing of DNT in Saturated Soils.** *R. Britto, M. Patel, F. Bogle, and L. McKay.*

Ronnie Britto (Tetra Tech, Inc./USA)

*** Effectiveness of a Metal Stabilizer When Treating Hazardous Waste with Modified Fenton's Reagent and Sodium Persulfate: A Laboratory Treatability Study.**

H. Guha, P. Kakarla, and M. Manolakas.

Hillol Guha (Leggette, Brashears, & Graham, Inc./USA)

Enhanced Delivery of Permanganate Using a Manganese Dioxide Particle Stabilization Aid. *M. Crimi and M. Quickel.*

Michelle L. Crimi (Clarkson University/USA)

Evaluation of Fenton's Reagent and Activated Persulfate for Treatment of a Pharmaceutical Waste Mixture in Groundwater.

L.R. Bennedsen, E.G. Sogaard,

P. Kakarla, T.H. Jorgensen, J. Dall-Jepsen,

M. Christophersen, and N.D. Durant.

Lars R. Bennedsen (Aalborg University/DENMARK)

*** Heated Persulfate Treatability Study of Pentachlorophenol and Diesel Carrier Solvent.**

T.S. Brown, T. Montoya, and M. Chandler.

Timothy S. Brown (Sound Environmental Strategies Corporation/USA)

*** ISCO Treatment of Dioxin- and Pentachlorophenol-Contaminated Soil from a Native American Burial Site (Treatability Study).** *M. Foget, D.P. Cassidy, and W. Lundy.*

Michael K. Foget (SHN Consulting Engineers & Geologists, Inc./USA)

ISCO Treatment of Polycyclic Aromatic Hydrocarbons (PAH). *D. Root, X. Zhai, and E. Lay.*

Duane K. Root (Shaw Environmental, Inc./USA)

*** New Advanced Oxidation Methods at Neutral pH.**

V. Sikka, A. Jones, and H. Cox.

Andrew K. Jones (Ross Technology Corporation/USA)

*** Peroxidation of Polychlorinated Biphenyl Compounds Containing Electrical Insulating Oil in Soil.** *A. Goi, M. Viisimaa, M. Trapido, and R. Munter.*

Anna Goi (Tallinn University of Technology/ESTONIA)

Persulfate Persistence under Thermal Activation Conditions. *R.L. Johnson, P.G. Tratnyek, and R. O'Brien Johnson.*

Paul G. Tratnyek (Oregon Health & Science University/USA)

pH Effect on EDTA/Ferric Ion-Activated Persulfate Oxidation of Trichloroethylene in Batch Studies.

C. Liang, C.-F. Huang, and C.-C. Chen.

Chenju Liang (National Chung Hsing University/TAIWAN)

*** Pilot-Study Remediation of a Consortium of VOCs and 1,4-Dioxane Utilizing In Situ Chemical Oxidation with MFR.**

J. Ahrens, J.C. Herin, and D. Riotte.

Jeffrey Ahrens (Geosyntec Consultants/USA)

Remediation of 1,2,3-Trichloropropane by Chemical Oxidation with Alkaline-Activated Persulfate.

J.H. Fortuna, E. Suchomel, P.G. Tratnyek, and V. Sarathy.

John H. Fortuna (Geosyntec Consultants/USA)

Use of Compound-Specific Isotope Analysis (CSIA) for Assessing the Performance of In Situ Chemical Oxidation of Chlorinated Compounds.

M. Marchesi, R. Aravena, N. Otero, A. Soler, K. Sra, N. Thomson, and S. Mancini.

Massimo Marchesi (University of Barcelona/SPAIN)

*** Using Oxidants to Deliver Catalyst for Superoxide In Situ Reduction of VOCs.** *D. Bryant, J. Vidumsky, and G. Burnett.*

Daniel J. Bryant (Geo-Cleanse International, Inc./USA)

D2. IN SITU CHEMICAL OXIDATION CASE STUDIES

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: Patrick J. Evans (CDM)

Pamela J. Dugan (Carus Corporation)

*** Case Study: Chemical Oxidation and Subsequent Enhanced Bioremediation to Reduce Petroleum Hydrocarbon Concentrations in Soil and Groundwater.** *D. Osbourne.*

Dan Osbourne (North Wind, Inc./USA)

*** Challenges with an ISCO Design and Implementation in Fractured Bedrock: A Case Study and Comparisons.**

S. Borchert, L. Cook, D. Steckler, and C. Brown.

Susanne M. Borchert (CH2M HILL, Inc./USA)

*** Chemical Oxidation Field Pilot Study Using Modified Fenton's Reagent.** *R. Teczon.*

Rick Teczon (Kennedy/Jenks Consultants/USA)

Chemical Oxidation Using Sodium Persulfate at a Superfund Site in Texas. *J. Wiley and P. Block.*

Joseph Wiley (URS Corporation / El Paso Corp., Env. Remed. Group/USA)

*** Comparing ISCO and ISCR for Treatment of Organochlorine Pesticides in Saturated Soil.**

K.A. Morris, R. Brown, D. Ross, and W.A. Butler.

Kevin A. Morris (ERM/USA)

*** Comparison of Two In Situ Oxidation Techniques for Remediation of TCA Contamination.** *L. Lessard, C. Glod, G. Austin, and M. Head.*

Lawrence Lessard (Lessard Environmental, Inc./USA)

Contaminant Rebound at ISCO Sites: Historical Prevalence, Predictors, and Mitigation Methods.

F.J. Krembs and W.S. Clayton.

Friedrich J. Krembs (Aquifer Solutions, Inc./USA)

*** Fast-Track, Large-Scale Activated Persulfate Remediation of Groundwater Contaminated with 1,4-Dioxane and VOCs.** *P.M. Dombrowski, B.A. Weir, and J. Brown.*

Paul M. Dombrowski (AECOM/USA)

*** Field-Scale Application of Peroxide-Activated Persulfate ISCO in a Clay Till Site.** *A. Tsitonaki, N. Tuxen, K.L. Andersen, M. Terkelsen, and H. Kern-Jespersen.*

Aikaterini Tsitonaki (Orbicon A/S/DENMARK)

*** Full-Scale Implementation and Results of ISCO to Treat Chlorinated Organic Solvents in Groundwater—A Case of Success in Brazil.** *M. Naves, S. Loebmann, S. Eskes, and R. Brown.*

Matheus Naves (ERM/BRAZIL)

Full-Scale Treatment of Residual PCE in Till Using Permanganate Oxidation. *M. Apfelbaum, J. Sidio,*

S. Daigle, J. Ekedahl, and K. Kasper.

Michael A. Apfelbaum (Woodard & Curran/USA)

*** Gains in Understanding of Activated Persulfate ISCO from Trials at Three Australian Sites.** *W.S. Clayton,*

F.J. Krembs, J.C. Fairweather, J.R. Stening, and

A.M. Cooper.

Wilson S. Clayton (Aquifer Solutions, Inc./USA)

*** In Situ Chemical Oxidation Treatment within Active Launch Complex 37, Cape Canaveral AFS, Florida.**

D.R. Theoret and A. Chrest.

Dennis R. Theoret (3E Consultants, Inc./USA)

*** In Situ Pilot-Scale Groundwater Treatment of TCE by Activated Persulfate.** *B. White, R. Wong, M. Pound, and P. Block.*

Brian C. White (Shaw Environmental & Infrastructure, Inc./USA)

Long-Term Monitoring of Rebound Conditions in ISCO.

M. Carver, J. Roberts, and R.A. Brown.

Marc Carver (ERM, Inc./USA)

Persulfate ISCO of Chlorobenzenes: Groundwater Quality Effects Observed during Pilot Study.

T.L. Johnson, E.L. Schaefer, J.T. Spadaro, C.L. Johnson, and R.T. Gresh.

Jack T. Spadaro (AMEC Earth & Environmental, Inc./USA)

Persulfate Treatment of Gasoline and Diesel Range Organics. *K. Sra, N.R. Thomson, and J.F. Barker.*

Neil R. Thomson (University of Waterloo/CANADA)

Quick-Turn Sodium Persulfate Oxidation to Neutralize Health Threats in Contaminated Soils. *K.D. Dyson and P.J. Palko.*

Kevin D. Dyson (Panther Technologies, Inc./USA)

*** Results of Aggressive In Situ Chemical Oxidation and Accelerated Anaerobic Bioremediation at Multiple Sites.** *K.M. Gaskill and B.A. Poling.*

Keith Gaskill (Sesco Group Inc./USA)

*** Results of In Situ Chemical Oxidation and Reduction Pilot-Scale Injection Study.** *H. Budzich, S. Ferris,*

K. Holloran, R. Howell, V. Srivastava, R. Wenzel, and R. Lantzy.

Heather Budzich (Parsons/USA)

*** Shallow Application of Alkaline-Activated Persulfate for Treating LNAPL in Heterogeneous Fill Aquifer.** *B.E. Wallace, D. Grose, B. Lebron, G. Coghlan, S. Glennie, J. Chebetar, and B. Caron.*
Gunarti H. Coghlan (CH2M HILL/USA)

Sodium Persulfate Activated with Modified Fenton's Reagent for the Treatment of Carbon Tetrachloride. *J. Fein, R. Habrukowich, P. Kakarla, K. O'Neal, W. Caldicott, and D. Glass.*
William Caldicott (In-Situ Oxidative Technologies (ISOTEC)/USA)

*** Treatability Testing as a Tool for Identifying Appropriate Site-Specific Remediation Technologies.** *C.G. Schreier, M. Bowery, and M. Martinson.*
Cindy G. Schreier (PRIMA Environmental, Inc./USA)

D3. BEST PRACTICES AND PROTOCOLS FOR IN SITU CHEMICAL OXIDATION

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: Tom Palaia (CH2M HILL)
Michelle L. Crimi (Clarkson University)

*** Beyond NOD, Assessing Nonbeneficial Reactions in ISCO.** *R.A. Brown and T. Pac.*
Richard A. Brown (ERM, Inc./USA)

Chromium at ISCO Sites: Is it a Problem? *M. Crimi, K. Kaur, T. Simpkin, T. Feng, and K. Moore.*
Michelle L. Crimi (Clarkson University/USA)

*** Conceptual Design of In Situ Chemical Oxidation Systems—Protocols for Optimization.** *T.J. Simpkin and M. Crimi.*
Thomas J. Simpkin (CH2M HILL/USA)

*** Correcting Common Mistakes: Estimating Contaminant Mass and Corresponding Oxidant Requirements for ISCO.** *R. Connell and D. Bryant.*
Robert C. Connell (Geo-Cleanse International, Inc./USA)

*** Health and Safety Planning for In Situ Chemical Treatment—Seven Years Later.** *B.K. Marvin.*
Bruce K. Marvin (Geosyntec Consultants/USA)

The Importance of Bench-Scale Treatability Studies as a Decision-Making Tool for ISCO. *D. Cassidy and D. Hampton.*
Daniel P. Cassidy (Western Michigan University/USA)

ISCO Design Best Practices as Demonstrated by Past Case Study Data. *F.J. Krembs and W.S. Clayton.*
Friedrich J. Krembs (Aquifer Solutions, Inc./USA)

Oxidant Stability vs Natural Oxidant Demand—The Final Word? *N.R. Thomson.*
Neil R. Thomson (University of Waterloo/CANADA)

*** A Protocol for Performance Monitoring and Optimization of In Situ Chemical Oxidation for Groundwater Remediation.** *T. Palaia and G. Ng.*
Tom Palaia (CH2M HILL/USA)

*** A Protocol for Site-Specific Screening of In Situ Chemical Oxidation for Groundwater Remediation.** *B. Petri, J. Munakata-Marr, R. Siegrist, K. Lowe, M. Crimi, F. Krembs, T. Palaia, and T. Simpkin.*
Benjamin G. Petri (Colorado School of Mines/USA)

*** SOD Comparison of Untreated versus CHP- and Permanganate-Treated Soil.** *S. Haskins, P. Haldemann, and M. Ungar.*
Stan Haskins (In-Situ Oxidative Technologies (ISOTEC)/USA)

A Spreadsheet Design Tool for Permanganate Delivery—Background and Applications. *T.J. Simpkin and R. Borden.*
Thomas J. Simpkin (CH2M HILL/USA)

D4. IN SITU CHEMICAL REDUCTION

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Marvin Unger (Hydrogeologic, Inc.)
Richard A. Brown (ERM, Inc.)

Chemical Reductants for ISCR: The Potential for Improvement. *P.G. Tratnyek.*
Paul G. Tratnyek (Oregon Health & Science University/USA)

Electrically Induced Reduction of TCE and Nitrate in Groundwater. *S. Jin, P.J.S. Colberg, T. Mehraban, S. Arens, H. Olsen, and M. Roginske.*
Song Jin (University of Wyoming/USA)

*** Elucidation of Abiotic Pathways during Successful ISCR-Enhanced Bioremediation of a TCE Source Area.** *J. Peale, E. Bakkom, J. Mueller, J. Molin, and A. Przepiora.*
James G.D. Peale (Maul Foster & Alongi, Inc./USA)

*** Field Study for In Situ Chemical Reduction of Carbon Tetrachloride Using EHC™.** *Y.E. Yan, L.M. LaFreniere, R.A. Sedivy, J.S. Alvarado, C. Roe, S. Gilmore, and D. Steck.*
Y. Eugene Yan (Argonne National Laboratory/USA)

*** Full-Scale Implementation of ISCR and Aerobic Bioremediation to Treat Pentachlorophenol in Groundwater and Soil—Brazil Site.** *M. Naves, S. Sussumu, S. Eskes, G.J. Skladany, and J. Molin.*
Matheus Naves (ERM/BRAZIL)

*** In Situ Biological Metal Precipitation and Anaerobic Biodegradation of Chlorinated Hydrocarbons.** *R. Heling, E. de Zeeuw, and Y. Veenis.*
Robert Heling (Groundwater Technology B.V./THE NETHERLANDS)

In Situ Chemical Reduction Technologies—Differentiators and Technology Implementation. *J. Mueller and R. Brown.*
James G. Mueller (Adventus Group/USA)

Remediation of 1,2,3-Trichloropropane by Reduction with Zero-Valent Zinc. *A.J. Salter, P.G. Tratnyek, and J.H. Fortuna.*
Alexandra J. Salter (Oregon Health & Science University/USA)

*** State-of-the-Technology in In Situ Chemical Reduction (ISCR).** *R.A. Brown, M. Unger, R. Darlington, and C. Lebron.*
Richard A. Brown (ERM, Inc./USA)

The Use of Soluble Chemical Reductants in Abiotic Reactions. *R.A. Brown.*
Richard A. Brown (ERM, Inc./USA)

D5. OPTIMIZED STRATEGIES FOR SUBSURFACE DELIVERY OF INJECTABLE ZERO-VALENT IRON

Platform Papers Wednesday/
Posters (*) Tuesday Evening
Chairs: Nancy E. Ruiz (U.S. Navy)
Cannon F. Silver (Battelle)

*** Combined Application of Lactates and nZVI for Remediation of Chlorinated Hydrocarbons.** *P. Kvapil, M. Cernik, and L. Lacinova.*
Petr Kvapil (AQUATEST/CZECH REPUBLIC)

Design, Field Application and Verification of Pneumatically Injected Permeable Reactive Barriers. *D.L. Schnell.*
Deborah L. Schnell (Pneumatic Fracturing, Inc./USA)

EZVI: Successes in DNAPL Reduction and Lessons from Field Implementations. *J.G. Booth, H. Faircloth, and M. Dings.*
J. Greg Booth (Toxicological & Environmental Associates, Inc./USA)

*** Field Application of Natural Polyphenol-Stabilized Nanoscale Iron Particles for In Situ Remediation of DNAPLs-Contaminated Groundwater.** *J.-W. Lee, J.-H. Kim, S.-H. Cho, J.-R. Jeon, E.-J. Kim, and Y.-S. Chang.*
Jin-Wook Lee (Hyorim Inc./SOUTH KOREA)

*** Field Evaluation of the Treatment of DNAPL Using Emulsified Zero-Valent Iron.** *S. O'Hara, T. Krug, M. Watling, J. Quinn, N. Ruiz, C. Su, and R. Puls.*
Mark Watling (Geosyntec Consultants/CANADA)

Field Test of a Shear-Thinning Fluid to Deliver ZVI Particles to the Subsurface. *M.J. Truex, V.R. Vermeul, M. Oostrom, and T. Macbeth.*
Michael J. Truex (Pacific Northwest National Laboratory/USA)

Fracture-Emplacement and 3-D Mapping of a Microiron/Carbon Amendment in TCE-Impacted Sedimentary Bedrock. *G.H. Bures, J.A. Skog, D. Swift, J. Rothermel, R. Starr, and J. Moreno.*
Gordon H. Bures (Frac Rite Environmental, Ltd./CANADA)

*** In Situ Construction of a Zero-Valent Iron Permeable Reactive Barrier within Bedrock Utilizing Pneumatic Fracturing.** *M. Beeler and R.C. Smith.*
Malcolm Beeler (TRC/USA)

*** Influence of nZVI Dose and Groundwater Flow Rate on PCE Dechlorination in Porous Media.** *H.-J. Kim, T. Phenrat, R.D. Tilton, T. Illangasekare, and G.V. Lowry.*
Gregory V. Lowry (Carnegie Mellon University/USA)

Injection of Nano Zero-Valent Iron for Subsurface Remediation: A Field-Scale Test of Materials, Methods, and Models. *P.G. Tratnyek, R.L. Johnson, J.T. Nurmi, P. Langren, G.V. Lowry, T. Phenrat, A. Cihan, T. Illangasekare, Y. Wu, and K.H. Williams.*
Paul G. Tratnyek (Oregon Health & Science University/USA)

Injection of ZVI/Carbon for Complete Source Zone Treatment of PCE/TCE in Fractured Basalt. *C. Mowder, R. Hanlon, C. Divine, J. Valkenburg, B. Simmons, and A. Northway.*
Carol S. Mowder (ARCADIS/USA)

*** Innovative Application of Pneumatic Fracturing and Atomized Injection Application in High-Traffic Urban Environment.** *S. Chen, P.G. Smith, and M. Hall.*
Steve Chen (ARS Technologies, Inc./USA)

*** Large-Scale DNAPL Remediation Using ZVI-Clay Soil Mixing at Site 89 MCB Camp Lejeune.** *C. Bozzini, D. Cleland, R. Lowder, J. Skeean, and M. Fulkerson.*
Christopher Bozzini (CH2M HILL/USA)

*** A Magnetic Susceptibility Method for Evaluating Distribution of Zero-Valent Iron in the Subsurface.** *J.G. Arnason, M. Harkness, and B. Butler-Veytia.*
John G. Arnason (GE Global Research/USA)

*** Modeling Tool to Design In Situ Nanoscale Zerovalent Iron (NZVI) Emplacement Strategies.** *G.V. Lowry, T. Phenrat, A. Cihan, H.-J. Kim, and T. Illangasekare.*
Gregory V. Lowry (Carnegie Mellon University/USA)

*** Results from ZVI Groundwater Treatability Study for TCE and Chloroform Reduction.** *K. Forman, M. Kito, H. Kayaci, J. Zimmerle, D. Rhoades, and C. Silver.*
Melanie Kito (U.S. Navy/USA)

*** Simulation of nZVI Transport at a Field Site.** *C. Kocur, D.M. O'Carroll, B. Sleep, Z. Xiong, and P.J. Bennett.*
Denis M. O'Carroll (University of Western Ontario/CANADA)

Subsurface Distribution of ZVI/EHC Slurry—Validating Radius of Influence. *J. Molin, J. Mueller, J. Moreno, J. Valkenburg, and M. Duchene.*
Josephine Molin (Adventus Group/USA)

*** Transport and Amassing of ZVI Nano-Sized Particles in Groundwater.** *M.H. Zaluski, S.W. Petersen, A.K. Runchal, and A. Logar.*
Marek H. Zaluski (MSE Technology Applications/USA)

D6. OPTIMIZED STRATEGIES FOR SUBSURFACE DELIVERY OF IN SITU CHEMICAL OXIDATION

Platform Papers Thursday/Posters (*) Tuesday Evening

Chairs: Ian T. Osgerby (U.S. Army Corps of Engineers)
Stephen H. Rosansky (Battelle)

*** Bulk Reduction of Contaminant Mass in Vadose Zone Soils via “Stepped” In Situ Oxidation Injection Events.** *J.D. Burgstiner, G. Babka, and D. Baird.*
J. David Burgstiner (URS Corporation/USA)

Controlled Vadose Saturation and Remediation (CVSR) with ISCO for Treatment of VOC-Contaminated Soil. *G. Cronk, S. Koenigsberg, B. Coughlin, M. Travers, and D. Schlott.*
Gary Cronk (JAG Consulting Group, Inc./USA)

Delivery and Distribution of Potassium Permanganate in Groundwater via a Horizontal Injection Well. *K.W. Eggers, J. Siegal, A.A. Rees, and R. Hobbs.*
Karl W. Eggers (AECOM/USA)

*** Enhanced Potassium Permanganate Slurry Injection in Fractured Bedrock Utilizing Hydraulic Fracturing.** *B. Rundell, B. Khona, B. White, N. Teamerson, and B. Dynkin.*
Bruce Rundell (U.S. EPA/USA)

*** Enhancing ISCO Using Encapsulated Permanganate: Selective Oxidation and Controlled-Release Studies.** *P.J. Dugan, B. Vlastnik, and L. Swearingen.*
Pamela J. Dugan (Carus Corporation/USA)

In Situ Chemical Oxidation (ISCO) Field Application and Monitoring Strategies. *M. Marley and B. Smith.*
Michael C. Marley (XDD, LLC/USA)

*** In Situ Chemical Oxidation (ISCO) Injection Optimization at Low-Permeability Sites.** *M. Pullen, T. Pac, and R. Lewis.*
Richard L. Lewis (ERM/USA)

In Situ Chemical Oxidation in Clays Using Hydraulic Fracturing. *G.H. Bures, C. Clark, and T.J. Williams.*
Gordon H. Bures (Frac Rite Environmental, Ltd./CANADA)

In Situ Chemical Oxidation with Persulfate Using a Pulse and Drift Approach. *M. Klemmer, J. Saling, and R. Kapp.*
Mark R. Klemmer (ARCADIS US/USA)

Innovative Activated Persulfate Delivery in Fractured Bedrock Using Groundwater Recirculation. *W.S. Clayton, A.M. Cooper, and J.C. Fairweather.*
Wilson S. Clayton (Aquifer Solutions, Inc./USA)

*** Large-Scale Permanganate Injection Using Mobile Injection Trailers.** *A. Struse, S. Schultz, and T.L. Clendenin.*
Amanda Struse (CH2M HILL, Inc./USA)

Multiple ISCO Delivery Mechanisms to Treat VOCs in Soil and Groundwater. *T.M. Kinney, F.W. Blickle, T.H. De Fouw, and G. Tafla.*
Thomas M. Kinney (Conestoga-Rovers & Associates/USA)

*** Prevalence and Persistence of Hexavalent Chromium During ISCO of Trichloroethylene with Permanganate.** *A.D.G. Jones, C.L. Serlin, M. Escobar, and D. Rowe.*
Antony D.G. Jones (ENVIRON International Corporation/USA)

*** Remediation of Soils and Groundwater Using Combined In Situ Chemical Oxidation and Laser-Induced Fluorescence (LIF) to Pinpoint Contaminant Sources.** *W. Lundy and R. St. Germain.*
William L. Lundy (DeepEarth Technologies, Inc./USA)

* **Solid Potassium Permanganate Emplacement Using Hydraulic Fracturing Pilot Study.** *C.D. Marks and M. Benson.*
Corinne Marks (URS Corporation/USA)

* **The Utility of Polymer Amendment to Improve Efficiencies of In Situ Permanganate Treatment.** *J.A.K. Silva, M.M. Smith, J.E. McCray, and J. Munakata-Marr.*
Jeffrey A.K. Silva (Colorado School of Mines/USA)

* **A Vertically Phased Approach to In Situ Chemical Oxidation (ISCO) at the Savage Municipal Water Supply Superfund Site.** *B. Nowack, R. Mongeon, A. Fuller, J. Warrington, and P.T. Harte.*
Bette Nowack (Weston Solutions, Inc./USA)

D7. IMPROVED DELIVERY METHODS: INJECTION AND SOIL-MIXING

Platform Papers Thursday/Posters (*) Wednesday

Chairs: Susanne M. Borchert (CH2M HILL, Inc.)
Patrick Hicks (Wavefront Energy and Environmental Services Inc.)

* **Chemical Oxidation of Diesel and Fuel Oil in San Francisco Bay Mud via In Situ Dual-Axis Soil Mixing.** *R. Kitay.*
Robert Kitay (Aqua Science Engineers/USA)

* **Comparison of Techniques for Creation of Iron-Filled Hydraulic Fractures.** *D. Knight and B. Slack.*
Doug Knight (FRx, Inc./USA)

* **Design and Implementation of Fluid Delivery Systems for In Situ Remediation of Large Plumes.** *C.E. Divine, S.T. Potter, F. Lenzo, E. Moreno-Barbero, J. Erickson, K.J. Preston, M. Gentile, and X. Song.*
Craig E. Divine (ARCADIS U.S., Inc./USA)

* **Distribution, Design, and Delivery Considerations for Chemical Oxidants and Activators.** *E. Cooper, T. Hanna, and P. Tang.*
Eliot D. Cooper (Vironex, Inc./USA)

* **Enhancement of Existing Remedial Systems Using Pneumatic Fracturing.** *D.L. Schnell.*
Deborah L. Schnell (Pneumatic Fracturing, Inc./USA)

* **The First Application of ISCO in Israel Using Activated Persulfate for Treating Groundwater Contaminated with Fuels and MTBE.** *A.A. Rees, H. Rauch, A. Haim, Y. Lapid, and G. Kaydar.*
Assaf A. Rees (AECOM/USA)

* **Fracturing versus Injection Delivery Techniques: Vanquishing the “Direct Push” Myth.** *G.H. Bures, C. Kaban, and K.S. Sorenson.*
Celeste Kaban (Frac Rite Remediation, Inc./USA)

* **In Situ Blending of Alkaline-Activated Sodium Persulfate.** *N. Scroggins, L. Davies, E. Meyers, J. Perdicaris, M. Martin, S. Ulbrik, and E. Mier.*
Nicole Scroggins (AECOM/USA)

* **Jet-Assisted Injection of Nano-Scale, Zero-Valent Iron to Treat TCE in a Deep Alluvial Aquifer.** *P.R. Chang, A.D. Pantaleoni, and D.J. Shenk.*
Paula R. Chang (ERM, Inc./USA)

* **Optimizing Remedial Treatment: Bench-Scale and Pilot Studies at Site 88 MCB Camp Lejeune.** *C. Bozzini, D. Cleland, R. Lowder, K. Hallberg, and M. Fulkerson.*
Christopher Bozzini (CH2M HILL/USA)

Recent Advances in Rotary Soil Blending. *J. Haselow, J. Rossabi, J. Vanek, E. Escochea, and S. Markesic.*
John S. Haselow (Redox Tech, LLC/USA)

Treatment of Chlorinated Solvent Source Zones via Admixing ZVI and Clay. *T. Sale and M. Olson.*
Tom Sale (Colorado State University/USA)

* **Treatment of TCE DNAPL via ZVI-Clay Soil Mixing.** *M. Olson and T. Sale.*
Mitchell Olson (Colorado State University/USA)

Using a Comprehensive Conceptual Site Model to Design a Hydraulic Fracturing Pilot Test. *D.L. Swift, J. Rothermel, R.C. Starr, J.A. Skog, G.H. Bures, and J. Moreno.*
Dana L. Swift (North Wind, Inc./USA)

Vadose Zone Soil Treatment of a Trichloroethylene Source Area Using DPT. *J.M. Frain, M. Wilkinson, and F. Barranco.*
Jil M. Frain (EA Engineering, Science, and Technology, Inc./USA)

Photo: Monterey County CVB



D8. DELIVERY DISTRIBUTION CASE STUDIES FOR ISCO AND BIOREMEDIATION

Platform Papers Thursday/Posters (*) Wednesday

Chairs: Eliot D. Cooper (Vironex, Inc.)

John W. Lane (U.S. Geological Survey)

*** A Case Study of Reductive Dechlorination Using In-Well Groundwater Circulation Technology.** *P. Chang, C. Aquirre, and A. Klavans.*
Paula R. Chang (ERM, Inc./USA)

*** Chemical Oxidation of Chlorinated Ethenes and Emerging Contaminants: Assessment Using UV-vis Absorbance.** *P.H. Fallgren and M.A. Urynowicz.*
Paul H. Fallgren (University of Wyoming/USA)

*** Combining Electrokinetics and Oxidation for Remediation of Heterogeneous and Low-Permeability Media.** *D. Reynolds, T. Robertson, D. Thomas, A. Fourie, M. Wu, D. Hodges, and E. Jones.*
David Reynolds (Golder Associates/AUSTRALIA)

*** The Effects of Chemical Oxidation on Contaminant Biodegradation.** *C. Schultz and M.A. Urynowicz.*
Chris L. Schultz (University of Wyoming/USA)

*** Enhancement of the Biologically Enhanced Chemical Oxidation (BECOSM) Process with Surfactants.** *L. Lessard, M. Head, and C. Glod.*
Lawrence Lessard (Lessard Environmental, Inc./USA)

Estimation of Pneumatic Fracturing Radius of Influence and Fracture Density in a Clay/Till Environment. *M. Samaroo, D. Downey, W. Westervelt, J. West, and C. Creber.*
Mahendra Samaroo (CH2M Hill/CANADA)

*** Evaluation of an Hydraulic Fracture-Emplaced EHC Reactive Barrier.** *P. Chang and A. Klavans.*
Paula R. Chang (ERM, Inc./USA)

*** In Situ Gas Evolution and Flow during Supersaturated Water Injection.** *R. Enouy, M. Li, A. Unger, and M. Ioannidis.*
Marios Ioannidis (University of Waterloo/CANADA)

Innovative Method for Assessing Contaminant Mass Distribution and Destruction. *P. Caprio, M. Magilton, P. Kakarla, and M. Temple.*
Paul Caprio (EA Engineering, Science and Technology, Inc./USA)

*** Parallel ISCO and ERD Pilot Studies for PCE and TCE Remediation in a Heterogeneous Aquifer.** *M. Novak, G. Tangalos, and S. Smith.*
George Tangalos (CH2M Hill/USA)

Quantitative Assessment of the Distribution of Injected Material during Hydraulic Fracturing. *W. Slack.*
William W. Slack (FRx, Inc./USA)

Unactivated Persulfate Oxidation Pilot Test in Saprolite with Deuterium Tracer. *S. Wang, M.R. Klemmer, C.E. Divine, D. Wilderman, J.G. Gay, and B. Rusinowski.*
Song Wang (ARCADIS/USA)

Use of Tracer Tests to Design Remediation Injection Systems. *M. Petersen, M. Harkness, A. Fisher, and R. Royer.*
Matthew Petersen (GE Global Research/USA)

Photo: Kerrick James



E1. THERMAL REMEDIATION CASE STUDIES

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Jim Cummings (U.S. EPA)
Jim Claffey (Brown and Caldwell)

*** Alterations of Natural Geochemistry by ISTD and Implications for Heavy Metal Mobilization and Corrosion Control.** *H. Aktor, H. Skou, O. Kiilerich, and H. Steffensen.*

Henrik Aktor (AKTOR Innovation ApS/DENMARK)

*** Electrical Resistance Heating Treatment of a Solvent Source Area at Kelly AFB.** *M.L. Alexander, M. Miller, M. Spradling, and J. Pezzullo.*

Matthew L. Alexander (SAIC/USA)

Enhanced In Situ Soil Remediation at a Former Manufactured Gas Plant. *J. Chittet, J. Gonzalez, J. Pope, J. Pezzullo, S. Tomczak, and N. Huston.*

Jeffery L. Pope (Burns & McDonnell Engineering Company/USA)

*** In-Pile Thermal Desorption for Treatment of Dioxin-Contaminated Sediment in Japan.** *G. Heron, R. Baker, J. Galligan, K. Tawara, H. Braatz, Y. Ito, and S. Higuchi.*

Gorm Heron (TerraTherm, Inc./USA)

*** Successful Steam-Enhanced Remediation of PCP NAPL Leads to Community Revitalization.** *A. Hughes, J. Peale, S. Taylor, J. Maul, B. Grening, L. Olin, K. Jolin, and L. Klasner.*

Alan Hughes (Maul Foster & Alongi, Inc./USA)

A Summary of the Performance of Electrical Resistance Heating at the Pemaco Superfund Site, Maywood, California. *D. Bush, J. Wingate, R.M. Caraway, and J. Hartley.*

Dacre Bush (OTIE Solutions/USA)

Thermal Treatment of Eight CVOC Source Areas to Near-Nondetect Concentrations. *G. Heron, J. Galligan, K. Parker, T.C. Holmes, M. Perlmutter, and M. Dobbs.*

Gorm Heron (TerraTherm, Inc./USA)

Thermal Treatment of Thick Peat Layers—DNAPL Removal and Shrinkage. *P.J. Jensen, C. Riis, S.G. Nielsen, G. Heron, P. Johansen, N. Ploug, and J. Holm.*

Pia J. Jensen (NIRAS A/S/DENMARK)

*** Treatment of Hydrocarbon Contamination in Chalk Using In Situ Radio-Frequency Heating (ISRFH) at a Former Petrol Filling Station in Kent, England.**

G. Maini, G. Houn, F. Will, and U. Roland.

Giacomo Maini (Ecologia Environmental Solutions Ltd./UK)

*** Triad Characterization and Steam Remediation of a DNAPL Site within Four Years.** *R.J. Fiacco, A. Kabir, C. Regan, J. Fernet, J. Gipson, and M.B. Smith.*

R. Joseph Fiacco (ERM/USA)

E2. THERMAL REMEDIATION: LATEST DEVELOPMENTS AND RECENT PERSPECTIVES

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Paul C. Johnson (Arizona State University)
Ralph S. Baker (TerraTherm, Inc.)

*** Bench-Scale Thermal Treatment of Contaminants from a Complex Pharmaceutical-Waste Megasite.**

R.P. Nielsen, E.G. Sogaard, N. Durant, D. Parkinson, M. Christophersen, J. Dall-Jepsen, and T.H. Jorgensen.

Rudi P. Nielsen (Aalborg University/DENMARK)

*** Bitumen Production with Electrical Resistive Heating and Application to Remediation of Coal Tar and Creosote Sites.** *R. Juhlin, B. Winder, and B. McGee.*

Randall Juhlin (McMillan-McGee Corporation/CANADA)

ESTCP Project ER-0719: Designing Low-Temperature ERH to Enhance In Situ Treatment Efficiencies.

G. Sandberg, T. Powell, T. Macbeth, and M. Truex.

Gregory Sandberg (TRS Group Inc./USA)

*** Geochemical and Stable Isotope (¹³C and ³⁷Cl) Changes during Electrical Resistance Heating.**

G.J. Smith.

Gregory J. Smith (DPRA, Inc./USA)

*** Large-Scale Physical Models of Thermal Remediation of DNAPL Source Zones in Aquitards.** *R.S. Baker,*

J. LaChance, G. Heron, and U. Hiester.

Ralph S. Baker (TerraTherm, Inc./USA)

Reactivity and Distribution of Chlorinated Ethenes during Thermal Treatment. *J. Costanza, K. Fletcher, F. Loeffler, and K. Pennell.*

Kurt D. Pennell (Tufts University/USA)

*** Remediation of Mixture of Organic Compounds by Six-Phase Heating.** *G. De Moor and W. Leys.*

Gerlinde De Moor (ARCADIS Belgium/BELGIUM)

Removal of Chlorinated Volatile Organic Compounds (cVOCs) from Fractured Rock Using Thermal Conductive Heating (TCH). *C.A. Lebron, B.H. Kueper,*

G. Heron, J. LaChance, D. Phelan, and P. Lacombe.

Carmen A. Lebron (U.S. Navy/USA)

*** State-of-the-Practice Review of In Situ Thermal Technologies.** *J. Triplett Kingston, P.R. Dahlen, and P.C. Johnson.*
Jennifer Triplett Kingston (Haley & Aldrich, Inc./USA)

*** Thermal Remediation of Deep TCE Contamination at a Site with High Groundwater Flow.** *B. Winder, R. Juhlin, and B. McGee.*
Brent Winder (McMillan-McGee Corp./CANADA)

Thermal Remediation of Fractured Rocks. *R.W. Falta, L.C. Murdoch, F. Chen, and X. Liu.*
Ronald W. Falta (Clemson University/USA)

Thermal Treatment—How Close Can You Go and Is It Safe to Humans? *N. Ploug, M. Jensen, J. Holm, P.J. Jensen, H.E. Steffensen, S.G. Nielsen, and G. Heron.*
Niels Ploug (Kruger A/S/DENMARK)

Thermally Enhanced In Situ Remediation Methods Beneath Buildings. *U. Hiester and V. Schrenk.*
Uwe Hiester (reconsite - TTI GmbH/GERMANY)

E3. COMBINING THERMAL WITH OTHER REMEDIATION TECHNOLOGIES

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: David A. Cacciatore (Shaw Environmental & Infrastructure)
David Fleming (TRS Group, Inc.)

Combining Low-Energy Heating with Biotic and Abiotic Treatment for DNAPL Sources. *T.W. Macbeth, M.J. Truex, M. Michalsen, E. Pitre, G. Sandberg, T. Powell, and K.S. Sorenson.*
Tamzen W. Macbeth (CDM/USA)

*** Combining Thermal Treatment with MNA at a Brownfield DNAPL Site.** *G. Heron, J. LaChance, J. Bierschenk, K. Parker, S. Vinci, T. Barba, and J. Schneider.*
Gorm Heron (TerraTherm, Inc./USA)

Complete In Situ Reduction of DNAPL Source Zones Using Combined Thermal and ZVI Soil Mixing. *H. Faircloth, E. Kirkland, P. La Mori, M. Kershner, and J. Matthews.*
Mark A. Kershner (U.S. Air Force/USA)

Effects of Thermally Enhanced Soil Vapour Extraction (TESVE) on Indigenous Microbial Communities and Continued Biological Reduction of Chlorinated Solvents in Chalk in the United Kingdom. *A.M. Kozłowska and S.R. Langford.*
Anna Maria Kozłowska (Provectus Group/UK)

Electrical Resistive Heating and Biostimulation in a Dutch Residential Area. *E. Marnette, J. de Jong, and B. van Rouendal.*
Emile C.L. Marnette (Tauf BV/THE NETHERLANDS)

*** Feasibility Evaluation of Thermal Remediation and Dual-Phase Extraction for Cleanup of a Multicontaminant Site.** *I. Lo, S. Coan, V. Mankad, R. Smith, H. Gupta, H. Cai, and P. Evans.*
Ian Lo (CDM/USA)

*** Remediation Using ISTD and Steam—Source Removal and Plume Effects.** *S.G. Nielsen, H. Steffensen, G. Heron, H. Skou, and N. Just.*
Steffen Griepke Nielsen (NIRAS A/S/DENMARK)

*** Sediment Remediation by Air Injection with Thermally Enhanced SVE.** *K. Kolibas and C.K. So.*
Charles K. So (Shaw Environmental and Infrastructure, Inc./USA)

*** Steam-Enhanced Extraction and Thermal Conduction Heating for In Situ Treatment of Tetrachloroethylene.** *J. Cole, M. Singer, G. Schaefer, D. Williamson, J. Galligan, G. Heron, D. Timmons, P. King, S. Trussell, G. Sandlin, and D. Flatt.*
Jason D. Cole (CH2M HILL/USA)

*** Thermal Conductive Heating Enhanced DNAPL Source Removal.** *A.Y. Fu, M.J. Jordana, and M. McClure.*
Amy Y. Fu (Golder Associates, Inc./USA)

*** Treatment Train for the Protection of Groundwater in the Capital Region of Denmark (Combined Use of ISTD, Active Ventilation, and Pump-and-Treat).** *L.T. Karlby, P. Johansen, M.B. Larsen, K. Rugge, N. Ploug, M. Faurbye, and M. Jensen.*
Lone T. Karlby (The Capital Region of Denmark/DENMARK)

Photo: Monterey County CVB



E4. IMPROVED UNDERSTANDING AND APPROACHES FOR PUMP-AND-TREAT, SURFACTANT FLUSHING, AND EX SITU GROUNDWATER TREATMENT APPLICATIONS

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: William P. Ball (The Johns Hopkins University)
Jennifer Nyman (Malcolm Pirnie, Inc.)

* **Activated Persulfate Oxidative Wet Scrubber for Treating SVE-Exhaust Gases.** *C. Liang, Y.-J. Chen, and K.-J. Chang.*
Chenju Liang (National Chung Hsing University/TAIWAN)

* **Advanced Oxidation Treatment of Groundwater with High Concentrations of Chlorinated Solvents.** *P. Herlihy and B. Bigelow.*
Bradden Bigelow (Environmental Chemicals Corporation/USA)

* **Alcohol Flushing in Aid of Polymer Injection to Enhance TCE Removal.** *N. Anaya, S. Hwang, and I. Padilla.*
Sangchul Hwang (University of Puerto Rico/USA)

* **Capture of Methanol from a Shallow Aquifer at 700 g/L Concentration—Recalcitrance to Compliance.** *R.W. Lee and B. Stokes.*
Roger W. Lee (ERM, Inc./USA)

Clayey Interbeds in a Sandy Aquifer in Florida: Remediation Significance. *S. Chapman and B. Parker.*
Steven W. Chapman (University of Guelph/CANADA)

* **Coupled Diffusion and Reaction Processes of TCE in Rock Matrices.** *C.E. Schaefer, V. Lazouskaya, and H. Dong.*
Volha Lazouskaya (Shaw Group/USA)

* **Evaluation of Persulfate Oxidative Regeneration of TCE Spent Activated Carbon.** *Y.-T. Lin, C. Liang, and W.-H. Shih.*
Ya-Ting Lin (National Chung Hsing University/TAIWAN)

Fenton-Driven Regeneration of MTBE-Spent Granular Activated Carbon. *S. Huling and E. Kan.*
Scott G. Huling (U.S. EPA/USA)

* **First Use in the UK of Full-Scale In Situ Surfactant-Enhanced Recovery within an Aquifer Impacted by Trichlorobenzene.** *J. Baldock, P. Crowcroft, A. Peacock, Z. Gillingham, A. Sykes, A. Thomas, J. Teer, M. Klabun, and R. Timson.*
James Baldock (ERM/UK)

* **Full-Scale In Situ PAH (Creosote Oil) Removal Using Surfactant Washing.** *L. Sykora, J. Jurak, M. Stavelova, and V. Kinkor.*
L. Sykora (Earth Tech CZ/CZECH REPUBLIC)

* **HiPOx® for Groundwater Recharge: Atrazine Destruction, Bromate Control, and Disinfection.** *D.M. Thompson, M. Hughes, M. Rudy, S. Porter, and K. Robinson.*
Keel Robinson (Applied Process Technology/USA)

Implications of Diffusive Exchange between Mobile and Immobile Porosities on Plume Behavior. *C. Schwabenlander, G. Colgan, M. Novak, S. Smith, and R. Wallace.*
Corey Schwabenlander (CH2M Hill/USA)

* **Natural Zeolites for MTBE Removal from Contaminated Groundwater.** *M.R. Boni, S. Scaffoni, and L. Tuccinardi.*
Silvia Scaffoni (University of Rome/ITALY)

Pilot-Scale Reduction of Hexavalent Chromium, Nitrate, and Perchlorate Using a Fluidized-Bed Bioreactor. *J.T. Bamer, P.J. Evans, P. Togna, and W. Guarini.*
Jeff T. Bamer (CDM/USA)

* **Remediation of Groundwater Polluted by Chlorinated Organics: The Synergic Effect of UV/H₂O₂—GAC.** *G. Mascolo, R. Ciannarella, M. Pagano, and A. Lopez.*
Giuseppe Mascolo (CNR - Water Research Institute/ITALY)

* **Removal of Chlorinated Organic Compounds Using Adsorption Coupled with Electrochemical Regeneration.** *N. Brown and T. Roberts.*
Nigel Brown (Arvia Technology Ltd./UK)

Scale-Dependent Contaminant Desorption Rates in Sediments. *C. Liu, J.M. Zachara, and J. McKinley.*
Chongxuan Liu (Pacific Northwest National Laboratory/USA)

* **Surfactant-Enhanced Remediation of Petroleum-Contaminated Soil, Bedrock, and Groundwater.** *G. Kenoyer, C. D'Sa, G. McLinn, and G.B. Ivey.*
Galen Kenoyer (RMT, Inc./USA)



E5. ADVANCES IN PHYSICAL/CHEMICAL REMEDIATION

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Sam Yoon (Tidewater Inc.)
James G. Mueller (Adventus Group)

Advancements in Use of Surfactant for LNAPL Remediation. *J.C. Hayward, T. Porter, F. Barranco, and J. Harwell.*
James Hayward (EA Engineering, Science, and Technology, Inc./USA)

*** Bubble Formation in Saturated Soil Columns under Pulsed Gas Flow.** *W.B. Kerfoot.*
William B. Kerfoot (Kerfoot Technologies, Inc./USA)

*** Case Study: Aggressive Removal of Free Petroleum Product through Dual-Phase Extraction.** *A. Adini and D.R. Louks.*
Ami Adini (Ami Adini & Associates, Inc./USA)

Evaluation of an AS/SVE Boundary Control System for Chlorinated Hydrocarbons in a Blast-Fractured Basalt Aquifer. *B. Goodwin, D. Lam, and A. Moore.*
Bryan Goodwin (Dow Chemical (Australia)Ltd./AUSTRALIA)

*** Evaluation of Surfactant-Enhanced Air Sparging for DNAPL-Contaminated Aquifer.** *Y.-J. Tsai and T.-C. Cheng.*
Yih-Jin Tsai (Diwan University/TAIWAN)

Field Demonstration of Supersaturated Water Injection (SWI) for Enhanced NAPL Recovery. *J. McCrary, N.C. Welte, M. Ioannidis, and J.F. Begley.*
James F. Begley (MTER/inVentures Technologies, Inc./USA)

*** Fifteen Years of In Situ Ozone Experience: Lessons Learned and Best Practices.** *W.S. Clayton.*
Wilson S. Clayton (Aquifer Solutions, Inc./USA)

*** Immobilizing Mercury in Sediment and Groundwater Using Iron Sulfide Nanoparticles.** *Z. Xiong, D. Kaback, B. Wielinga, Q. Liang, and D. Zhao.*
Zhong Xiong (AMEC Geomatrix, Inc./USA)

In Situ Hydrocarbon Remediation by SVE with Ozone and Air Sparging. *S.E. Fosse, D. Norman, R. Moncrief, and S.C. Barr.*
Stephanie E. Fosse (Provost & Pritchard Engineering Group, Inc./USA)

Installation and Operation of an Air Sparge and Soil Vapor Extraction System Using Horizontal Directionally Drilled Wells. *R.K. McCord, C.L. Sprinkle, S. Schultz, G. Losonsky, and T.L. Clendenin.*
Kylie McCord (CH2M Hill/USA)

*** Laboratory Experiments Addressing Energy Issues, Salt Movement, and Moisture Detection during Desiccation.** *M. Oostrom, T.W. Wietsma, M.J. Truex, and J.H. Dane.*
Mart Oostrom (PNNL/USA)

*** On the Kinetics of Mechanochemical Reductive Dechlorination of Polychlorinated Aromatic Pollutants at Room Temperature.** *V. Birke, C. Schutt, and W.K.L. Ruck.*
Volker Birke (Ostfalia University/GERMANY)

Pulsed Air Sparging Used to Strip CVOCs from Cutting Oil in Large-Scale LNAPL Smear Zone. *M. Klemmer, B. Zahniser, and C. Mowder.*
Mark R. Klemmer (ARCADIS US/USA)

*** Recovery of Residual Free-Phase NAPL by Supersaturated Water Injection.** *M. Li, R. Enouy, and M. Ioannidis.*
Marios Ioannidis (University of Waterloo/CANADA)

Self-Sustaining Treatment for Active Remediation (STAR): Ex Situ Field Application for the Treatment of Hydrocarbon-Impacted Soils. *D. Major, G.P. Grant, J.I. Gerhard, J.L. Torero, C. Switzer, and P. Pironi.*
David W. Major (Geosyntec Consultants/CANADA)

*** Sequential Implementation of Air and Ozone Sparging.** *L. Goldstein, D. Bradshaw, P. Zawislanski, and M. Adams.*
Lucas Goldstein (ARCADIS/USA)

TCE Plume Remediation via the ART In-Well Technology in Anniston, Alabama. *M. Remlinger, C. Waters, and M. Odah.*
Mark Remlinger (Matthews International Corporation/USA)

*** Treating Chlorinated Solvents in Fractured Rock Using an In-Well Recirculation Technology, A Case Study.** *R.E. Lees, S. McDonald, M. Langille, and M. Lesley.*
Raymond Lees (Malcolm Pirnie, Inc./USA)

Using 2-D MTBE Stable Isotopic Analysis to Optimize a Commercial-Scale Pulsed Air Sparging/SVE System. *X. Yang, S. Subramanian, T. Dull, T. Tunnicliff, and D. Tsao.*
Shankar Subramanian (URS Corporation/USA)

*** Vacuum-Enhanced Recirculation System.** *M. Pehlivan.*
Mehmet Pehlivan (Bays Environmental Remediation Management/USA)

E6. INNOVATIVE ADVANCES AND APPLICATIONS OF BIOBARRIERS

Platform Papers Wednesday/Posters (*) Wednesday

Chairs: Arun R. Gavaskar (U.S. Navy)
Kevin A. Morris (ERM)

*** An Approach to Improve Donor and Culture Delivery over Traditional Groundwater Recirculation Systems.**

L. Van Tassell, N.T. Bice, J. Fortuna, J. Gallinatti, E. Suchomel, and M. McMaster.

Lisa Van Tassell (Geosyntec Consultants/USA)

*** Biobarrier Treatment of a TCE Plume in a Complex Hydrogeologic Environment.**

K.D. MacFarlane, D.A. Cacciatore, D.P. Leigh, M. Silver, and A. Atta.

Kim D. MacFarlane (Shaw Environmental, Inc./USA)

*** Chlorinated Solvent Remediation—Making Adjustments Based on Field Observations and Data Assessment.**

M. Helton, J. Romer, L. LaPat-Polasko, and K. Brinker.

Melissa Helton (AMEC Earth & Environmental, Inc./USA)

*** Column Test Evaluation of Petroleum Hydrocarbon Remediation in a Biowall Application.**

D. Schroder, H. Stevens, and M. Patterson.

David L. Schroder (Stantec Consulting/USA)

Comparison of EVO Injection Strategies in a Coastal Plain Aquifer.

H.V. Rectanus, S. Rosansky, R. Darlington, P.-F. Tamashiro, A. Gavaskar, and T. Ford.

Heather V. Rectanus (Battelle/USA)

Continuous Reagent Delivery for In Situ Bioremediation: Challenges and Solutions.

J. Erickson, K. Preston, and E. Moreno-Barbero.

Kelli Jo Preston (ARCADIS/USA)

A Critical Review of Mulch Biowalls Seven Years after Installation.

K.A. Morris.

Kevin A. Morris (ERM/USA)

*** Emulsified Oil Injection Using Dedicated Wells Pilot Study.**

C.D. Marks and M. Benson.

Corinne Marks (URS Corporation/USA)

*** Enhanced Bioremediation of Chlorinated Solvents in Fractured Media.**

E. Heyse, D.R. Griffiths, K.A. Smith, and D. Anders.

Edward C. Heyse (Parsons/USA)

*** In Situ Biobarrier for Treatment of TCE and Perchlorate Plume at Vandenberg Air Force Base.**

C.M. Terpolilli, G. Broughton, M.J. Thomas, and A. Atta.

Garrett Broughton (Shaw Environmental & Infrastructure/USA)

In Situ Biobarrier Performance for Treating High Explosives and Chromium in Groundwater.

W.S. Clayton and S.J. Seitz.

Wilson S. Clayton (Aquifer Solutions, Inc./USA)

*** In Situ Remediation of Chlorinated Ethenes Using Two Carbon Sources, Bioaugmentation, and Innovative Amendment Preparation.**

R.E. Mayer, P. Srivastav, S. Watson, G.N. Jones, A. Willmore, and S. Reed.

Robert E. Mayer (Shaw Environmental and Infrastructure Group/USA)

*** Installation and Operation of a PRB within a TCE-Impacted Groundwater Plume within a Paleochannel.**

C.R. Scott, D. Springer, and A. Atta.

Craig R. Scott (Tetra Tech, Inc./USA)

Installation of a Deep Permeable Reactive Barrier to Treat Trichloroethylene Plume at Property Boundary.

C.E. Hudson, D.J. Hauser, S. Schultz, and T.L. Clendenin.

Casey E. Hudson (CH2M HILL/USA)

Pilot Study of In Situ Bioremediation of Perchlorate-Impacted Groundwater in Alluvium and Bedrock at Former MCAS El Toro.

J. Callian, J. Dunn, D. Rawal, M. Wolff, C. Wanyoike, H. Singh, D. Herlihy, and R. Boynton.

Jacqueline Dunn (U.S. Navy/USA)

*** Pilot-Scale Biobarrier Using EOS® in Fractured Granite.**

M.A. Boysun, R.H. Mora, H. Holbrook, S. Grossi, and P. Hallman.

Melissa A. Boysun (AECOM/USA)

*** Reactive Biobarrier Using Enhanced Reductive Dechlorination for a DNAPL Source Area.**

K. Warner, J. Applegate, D. Fitton, and R. Cowdery.

Kevin Warner (ARCADIS U.S., Inc./USA)

Rejuvenating the Effectiveness of a Full-Scale Biowall System through Organic Substrate Injection.

D.R. Griffiths, E. Heyse, J. Hicks, B.M. Henry, and D.A. Anders.

Daniel R. Griffiths (Parsons/USA)

*** Soy Lactate PRB to Enhance Reductive Dechlorination of Impacted Groundwater Venting to a Pond.**

B. Landale, F.W. Blickle, A. Bains, and K.A. Richards.

Beth Landale (Conestoga-Rovers & Associates, Inc./CANADA)

- * **Successful Treatment of an Explosives Plume in Groundwater Using an Organic Mulch Biowall.** *D. Adamson, S. Farhat, C. Newell, and F. Ahmad.*
David T. Adamson (GSI Environmental, Inc./USA)

E7. PERMEABLE BARRIER ADVANCES AND APPLICATIONS

Platform Papers Thursday/Posters (*) Wednesday

Chairs: Suzanne O'Hara (Geosyntec Consultants)
Chuck N. Elmendorf (Panther Technologies, Inc.)

- * **Chlorinated Solvent Plume Remediation Using a Zero-Valent Iron Permeable Reactive Barrier.** *J.T. Kelley, J.R. Kolanek, M.J. Adams, and S. Cervi.*
Justin T. Kelley (AECOM/USA)

Combined Use of ISCO for Source Treatment and Reductive PRB for Plume Control. *C. Mathenia, T. Zychinski, J. Molin, J. Moreno, and M. Dingens.*
Cheryl Mathenia (Burns & McDonnell/USA)

- * **Comparative Study of Batch Sorption of Single and Metal Cocktails by a Zeolite and an Organoclay for Permeable Reactive Barrier Applications.** *C. Ouellet-Plamondon and A. Al-Tabbaa.*
Claudiane M. Ouellet-Plamondon (University of Cambridge/UK)

- * **Design, Installation, and Post-Installation Monitoring of a ZVI PRB in a Residential Neighborhood.** *B. Bjorklund, J. Warner, A. Chemburkar, K. Lake, J. Moe, and K. Dyson.*
Brian Bjorklund (ERM/USA)

- * **Effect of Particle-Size on EHC Distribution during Direct Injection of a Permeable Reactive Barrier.** *P.R. Chang, J.A. Shipps, and J. Moreno.*
Paula R. Chang (ERM, Inc./USA)

- * **Electrically Induced TCE and Nitrate Reduction and ZVI Rejuvenation.** *K. Kronoveter, Z. Ren, S. Jin, P. Colberg, T. Mehraban, S. Arens, H. Olsen, and M. Roginske.*
Karen Kronoveter (University of Colorado Denver/USA)

Formation Processes and Impacts of Reactive and Nonreactive Minerals in Permeable Reactive Barriers. *R.T. Wilkin.*
Richard T. Wilkin (U.S. EPA/USA)

- * **Gas Bubbles in PRBs and the Effect to Hydraulic Conductivity.** *M. Ebert, A. Parbs, A. Jesussek, and A. Dahmke.*
Markus Ebert (University of Kiel/GERMANY)

Granular ZVI and Biological Reductive Dechlorination for the Treatment of Chlorinated Solvent Complex Mixtures in PRB. *M. Baric, F. Aulenta, M. Beccari, M. Majone, M. Petrangeli Papini, M. Steardo, and L. Alifano.*
Marco Petrangeli Papini ("Sapienza" University of Rome/ITALY)

- * **Innovative No-Waste Method for Installing Remediation Treatment Materials.** *C. Athmer and J. Kolz.*
Christopher J. Athmer (Terran Corporation/USA)

Installation and Verification of a Vertical Hydraulically Fractured ZVI PRB in a Residential Setting. *K. Dyson, P.J. Palko, B. Bjorklund, and A. Chemburkar.*
Kevin Dyson (GeoSierra Environmental, Inc./USA)

Longevity Evaluation of Commercial Permeable Reactive Barriers Using Practical Field Methods. *S.D. Warner, M. Zhang, P. Bennett, and C.M. Mok.*
Scott D. Warner (AMEC Geomatrix/USA)

Longevity Expectations of ZVI Barriers. *A. Gavaskar and K. Bowers.*
Arun R. Gavaskar (U.S. Navy/USA)

- * **Long-Term Performance Evaluation of Iron PRB in its Ninth Year.** *M. Nakashima and M. Negishi.*
Makoto Nakashima (Kokusai Environmental Solutions Co., Ltd./JAPAN)

* **Microbial Hydrogen-Consuming Processes in ZVI Permeable Reactive Barriers Used for Chloroethene Elimination.** *A. Tiehm, K.R. Schmidt, H. Schell, A. Muller, and A. Verboschi.*
Kathrin R. Schmidt (Water Technology Center (TZW)/GERMANY)

- * **Performance Evaluation of a ZVI PRB Impacted by Increasing Contaminant Flux of a Freon 113 and Chlorinated Solvent Commingled Plume.** *M. Liskowitz and S. Chen.*
Michael Liskowitz (ARS Technologies, Inc./USA)

Pilot-Scale Permeable Reactive Barrier Installation Using Deep Soil Mixing and BOS100®. *K. Gerber, R. Mora, K. White, and S. Noland.*
Kathleen Gerber (U.S. Air Force/USA)

PRB Design: What to Use and How to Emplace It. *R.A. Brown, M. Carver, and A. Chemburkar.*
Richard A. Brown (ERM, Inc./USA)

- * **Site Investigation, Treatability, and Feasibility Study for Erecting a Permeable Reactive Barrier under Arid, Highly Saline Conditions at a Trichloroethene-Contaminated Site in Australia.** *V. Birke and R. Naidu.*
Volker Birke (Ostfalia University/GERMANY)

E8. NANOSCALE ZERO-VALENT IRON AND OTHER REACTIVE PARTICLES

Platform Papers Thursday/Posters (*) Wednesday

Chairs: Cherie L. Geiger (University of Central Florida)
Charles Schaefer (Shaw Environmental, Inc.)

Case Study on ZVI-Clay Remediation with Mass and Flux Reduction of PCE. A.S. Fjordboge, P. Kjeldsen, C. Riis, L. Walsted, N. Muchitsch, A.G. Christensen, M. Terkelsen, and C. Bagge.

Annika S. Fjordboge (Technical University of Denmark/DENMARK)

Degradation of 2-4-Dinitrotoluene in Soils Using Lactate-Modified Nanoscale Iron Particles.

A.P. Khodadoust, K.R. Reddy, and K. Darko-Kagya.

Amid P. Khodadoust (University of Illinois at Chicago/USA)

*** The Effect of Sorption on Simultaneous Sorption and Debromination of PBDEs by nZVI/Pd-AC.** Y. Zhuang, S. Ahn, and R.G. Luthy.

Yuan Zhuang (Stanford University/USA)

EZVI Feasibility Assessment for Treating a CHC-Plume: A French Case Study. D. Nuyens, J. Blois, R. Paschke, J. Wolters, and J. Kesari.

Dirk Nuyens (ERM/France)

*** Field Comparison of Selected nZVI: Case Study of Pisecna Site.** M. Cernik, L. Lacinova, S. Klimkova, and P. Kvapil.

Miroslav Cernik (Technical University of Liberec/CZECH REPUBLIC)

Field Injection and Emplacement Verification of Nano-Sized ZVI to Remediate Hexavalent Plume at DOE Hanford Site. S.W. Petersen, K.M. Manchester, and G. Wyss.

Scott W. Petersen (CH2M Hill Plateau Remediation Company/USA)

*** Hydrogen Absorption and Release by Pd/MCM-41.**

C.P. Guthrie, E.J. Reardon, H. Peemoeller, and J.L. Vogan.

Colin P. Guthrie (University of Waterloo/CANADA)

Impact of Trace Elements and Impurities in Zero-Valent Iron Types on Reductive Dechlorination of Chlorinated Ethenes in Groundwater. V. Birke, C. Schuett, L. Vigelahn, H. Burmeier, and H.-J. Friedrich.

Volker Birke (Ostfalia University/GERMANY)

*** In Situ Remediation of Chlorinated Solvent Source Zone Using ZVI-Clay Treatment Technology.**

M.M. Thomson, T. Ovbey, and C. Bozzini.

Michelle M. Thomson (DuPont/USA)

*** In Situ Source Area Remediation with Emulsified Zero-Valent Iron (EZVI).** B. Droy, G. Booth, R. Musser, J. Barber, and S. Cobert.

Bradley F. Droy (Toxicological & Environmental Associates, Inc./USA)

*** Nanotechnology for Site Remediation: Applications and Implications.** M. Otto.

Martha Otto (U.S. EPA/USA)

*** Performance of a Cosolvent Electron Donor with ZVI to Remediate PCE in Soil and Groundwater.**

B. Wyrick and M.C. Allen.

Robert Wyrick (AECOM/USA)

The Sustainability of In Situ Biochemical Reduction of TCE in Groundwater When Influenced by Chemical Oxidation Treatment. F. Barranco, J.M. Frain, and M. Wilkinson.

Frank T. Barranco (EA Engineering, Science, and Technology, Inc./USA)

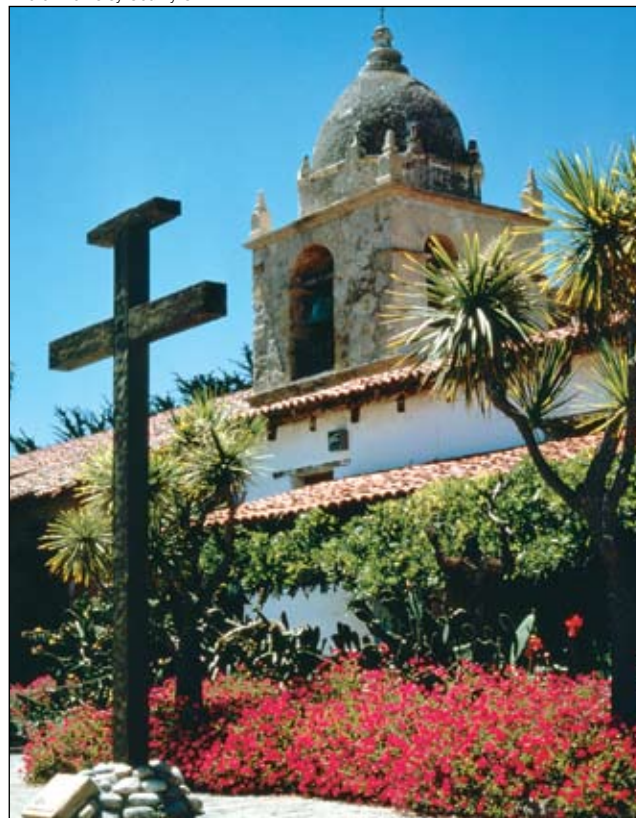
Treatment of Benzene Hexachloride and Arsenic Using Nanoscale Zero-Valent Iron. N. Shetty, A.A. Keskar, and C. Brownfield.

Nanjun V. Shetty (AECOM/USA)

*** Treatment of Chlorinated Ethenes by Source Removal and ZVI at a Manufacturing Plant in Japan.** J. Meier and M. Hishiyama.

Jon Meier (ERM/JAPAN)

Photo: Monterey County CVB



F1. ENHANCED BIOREMEDIATION OF CHLORINATED SOLVENTS

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Rick D. Gillespie (Regenesis)

Rachel A. Brennan (The Pennsylvania State University)

*** Above-Ground Enhanced Bioremediation of Chlorinated Solvents in Groundwater Using a WBC-2 Seeded Bioreactor.** *M.M. Lorah, D. Graves, and J. Wrobel.*
Michelle M. Lorah (U.S. Geological Survey/USA)

*** Application of Water-, Vegetable Oil-, and Gas-Based Electron Donors to Treat Perched Water.** *H. Cai, P. Evans, A. Lopez, H. Lai, and W. Weaver.*
Hua Cai (CDM/USA)

*** Bench-Scale Evaluation of Bioaugmentation versus Biostimulation of Chlorinated Solvents in Groundwater.** *L. LaPat-Polasko, L. Conlan, and N. Patel.*
Laurie T. LaPat-Polasko (AMEC Geomatrix/USA)

*** Biodiesel Waste as an Electron Donor for Enhanced Anaerobic Bioremediation of Chlorinated Solvents.** *A. Lopez, P. Evans, H. Cai, H. Lai, and W. Weaver.*
Alexis Lopez (CDM/USA)

*** Comparative ERD Pilot Testing of Multiple Electron Donors and Bioaugmentation in a Challenging Geochemical Environment.** *M. Schnobrich, A. Griffin, M. Logan, J.P. Martin, and P. Preston.*
Matthew R. Schnobrich (ARCADIS/USA)

*** Comparison of Biostimulation and Bioaugmentation for Chlorinated Solvent Remediation: A Microcosm Study Approach.** *T. King, B. Bond, and A. Hackenberg.*
Trevor King (Langan Engineering & Environmental Svcs./USA)

*** Effects of Biosolids on the Biodegradation of Trichloroethylene-Contaminated Soils.** *J.-M. Hung, H.-Y. Chang, Y.-T. Chen, H.-C. Liu, and C.-J. Lu.*
Jui-Min Hung (National Chung Hsing University/TAIWAN)

Enhanced Bioremediation of a Former Dry Cleaner Using HRC®, HRC-X®, and 3DMe® with Passive Venting. *J.C. Brown.*
Jesse C. Brown (Golder Associates, Inc./USA)

*** Enhanced Bioremediation Using ChitoRem™.** *S.D. Buser, M.J. Jordana, and R.J. Lu.*
Steven D. Buser (Golder Associates, Inc./USA)

Field-Scale Correlations between Degradation Rates, TOC, and Biogeochemistry in ERD. *M. Schnobrich, J.P. Martin, M. Logan, A. Auffermann, and F. Payne.*
Matthew R. Schnobrich (ARCADIS/USA)

Field-Scale In Situ Aerobic and Anaerobic Biodegradation of Vinyl Chloride in Groundwater. *L. LaPat-Polasko, E. McFadden, and E. Bailiff.*
Laurie T. LaPat-Polasko (AMEC Geomatrix/USA)

Full-Scale Conversion and Performance Comparison of Aerobic and Anaerobic In Situ Treatment Approaches for a Large Plume. *C.E. Divine, J.L. Manley, K.L. Heinze, M.V. Logan, S.D. Andrews, and T. Santangelo-Dreiling.*
Craig E. Divine (ARCADIS U.S., Inc./USA)

*** In Situ Aerobic Cometabolism Followed by Reductive Dechlorination of Trichloroethene to Enable Brownfield Redevelopment.** *L.J. Dodge, E. Mertz, R. Harwood, M. Saul, and G. Greulich.*
Lawra J. Dodge (Excel Environmental Resources, Inc./USA)

In Situ Anaerobic Bioremediation of a TCE Plume Using In Situ Bioremediation and Groundwater Recirculation at Vandenberg Air Force Base. *G. Broughton, C.M. Terpolilli, M.J. Thomas, and C. Nathe.*
Garrett Broughton (Shaw Environmental & Infrastructure/USA)

*** ITRC's Technical and Regulatory Guidance for Bioremediation of Chlorinated Ethene DNAPLs.** *R. Wymore, T. Macbeth, N. Akladiss, W. Clayton, M. DeFlaun, D. Major, J. Farrell, P. Hadley, E. Hausamann, S. Hill, C. Lebron, J. Lisiecki, M.J. Ondrechen, F. Payne, J. Sechen, M. Sieczkowski, D. Smith, M. Smith, H. Stroo, and L. Syverson.*
Ryan A. Wymore (CDM/USA)

*** Lab-Scale Feasibility Testing for Remediation of CAHs-Impacted Site.** *L. Moretti, A. Battaglia, and M. Cremonesi.*
Leandro Moretti (AECOM/ITALY)

*** Performance of a Cosolvent Electron Donor to Remediate PCE in Groundwater.** *B. Wyrick and E. Stewart.*
Robert Wyrick (AECOM/USA)

*** Remediation of 1,2-Dichloroethane- and Vinyl Chloride-Contaminated Groundwater: Lab and Field-Pilot Tests.** *C. Sandrone, M. Carboni, P. Gorla, A. Campi, and L. Micheletti.*
Marcello Carboni (TRS Servizi Ambiente s.r.l./ITALY)

The Use of Sugars and Biogenic Catalysts for the Bioremediation of PCE-Contaminated Sites: Success and Limitations. *K.E. Scherr, A.P. Loibner, and M. Nahold.*
Kerstin E. Scherr (University of Natural Resources and Applied Life Sciences/AUSTRIA)

F2. PHYSICAL AND MICROBIOLOGICAL INHIBITORS TO BIOREMEDIATION

Platform Papers Monday/Posters (*) Monday Evening

Chairs: M. Hope Lee (Idaho National Laboratory)
Erik A. Petrovskis (Geosyntec Consultants)

*** Anaerobic Removal of Sulfate from Acid Mine Drainage: The Influence of pH and Concentration of Sulfate.** *R.P. Rodriguez and M. Zaiat.*
Renata P. Rodriguez (University of Sao Paulo/BRAZIL)

Biostimulation and Bioaugmentation of Chlorinated Ethenes in Subarctic Sediments. *S. Richmond, R. Sundet, J. Paris, and T. McDougall.*
Sharon Richmond (Alaska Department of Environmental Conservation/USA)

Challenges to Enhanced In Situ Bioremediation of Chlorinated Solvents in a Cold-Temperature Environment. *B.M. Henry, M. Markell, and D. Baumler.*
Bruce M. Henry (Parsons/USA)

*** Complete Bioremediation of a TCE Plume in a Cold-Water Aquifer.** *P.I. Dacyk, E. Evans, and J. Holley.*
Peter I. Dacyk (HydroGeoLogic, Inc./USA)

*** Evaluating the Feasibility of Bioremediation for Treating Halomethanes in Source Zones.** *H. Shan, C. Sprinkle, M. Perlmutter, and D.L. Freedman.*
Huifeng Shan (CH2M HILL/USA)

Evaluation of Biogeochemical Degradation of Chlorinated Ethenes by Recirculation of Amendments at Hickam AFB, Hawaii. *D.P. Leigh, R.J. Steffan, C. Schaefer, J. Strzempka, W. Grannis, and E. Becvar.*
Daniel P. Leigh (Shaw Environmental and Infrastructure, Inc./USA)

*** Evaluation of Viruses in Groundwater from Contaminated Sites: Implications for Performance of Remedial Strategies.** *S. Saurey, A. Eisenmenger, B.D. Lee, and M.H. Lee.*
M. Hope Lee (Idaho National Laboratory/USA)

*** Hydrodynamic Impact on Bacterial Chemotaxis in Heterogeneous Porous Media.** *M. Wang and R.M. Ford.*
Meng Wang (University of Virginia/USA)

*** Inhibitory Effect of 2-Chlorophenol on Sulfate-Reducing Suspended Biomass and Biofilm Reactors.** *U. Garcia, L. Celis, H. Poggi, and M. Meraz.*
Ulises Garcia (Universidad Autonoma Metropolitana/ MEXICO)

An Overview of Bench-Scale Treatability Studies Performed to Assess Biodegradation of Contaminant Mixtures. *J. Roberts, S. Dworatzek, P. Dennis, R. Schofield, and J. Webb.*
Jeff D. Roberts (SiREM/CANADA)

*** Persistence of Chloroethane during Full-Scale Enhanced In Situ Bioremediation of Chlorinated Ethanes.** *E. Mysona, B. Henry, C. Coker, and R. Lantzy.*
Eric S. Mysona (Parsons/USA)

*** Reductive Dechlorination in High-Sulfate Conditions.** *T. Balba, S. Dore, L. Pabst, D. Pope, C. Nunn, and A. Weston.*
Alan F. Weston (Conestoga-Rovers & Associates/USA)

*** A Three-Layer Diffusion Cell to Assess Bioenhanced Dissolution of TCE DNAPL.** *J. Philips, E. Smolders, and D. Springael.*
Jo Philips (Catholic University of Leuven/BELGIUM)

F3. BIOSTIMULATION: CARBON DONOR STRATEGY, NUTRIENTS, AND pH CONTROL

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: William A. Newman (RNAS, Inc.)
R. Ryan Dupont (Utah State University)

Acidity Production and Buffer Requirements for In Situ Bioremediation of Chlorinated Solvents. *A. Brovelli, C. Robinson, D.A. Barry, and J.I. Gerhard.*
Clare E. Robinson (University of Western Ontario/CANADA)

Bioaugmentation for Chlorinated Ethene Remediation in Low-pH Aquifers. *D.R. Lippincott, R. Steffan, C. Schaefer, and S. Vainberg.*
David R. Lippincott (Shaw Environmental, Inc./USA)

Buffering Acidic Aquifers with Soluble Buffer to Promote Reductive Dechlorination. *M.D. Lee, E. Hauptmann, R.L. Raymond, D. Ochs, R. Lake, and M. Selover.*
Michael D. Lee (Terra Systems, Inc./USA)

*** Enhanced Biobarrier Treatment of a Mixed VOC Plume in a Low-pH Aquifer.** *C. Shoup, W.J. Pepe, R.A. Sellen, M. Harkness, R. Farnum, A. Fisher, and J. Robinson.*
Cassandra Shoup (MWH/USA)

*** Injection of Sodium Lactate as a Buffer with Whey Powder.** *J.L. Weidhaas, D.L. Swift, J. Rothermel, A. O'Hagan, G. Mecham, and R.P. Wells.*
Jennifer L. Weidhaas (North Wind, Inc./USA)

*** Large-Scale Enhanced Reductive Dechlorination for the Remediation of Chlorinated Volatile Organic Compounds.** *W. Kwan, S. Senh, and G. Netuschil.*
Wai P. Kwan (Roux Associates, Inc./USA)

Loading Rates and Impacts of Substrate Delivery for Enhanced In Situ Anaerobic Bioremediation.
B.M. Henry, R.N. Miller, and E.S.K. Becvar.
Bruce M. Henry (Parsons/USA)

*** Pulsed versus Continuous Carbon Application in Bioremediation: Effect on Fermentation Products and Microbial Communities.** *D. Nelson and P. Novak.*
Denice K. Nelson (University of Minnesota/USA)

*** A 20-Site Review: Groundwater pH Effects of an Electron Donor Microemulsion.** *B. Mork, S. Dobyns, and C. Sandefu.*
Benjamin Mork (Regenesis/USA)

F4. BIOAUGMENTATION

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: David W. Major (Geosyntec Consultants)
Kent S. Sorenson (CDM)

*** Bioaugmentation with a *Dehalobacter*-Containing Consortium Initiates Chloroform Reductive Dechlorination.** *S.D. Justicia Leon, F.E. Loeffler, S. Tang, A. Grostern, M. Duhamel, and E.A. Edwards.*
Frank E. Loeffler (Georgia Institute of Technology/USA)

Bioremediation Strategy for a Mixed Chlorinated Volatile Organic Compound Plume. *W. Brady, J. George, M. McMaster, J. Roberts, and M. Allendorf.*
Warren D. Brady (Geosyntec Consultants/USA)

Comparison of Passive and Active Large-Scale Bioaugmentation Approaches: Field Demonstration Results. *R.A. Wymore, K.S. Sorenson, M. Lamar, T.W. Macbeth, and J. Trotsky.*
Ryan A. Wymore (CDM/USA)

*** *Dehalococcoides* Distribution in Soil Column Experiments Controlled by Chemostats.**
A.G.T. Pedersen, M.R. Flindt, and B. Thamdrup.
Anna Glarbo T. Pedersen (University of Southern Denmark/DENMARK)

*** Effect of Soil Organic Matter and Bioaugmentation on Biodegradation of Petroleum Hydrocarbon-Contaminated Soils.** *P.-W.G. Liu, P.-T. Pan, L.-M. Whang, and S.-S. Cheng.*
Pao-Wen Liu (Chung Hwa University of Medical Technology/TAIWAN)

Factors Affecting Bioaugmentation Success.

R.J. Steffan, S. Vainberg, D. Lippincott, C.E. Schaefer, and D.C. Pohlmann.
Robert J. Steffan (Shaw Environmental, Inc./USA)

Full-Scale Removal of PCP from Granite Timber Post and Pole Site Soil. *H.L. Allen, J. Byron, A. Lange, T.F. Miller, and K. Alexander.*
Harry L. Allen (U.S. EPA/USA)

*** Full-Scale Treatment of Petroleum-Contaminated Soil with Pentanonic Acid and System E.T.20.** *J. Weidhaas, A. Bailey, D. Jorgenson, and K. Kearny.*
Jennifer L. Weidhaas (North Wind, Inc./USA)

In Situ Bioremediation of Karst Aquifer in Texas.
D.C. Pohlmann, R.E. Mayer, and W.A. Foss.
Dirk C. Pohlmann (Shaw Environmental Inc./USA)

*** Incomplete Reductive Dechlorination of Chlorinated Ethenes—Experiences and Results of Laboratory and Field Studies.** *G. Hirschmann, A. Thiem, K.R. Schmidt, and K.-J. Radmann.*
Guenther Hirschmann (Ministry of Urban Development and Environment/GERMANY)

*** PCB-Contaminated Soil: Analytical Aspects of a Bioremediation Process.** *E. Beccaloni, M. Beccaloni, A.M. Coccia, P.M.B. Gucci, I. Lacchetti, R. Paradiso, and F. Vanni.*
Eleonora Beccaloni (Italian National Institute of Health/ITALY)

*** Post-ERH Bioaugmentation at a DNAPL Source Area.**
R.B. Wice, R. McDaniel, and G. Walters.
Richard B. Wice (Shaw Environmental and Infrastructure, Inc./USA)

F5. MOLECULAR BIOLOGICAL TOOLS FOR REMEDIATION

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Tamzen W. Macbeth (CDM)
Michael A. Singletary (U.S. Navy)

Biodegradation of Chlorinated Solvents in Unsaturated Zone Microcosms. *M.H. Lee and S. Fiorenza.*
Stephanie Fiorenza (BP America/USA)

Case Study Review: Lessons Learned in Applying MBTs for Remediation. *T.W. Macbeth and M.A. Singletary.*
Tamzen W. Macbeth (CDM/USA)

*** Comparison of FISH versus PCR-Based Quantification of *Dehalococcoides* Cells in PCE/TCE-Contaminated Groundwater.** M. LePuil, R. Britto, S. Muffler, R. Arnseth, F. Loeffler, J. Biggerstaff, S. Minkin, M. Kovacich, and D. Burnell.

Michael LePuil (Tetra Tech, Inc./USA)

*** Depth-Resolved Molecular Biological Analysis of Groundwater Contaminant Plumes Using Cryogenic Core Collection.** C.N. Brow, R. O'Brien Johnson, H.M. Simon, and R. Johnson.

Richard L. Johnson (Oregon Health & Science University/USA)

Distribution of *Dehalococcoides* Bacteria between Aqueous and Solid Phases. N.L. Capiro, J.K. Hatt, K.D. Pennell, and F.E. Loeffler.

Natalie L. Capiro (Tufts University/USA)

*** Dynamic Expression of Putative Genes in the Aerobic, *cis*-1,2-Dichloroethene Degradation Pathways of *Polaromonas* sp. Strain JS666.** C. Giddings and J.M. Gossett.

Cloelle S. Giddings (Cornell University/USA)

*** Electric Shock-Assisted Gene Transfer for Bioremediation.** D.Y. Lyon, J. Pivetal, L. Blanchard, and T.M. Vogel.

Delina Y. Lyon (Universite de Lyon/France)

*** Enhanced In Situ Microbial Monitoring at Field-Scale Chlorinated Solvents Sites.** L. LaPat-Polasko, J.T. Spadaro, and C. Macon.

Laurie T. LaPat-Polasko (AMEC Geomatrix/USA)

*** Evaluating Microbial Biomass and Diversity: Do Your Methods Bias Your Results?** A.L. Eisenmenger, S. Saurey, R. Tafts, S. Walton, B.D. Lee, and M.H. Lee.

M. Hope Lee (Idaho National Laboratory/USA)

*** Evaluating the Role of Rhamnolipid Biosurfactant in the Bioremediation of Petroleum Hydrocarbon-Polluted Soil.** R. Ch, R. Nedunuri, and V. Himabindu.

Vurimindi Himabindu (Jawaharlal Nehru Technological University/INDIA)

*** Examining Gene Expression in Environmental Samples.** D. Ogles, B. Baldwin, G. Davis, and A. Biernacki.

Dora Ogles (Microbial Insights, Inc./USA)

Expression of Genes Associated with Aerobic Vinyl Chloride Biodegradation in Groundwater from a Contaminated Site. A. Chuang, Y.O. Jin, T. Mattes, and S. Fogel.

Timothy E. Mattes (University of Iowa/USA)

*** High-Throughput Quantitative FISH for Specific Microbial Enumeration in Environmental Samples.**

S. Minkin, S. Bewick, B. McCartt, C. Musta, J. Biggerstaff, and M. LePuil.

Steven Minkin (University of Tennessee/USA)

*** Identification of Microorganisms Utilizing Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX) as a Carbon Source.**

H. Roh, K.-C. Cho, M. Fuller, P. Hatzinger, and K.-H. Chu.

Kung-Hui (Bella) Chu (Texas A&M University/USA)

*** Incorporation of Phylogenetic Microarrays and Dehalogenase Activities in a Predictive PCE Degradation Model.** M.M. David, S. Cecillon, and T.M. Vogel.

Maude M. David (Universite de Lyon/France)

*** The Involvement of a Cyclohexanone Monooxygenase Gene of *Polaromonas* sp. JS666 during Aerobic *cis*-dichloroethene Degradation.** W.L. Wan Johari and J.M. Gossett.

Wan Lutfi Wan Johari (Cornell University/USA)

*** Metagenomics in Practice: From Isolation of Metabolic Pathways to Assessment of Degradation Potential In Situ.** M.V. Brennerova, J. Josefiova, M. Praveckova, T. Cajthaml, M. Stavelova, J. Machackova, and V. Brenner.

Maria V. Brennerova (Czech Academy of Sciences/CZECH REPUBLIC)

*** Microbial Community Composition Assessment During In Situ Chemical Oxidation with Permanganate.**

A. Jones, C. Serlin, M. Escobar, B. Sercu, and P. Holden.

Antony D.G. Jones (ENVIRON International Corporation/USA)

*** Microcosm Assessment of a DNA-Probe Applied to Aerobic Degradation of *cis*-1,2-Dichloroethene by *Polaromonas* sp. Strain JS666.** C. Giddings, L. Jennings, and J.M. Gossett.

Cloelle S. Giddings (Cornell University/USA)

*** Monitoring Gene Expression to Evaluate the Effectiveness of Oxygen Infusion.** B. Baldwin, D. Ogles, G. Davis, J. Blair, M. Purchase, and J.M. Baker.

Brett R. Baldwin (Microbial Insights, Inc./USA)

Monitoring Microbial Community Structure and Dynamics during In Situ U(VI) Bioremediation with a Field-Portable Microarray Analysis System. A. Peacock, D. Chandler, A. Kukhtin, R. Mokhiber, C. Knickerbocker, G. Rudy, J. Golova, D. Ogles, and P. Long.

Aaron D. Peacock (Haley & Aldrich, Inc./USA)

*** A New Core Sampler for Cryogenic Collection of Subsurface Samples for Molecular Tools Analysis.**

R. Johnson, R. O'Brien Johnson, and T. Christy.

Richard L. Johnson (Oregon Health & Science University/USA)

Overview of Application of MBTs for Remedial Design and Performance Monitoring. *E. Petrovskis.*
Erik A. Petrovskis (Geosyntec Consultants/USA)

*** Relationship between In Situ *Dehalococcoides* Growth Rates and Aquifer Conditions.** *P. Dennis, J. Wilkinson, X. Druar, and E. Edwards.*
Philip C. Dennis (SiREM/CANADA)

Screening of Known and Novel Chloroflexi Species in Chloroorganic-Contaminated Sites. *N.M. Lee, F.E. Loeffler, K.M. Ritalahti, C.A. Lebron, D.B. Meisinger, H. Schmidt, E. Padilla-Crespo, S. Spring, and M. Schmid.*
Natuschka M. Lee (Technical University Munich/GERMANY)

*** Site Conditions and *Dehalococcoides* Concentrations: Observations from a Field-Derived Database.** *G.A. Davis, D. Ogles, B. Baldwin, and A. Biernacki.*
Greg A. Davis (Microbial Insights, Inc./USA)

*** Spatial and Temporal Distribution of Microbial Communities in a TCE DNAPL Site: SABRE Field Studies.** *S. Dworatzek, R.F. Herrmann, T. Dahling, C.M. Acheson, and M. Harkness.*
Sandra M. Dworatzek (SiREM/CANADA)

*** Total Microbial Profiling...Because Sometimes Bacteria Just Aren't Enough.** *A.L. Douglas, P. Stenroos, J.S. Goudey, and L.L.R. Marques.*
Annemarie L. Douglas (HydroQual Laboratories Ltd./CANADA)

The Truth is Out There: Unraveling the Mystery of the Missing DCE, Vinyl Chloride, and Ethene. *E. Cox, C. Austrins, J. Spain, K. Shin, S. Nishino, J. Gossett, C. Giddings, L. Jennings, E. Edwards, T. Johnson, M. Duhamel, and B. Sherwood Lollar.*
Evan E. Cox (Geosyntec Consultants/CANADA)

Use of Microbial Internal Controls for Assessment of *Dehalococcoides* Biomarker Genes in Groundwater. *K. Ritalahti, J. Hatt, F. Loeffler, N. Barros, D. Major, E. Ney, G. Davis, D. Ogles, P. Dennis, J. Wilkinson, W. Chan, M. Duhamel, E. Edwards, H. Vrionis, C. Lebron, and C. Yeager.*
Kirsti M. Ritalahti (Georgia Institute of Technology/USA)

*** Use of Molecular Biological Tools to Evaluate and Verify Remediation of Chlorinated Ethenes by Aerobic Soy-Based Cometabolism.** *D. Blackert, T. Palaia, J. Cibrik, and J. Haberl.*
Don W. Blackert (KU Resources/USA)

F6. ADVANCES IN BIOREMEDIATION FOR SITE RESTORATION

Platform Papers Wednesday/Posters (*) Wednesday

Chairs: Daniel P. Leigh (Shaw Environmental and Infrastructure, Inc.)
Neal D. Durant (Geosyntec Consultants)

*** Advancing the Remediation of Soil Contaminated with Chlorinated Compounds.** *S. Kauppi, A.-L. Rantalainen, R. Strommer, M. Romantschuk, and A. Sinkkonen.*
Sari Kauppi (University of Helsinki/FINLAND)

Aerobic Biodegradation of Chlorpyrifos by Microbes Enriched from Agricultural Soils. *M.K. Tiwari and S. Guha.*
Manoj K. Tiwari (Indian Institute of Technology, Kanpur/INDIA)

*** Anaerobic Microbial Oxidation of Aromatic Compounds with Anoxic Enrichment Cultures.** *A. Shibata, S. Yang, L. Ye, Z. Li, N. Ohhata, R. Doi, Y. Inoue, D. Suzuki, A. Katayama, and N. Yoshida.*
Arata Katayama (Nagoya University/JAPAN)

*** Biodegradation Kinetic Study of Soluble and Crystalline Naphthalene.** *P.-K. Chang, J.-M. Hung, Y.-T. Chen, H.-C. Liu, and C.-J. Lu.*
Jui-Min Hung (National Chung Hsing University/TAIWAN)

*** Biodegradation of Diesel in a Continuous-Upflow Biofilm Reactor at Redox Potentials in the Range of -300 mv to -370 mv.** *K. Acuna-Askar, M. Gonzalez-Rodriguez, and R. Tijerina-Menchaca.*
Karim Acuna-Askar (Universidad Autonoma de Nuevo Leon/MEXICO)

*** Biodegradation of Jet Fuel-Contaminated Soil Enhanced by Chemical Oxidation.** *M. Kralova, J. Jurak, J. Machackova, S. Proksova, and M. Stavelova.*
Monika Kralova (Earth Tech CZ/CZECH REPUBLIC)

*** Bioremediation Activities of *Pleurotus pulmonarius* and Mycorrhiza on the Growth of *Amaranthus hybridus* in a Crude Oil-Polluted Soil.** *E.A. Elum.*
Ejiro A. Elum (Obafemi Awolowo University/NIGERIA)

*** Bioremediation of Preservative-Treated Wastewood Using Wood-Degrading Fungi.** *V.W. Yang and B.L. Illman.*
Vina W. Yang (USDA/USA)

*** Bioremediation: A Sophisticated Sustainable Tool for Eco-Friendly Recycling of Wastewaters.** *A.H. Molla.*
Abul H. Molla (Bangabandhu Sheikh Mujibur Rahman Agricultural University/BANGLADESH)

THE ELEVENTH INTERNATIONAL

IN SITU AND ON-SITE BIOREMEDIATION SYMPOSIUM

Reno, Nevada
June 27–30, 2011

Advances in bioremediation continue to improve the performance and reliability of microbial-based processes for site restoration, waste treatment, and pollution prevention. The *International In Situ and On-Site*

Bioremediation Symposium series offers a broad perspective on the status of environmental biotechnology worldwide, integrating the latest developments in fundamental research with innovative engineering applications. The Tenth Bioremediation Symposium (Baltimore, May 2009) brought together more than 700 international stakeholders, practitioners, and experts from industry, academia, and government. Nearly 400 platform and poster presentations and panel discussions provided an opportunity for in-depth discussions of emerging topics.

The 2011 program will continue to emphasize recent advances in bioremediation tools, design, and management; the interaction of bioremediation with other remedial approaches; global applications of bioremediation; and sustainable remediation. Presentations will cover such topics as remediation of soil, groundwater, sediments, and landfills contaminated by metals, PAHs, PCBs and dioxins, nitrates, energetics, perchlorates, chlorinated solvents, and petroleum products and additives; improved methods to evaluate natural attenuation; bioaugmentation and biostimulation to enhance intrinsic microbial processes; bioremediation directed at source zones; phytoremediation; bioremediation used in concert with physical/chemical processes; sustainable remediation; and regulatory and public perception issues.

To inquire about opportunities for your organization to sponsor the Symposium, please call 800-783-6338. Details on abstract preparation and submission, exhibits, and submission of proposals for short courses will be available at www.battelle.org/biosymp by March 31, 2010. Abstracts will be due in summer 2010. The Symposium is organized and presented by Battelle.

*** Cosubstrate Effects on MTBE Biodegradation Kinetic Rates at Three Hydraulic Retention Times.** *K. Acuna-Askar, C.D. Gomez-Ibarra, R. Tijerina-Menchaca, and M.T. Garza-Gonzalez.*

Karim Acuna-Askar (Universidad Autonoma de Nuevo Leon/MEXICO)

*** DNAPL Source Zone Treatment Using an In Situ Air Sparging and Enhanced In Situ Bioremediation Treatment Train.** *D. Williamson, S. Schultz, A. Struse, K. McCord, T. Wiley, and T. Bagnell.*

Dean F. Williamson (CH2M HILL/USA)

*** Enhanced Bioremediation of Pentachlorophenol by Immobilized Consortium under Wide Environmental Conditions.** *T. Verma.*

Tuhina Verma (Dr. R.M.L. Avadh University/INDIA)

*** An Experimental Model to Evaluate Microbial Biodegradation Efficiency on Volatile Organic Compounds.** *K. Acuna-Askar, J.F. Villarreal-Chiu, R. Tijerina-Menchaca, and M.T. Garza-Gonzalez.*

Karim Acuna-Askar (Universidad Autonoma de Nuevo Leon/MEXICO)

*** Field-Scale Bioremediation of Perchlorate in Groundwater Utilizing an Active-Passive Treatment Approach.** *D.R. Lippincott, P.B. Hatzinger, C. Schaefer, and J.M. Cullinane.*

David R. Lippincott (Shaw Environmental, Inc./USA)

*** Fungal Biofilters Operating under Sterile and Nonsterile Conditions.** *C. Novotny, O. Benada, O. Kofronov, S. Montalvao, J. Teixeira, J. Pocedic, and P. Hasal.*

Cenek Novotny (Academy of Sciences of the Czech Republic/CZECH REPUBLIC)

*** In Situ Remediation of BTEX, MTBE, and TPH Using EAS™ as a Terminal Electron Acceptor.** *T.J. Parker, G. Birk, and J. Sankey.*

John Sankey (True Blue Technologies, Inc./CANADA)

Is Perchlorate Degradation in a Zero-Valent Iron Barrier Biotic? *A. Peacock, S. Neville, C. Fennessy, D. Ogles, and G. Davis.*

Aaron D. Peacock (Haley & Aldrich, Inc./USA)

*** Large-Scale In Situ Bioremediation of Pesticide-Impacted Soil.** *D. Hill, A. Seech, K. Bolanos-Shaw, and E. Dmitrovic.*

David Hill (Vertex Environmental Inc./CANADA)

MTBE and BTEX Biodegradation to ppb Levels in Full-Scale Reactors. *E. Arvin, C.K. Waul, R. Krag, and C. Juhl Soeegaard.*

Erik Arvin (Technical University of Denmark/DENMARK)

Mycoremediation of Waste Wood Treated with CCA and ACQ. *B. Illman and V. Yang.*
Barbara Illman (U.S. Forest Service/USA)

Pilot- and Full-Scale Treatment of Groundwater Plume Using Mobile Enhanced Biosparging System. *T.S. Renn, S.W. Duda, and T. Matty.*
Timothy S. Renn (AECOM/USA)

A Robust Model for Biotic and Abiotic Degradation of Chlorinated Aliphatic Hydrocarbons in an In Situ Bioreactor. *C. Beal, K. Bradley, R. Edwards, K. Rice, and G. Sanchez.*
Robert W. Edwards (Noblis/USA)

*** Start-Up, Optimization, and Initial Performance of a Biosparge System for Treatment of MTBE-Contaminated Groundwater under Complex Lithologic Conditions at the 13 Area Gas Station Site, Marine Corps Base, Camp Pendleton.** *C. Zimmerman, P. Chang, R. Sirabian, J. Bartlett, T. Sahagun, and B. Patel.*
Chris Zimmerman (Battelle/USA)

Success: Bioremediation Cleanup of MTBE in a Southern California Drinking Water Aquifer. *S.L. Boyle, P.M. Tornatore, and J.M. Baker.*
Susan L. Boyle (Haley & Aldrich, Inc./USA)

*** Using True Microemulsion Technology to Simplify the Delivery of Vegetable Oil-Based Substrate.** *M.R. Sieczkowski.*
Michael R. Sieczkowski (JRW Bioremediation, L.L.C/USA)

F7. FIELD-SCALE APPLICATIONS OF ENHANCED IN SITU BIOREMEDIATION

Platform Papers Thursday/Posters (*) Wednesday

Chairs: Thomas E. McHugh (GSI Environmental)
Heather V. Rectanus (Battelle)

*** Combining Enhanced Bioremediation and Soil Vapor Extraction for Chlorinated Solvent Site Cleanup.** *M. Stevens, K. White, H. Clough, and A. Spencer.*
Michael W. Stevens (Ash Creek Associates/USA)

*** Direct Injection at Site 21 Treasure Island, California.** *N. Kong, W. Akiyama, M. Yurovsky, and S. Anderson.*
Nathan W. Kong (Shaw Environmental, Inc./USA)

DNAPL Source Zone Cleanup with Enhanced Reductive Dechlorination. *J.M. Warburton, J.A. Peebles, I. Al-Fayyomi, and D. O'Connor.*
Joseph M. Warburton (Brown and Caldwell/USA)

Effective Enhanced In Situ Bioremediation at a Former Dry Cleaner to Treat a DNAPL Source Zone and VOC Plume. *D. Williamson, A. Carver, J. Chetebbar, S. Park, and D. Caldwell.*
Dean F. Williamson (CH2M HILL/USA)

*** Emulsified Vegetable Oil Treatment on Chlorinated Solvent Source Areas at Cape Canaveral AFS.** *A. Chrest and D.R. Theoret.*
Anne Chrest (Portage, Inc./USA)

*** Enhanced Anaerobic Dechlorination of Dry Cleaning Site Using Emulsified Vegetable Oil and Whey.** *M. Mejac and J. Tarvin.*
Mark M. Mejac (AECOM/USA)

*** Enhanced Bioremediation Treatment of a Trichloroethylene Source Area at Tyndall AFB.** *S. Parzentny, D.R. Theoret, and T. Jellett.*
Sylvia Parzentny (U.S. Air Force/USA)

*** Enhanced In Situ Bioremediation in a Coastal Plain Aquifer.** *S. Rosansky, R. Darlington, T. Ford, M. Fattahipour, P.-F. Tamashiro, and A. Gavaskar.*
Stephen H. Rosansky (Battelle/USA)

*** Evidence of Biosurfactant-Enhanced Soil Vapor Extraction Recovery Associated with Biostimulation.** *S.O. Helgen and J.E. Vondracek.*
Steven Helgen (Integral Consulting, Inc./USA)

*** Full-Scale Biostimulation Source and Barrier Remediation for TCE in Groundwater.** *K.A. Morris, D. Ross, M. Leahy, and W.A. Butler.*
Kevin A. Morris (ERM/USA)

*** Full-Scale Enhanced Bioremediation of CVOCs in a Sand and Gravel Aquifer.** *T. Adams.*
Timothy V. Adams (Roux Associates, Inc./USA)

Full-Scale Source Area Bioremediation and Bioaugmentation Using Emulsified Oil Injections. *R.A. Wymore, K.S. Sorenson, T. Bragdon, N. Smith, U. Tulsiani, T.W. Macbeth, and M. Robles.*
Ryan A. Wymore (CDM/USA)

Hydrogeophysical Characterization and Monitoring of a TCE Source Zone during Enhanced In Situ Bioremediation. *J. Chambers, P. Wilkinson, G. Wealthall, R. Dearden, R. Ogilvy, M.H. Loke, and R. Wilson.*
Jonathan Chambers (British Geological Survey/UK)

Implications of Complete Reductive Dechlorination Persisting Years after Electron Donor Injection—Two Case Studies. *C.L. Jacob, C.N. Venot, E.F. Weber, C.M. Bach, and J.N. Bet.*
Clinton L. Jacob (Landau Associates, Inc./USA)

* **In Situ Anaerobic Bioremediation of a Mixed TCE and Perchlorate Plume at Vandenberg Air Force Base.** *G. Broughton, C.M. Terpolilli, M.J. Thomas, and A. Atta.*
Garrett Broughton (Shaw Environmental & Infrastructure/USA)

* **In Situ Treatment of Chlorinated Ethenes at the Treasure Island Site 24 Source Area.** *M. Yurovsky.*
Michael Yurovsky (Shaw Environmental & Infrastructure, Inc./USA)

Ketone Production in Enhanced Reductive Dechlorination Systems. *M. Schnobrich and S. Wang.*
Matthew R. Schnobrich (ARCADIS/USA)

* **Managing Injectability for High-Volume/Long-Duration In Situ Anaerobic Remediation Systems.** *M. Gentile, K. Houston, J. Horst, and S. Potter.*
Margaret Gentile (ARCADIS U.S. Inc./USA)

* **Multiple Remediation Approaches Demonstrate Cumulative Effectiveness in Treating Tetrachloroethene.** *T. Fowler, C. Dockter, D. Hanson, and B. Timmins.*
Troy Fowler (Hart Crowser, Inc./USA)

* **Nutrient and Culture Injection to Enhance Anaerobic Dechlorination at a Former Navy Facility.** *C.T. Coonfare, B. Headington, K.S. Sorenson, M.R. Lamar, S. Samaritoni, and D. Parker.*
Christopher T. Coonfare (Battelle/USA)

F8. PHYTOREMEDIATION

Platform Papers Thursday/Posters (*) Wednesday
Chair: Tesema Chekol (Battelle)

* **Effects of SCB Liquid Fertilizer on Photosynthetic Properties and Growth of Cd and Pb-Treated *Kalopanax pictus* Seedlings.** *S.-H. Han, D.-H. Kim, J.-C. Lee, and P.-G. Kim.*
Sim-Hee Han (Korea Forest Research Institute/REPUBLIC OF KOREA)

* **Engineering Transgenic Grasses for In Situ Treatment of RDX and TNT.** *S. Strand, N. Bruce, L. Rylott, S. Doty, and G. Zhang.*
Stuart E. Strand (University of Washington/USA)

* **Growth Responses and Phytoextraction of *Pinus thunbergii* on Cd-Contaminated Soil.** *S.-H. Han, D.-H. Kim, J.-C. Lee, and P.-G. Kim.*
Sim-Hee Han (Korea Forest Research Institute/REPUBLIC OF KOREA)

Monitoring and Assessment: Phytoremediation of a Carbon Tetrachloride Plume. *L.M. LaFreniere, E. Yan, C. Negri, R. Sedivy, S. Gilmore, and C. Roe.*
Lorraine M. LaFreniere (Argonne National Laboratory/USA)

Phytoremediation of TCE and Explosives by Transgenic Aspen. *S.L. Doty, J.W. Kang, H.-W. Wilkerson, F.M. Farin, T. Bammler, R.P. Beyer, S.E. Strand, and N. Bruce.*
Sharon L. Doty (University of Washington/USA)

* **Remedial and Hydraulic Effects of an Engineered Phytoremediation System on Groundwater at Two Sites in Michigan.** *E. Gatliff, F. Manale, D. Wandor, S. Lucas, and M. Siegman.*
Frank Manale (Toxicological & Environmental Associates, Inc./USA)

The Impact of Trees on Groundwater Hydrology and Jet-Fuel Contamination. *J.E. Landmeyer, E. Guthrie Nichols, R. Cook, B. Fetzer, J.-P. Messier, B. Atkinson, and G. Shaw.*
George Shaw (W.L. Gore & Associates, Inc./USA)

Use of Physical and Chemical Data to Assess the Efficacy of Chlordane Remediation by Willow Trees. *M.T. Jordan, J. Musella, W. Doucette, J.P. Messier, and F. Blaha.*
Michael T. Jordan (AECOM/USA)

F9. INTERACTION OF IN SITU BIOTIC AND ABIOTIC PROCESSES

Platform Papers Thursday/Posters (*) Wednesday
Chairs: Ramona Darlington (Battelle)
Carmen A. Lebron (U.S. Navy)

Abiotic and Biotic Transformation of TCE under Sulfate-Reducing Conditions: The Role of Spatial Heterogeneity. *J.T. Wilson, Y. He, B. Henry, and P. Evans.*
John T. Wilson (U.S. EPA/USA)

* **Abiotic Reduction of Chlorinated Organic Compounds with Biogenic Iron Sulfide.** *S. Tritschler and A. Agrawal.*
Sarah Tritschler (Wright State University/USA)

* **Biogeochemical Processes that Influence the Rate and Extent of Anaerobic Dechlorination.** *I. Kouznetsova, J.I. Gerhard, X. Mao, D.A. Barry, C. Robinson, A. Brovelli, M. Harkness, E.E. Mack, and S. Dworatzek.*
Jason I. Gerhard (University of Western Ontario/CANADA)

Differentiating Biogenic and Geochemical Minerals. *R.A. Brown and J.K. Henderson.*
Richard A. Brown (ERM, Inc./USA)

Distinguishing between Biotic and Abiotic Degradation of Chlorinated Hydrocarbons Using Compound-Specific Isotope Analysis (CSIA). *M. Elsner, G. Lacrampe Couloume, S. Mancini, L. Burns, and B. Sherwood Lollar.*
Silvia A. Mancini (Golder Associates, Inc./CANADA)

Engineering Considerations for Biogeochemical Transformation of Chlorinated Solvents in Groundwater.

P. Evans, K. Whiting, B. Henry, J. Wilson, C. Lebron, and E. Becvar.

Patrick J. Evans (CDM/USA)

* ERD By-Products—A Guide to the Geochemistry of Secondary Toxic Metals.

J. Hartley, B. Schroth, and

D. Glanzman.

Jim Hartley (CH2M HILL/USA)

Evidence of Biogeochemical Transformation Processes in an EVO Biobarrier.

R. Darlington, S. Rosansky,

H.V. Rectanus, T. Ford, P.-F. Tamashiro, and A. Gavaskar.

Ramona Darlington (Battelle/USA)

* Extracellular Electron Shuttling Compounds: Bridging Biological and Chemical Reactions in Bioremediation and Biofuel Production.

N. Wei, K.A. Dunnett, X. Ye,

A. Haluska, and K.T. Finneran.

Na Wei (University of Illinois/USA)

* In Situ Abiotic/Biotic Degradation of Chlorinated

Ethenes at Moffett Field, California. *D.P. Leigh, N. Hey,*

W. Akiyama, and J. Crosby.

Daniel P. Leigh (Shaw Environmental and Infrastructure, Inc./USA)

GI. CONTAMINATED SEDIMENTS ASSESSMENT AND REMEDIATION

Platform Papers Monday/Posters (*) Monday Evening

Chairs: John L. Hardin (Battelle)

Steven B. Hawthorne (University of North Dakota)

* Alternative Strategies for the In Situ Remediation of Contaminated Sediments.

C. Patton, D. Rider, and

A. Leeson.

Cara Patton (HydroGeoLogic, Inc./USA)

* Assessment of Copper Bioavailability—A Key Aspect of In-Place Management of Contaminated Sediments within a Wetland.

J. Barkach, D. McCauley, E. Schneider,

and M. Garton.

John H. Barkach (Great Lakes Environmental Center/USA)

Assessment of PAH Bioavailability—A Key Aspect of In-Place Management of Contaminated Sediments.

D. McCauley, J. Barkach, and M. Garton.

Dennis J. McCauley (Great Lakes Environmental Center/USA)

* Capping of the Historic Area Remediation Site

(HARS). *S.C. Knowles, A.F. Gregory, and M.P. Greges.*

Stephen C. Knowles (U.S. Army Corps of Engineers/USA)

* Contaminated Sediments and Riverbank Erosion—A Dendrogeomorphic Method to Determine Annual

Erosion Rates. *B. Dick, I. Jewell, I. Peszlen, R. Hey, and P. Simon.*

Bryan M. Dick (AECOM/USA)

* Electrochemical Oxidation of PAHs in Water from

Harbor Sediment Purification. *J. Muff and E.G. Sogaard.*

Jens Muff (Aalborg University/DENMARK)

Field Method for Sediment Pore-Water PAHs Using SPME and Laser-Induced Fluorescence Spectroscopy.

S.B. Hawthorne, R. St. Germain, and N.A. Azzolina.

Steven B. Hawthorne (University of North Dakota/USA)

Field-Scale Pilot Test of a Reactive Core Mat to

Address Coal Tar Seepage to a River. *S.M. Carroll,*

J. Barrett, W. Haswell, W. Fisher, and M. Okin.

Sean M. Carroll (Haley & Aldrich Inc./USA)

Sixth International Conference on Remediation of Contaminated Sediments

February 2011

The *International Conference on Remediation of Contaminated Sediments* addresses the challenges of effectively combining scientific and engineering advances in sediments remediation and containment with assessment and management frameworks and governing policies and regulations to achieve effective environmental protection goals. The Fifth Sediments Conference was the largest to date in this series. It was attended by nearly 900 scientists, engineers, regulators, remediation site owners, and other environmental professionals, representing



universities, government agencies, consultants, and R&D and service firms from around the world. The program consisted of more than 400 platform and poster presentations and two panel discussions.

The 2011 program will cover innovative science, engineering, and management approaches related to contaminated sediment characterization and assessment; remediation and restoration; management considerations, policies, and guidelines that affect decision-making; and the definition and demonstration of remediation success.

To inquire about opportunities for your organization to sponsor the Conference, please call 800-783-6338. Details on abstract preparation and submission, exhibits, and submission of proposals for short courses will be available at www.battelle.org/sedimentscon by February 28, 2010. Abstracts will be due in July 2010. The Conference is organized and presented by Battelle.

* **Groundwater/Surface Water Interaction Study Guidance to Support Sediment Remediation Projects.** *J.R. Starr and D.S. Lipson.*
Jesse R. Starr (ARCADIS/USA)

* **Investigating Dioxin Impacts to the Woonasquacket River via Groundwater Transport.** *D. Dahlen, N. Richardson, C.J. Rosiu, and C. Silver.*
Deirdre Dahlen (Battelle/USA)

* **Laboratory Assessment of Ebullition-Facilitated Migration of Coal Tar through an Amended Sand Cap.** *E.L. McLinn, T.R. Stolzenburg, and K. McCord.*
Eugene L. McLinn (RMT, Inc./USA)

Lake Sediment Stabilization to Treat Dioxins, Herbicides, Metals and VOCs, and to Impart Strength. *T.L. Johnson, E.L. Schaefer, C.R. Poulsen, S.F. Gormley, J.T. Spadaro, and R.T. Gresh.*
Jack T. Spadaro (AMEC Earth & Environmental, Inc./USA)

Natural Attenuation of Chlorinated Solvents in a Subterranean Estuary: Part 2—Biological Processes. *N. Durant, L. Smith, D. Himmelheber, W. Locke, J. Gasper, J. French, C. Barr, and M. Pound.*
Neal D. Durant (Geosyntec Consultants/USA)

* **Occurrence of Mn-Oxidizing Microorganisms in Baltimore Harbor Sediments and their Role in Cr(III) Oxidation to Cr(VI).** *P. Belyantseva, A. Wadhawan, and E.J. Bouwer.*
Polina Belyantseva (Johns Hopkins University/USA)

* **Recovery of a Northeastern Lake Fishery Following the Removal of Sediments Containing Lead Chromate.** *R. Schuck and S. Clough.*
Stephen R. Clough (Haley & Aldrich, Inc./USA)

* **Sediment Cap Amendment Performance at the McCormick and Baxter Superfund Site, Portland, Oregon.** *H. Blischke.*
Heidi Blischke (GSI Water Solutions, Inc./USA)

* **Sustainable Remediation and Diversity and Abundance of Bacterial Species in Wetland.** *S. Chattopadhyay.*
Sandip Chattopadhyay (Tetra Tech EM, Inc./USA)

3-D Characterization of NAPL-Contaminated Sediments with Laser-Induced Fluorescence-Based Samplers and Probes. *R. St. Germain.*
Randy W. St. Germain (Dakota Technologies, Inc./USA)

* **Use of Passive Samplers to Evaluate Remediation Effectiveness at the United Heckathorn Superfund Site: An Overview.** *T. Frank, R.M. Burgess, M.G. Cantwell, P.M. Gschwend, J. MacFarlane, G. Lotufo, J. Spahn, and S. Lin.*
Tamara Frank (E2 Consulting Engineers/USA)

G2. VAPOR INTRUSION CSMs: TOXICITY, RISK, FATE AND TRANSPORT

Platform Papers Monday/Posters (*) Tuesday Evening

Chairs: Pamela Rodgers (Battelle)
Ruth Owens (U.S. Navy)

* **After a Year of Comparing Two Vapor Intrusion Models: What Have We Learned?** *W.B. Mills and K. Sayenko.*
William B. Mills (Tetra Tech, Inc./USA)

Evaluation of Vapor Intrusion Using Controlled Building Pressure Conditions. *T. McHugh, D. Bailey, R. Landazuri, B. Chadwick, and I. Rivera-Duarte.*
Thomas E. McHugh (GSI Environmental/USA)

* **Implementation of a Strategic Approach for Complex VI Assessment at a Large Military Facility.** *E. Majcher, P. Nicholson, T. McAlary, D. Himmelheber, A. Krasnopoler, R. Ettinger, and J. Wrobel.*
Emily H. Majcher (Geosyntec Consultants/USA)

* **Indoor Air Pollution: Study of TCE Transport through Soil and Basement.** *M. Musielak, M. Marcoux, and M. Quintard.*
Marion Musielak (Institut de Mecanique des Fluides de Toulouse/France)

Introducing the U.S. EPA Draft "Conceptual Model Scenarios for the Vapor Intrusion Pathway" Document. *L.D.V. Abreu.*
Lilian D.V. Abreu (ARCADIS/USA)

Navy Vapor Intrusion Background Indoor Air Guidance. *L. Lund, M. Novak, S. Emsbo-Mattingly, S. Rouhani, and R. Owens.*
Loren Lund (CH2M Hill/USA)

* **Navy's Review of State of the Art on Vapor Intrusion Assessment.** *B.D. Chadwick, I. Rivera-Duarte, T. McAlary, R. Ettinger, P. Johnson, B. Eklund, and H. Hayes.*
Bart D. Chadwick (U.S. Navy/USA)

* **Public Participation in Vapor Intrusion Investigation Process.** *L. Larsen-Hallock.*
Lorraine A. Larsen-Hallock (California EPA Dept of Toxic Substances Control/USA)

*** Use of Flux Chambers for Estimating Vapor Intrusion into Structures.** *D. Gallagher.*

Dan Gallagher (California Dept of Toxic Substances Control/USA)

Vapor Intrusion through Sewer Systems: Migration Pathways of Chlorinated Solvents from Groundwater to Indoor Air. *C. Riis, M.H. Hansen, H.H. Nielsen,*

A.G. Christensen, and M. Terkelsen.

Charlotte E. Riis (NIRAS/DENMARK)

G3. VAPOR INTRUSION SAMPLING AND ASSESSMENT

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Dan Gallagher (California Dept of Toxic Substances Control)

Robert Ettinger (Geosyntec Consultants)

*** Cost and Data Quality Implications in Current TO-15 Sampling Procedures.** *G.K. Shkuda, N. Repetti,*

A. Coenen, C. Domaradzki, and D. Speis.

Gregory K. Shkuda (Environmental Resources Management/USA)

*** Importance of Purge Volume, Purge Rate, and Sample Volume on Soil Gas Concentrations.** *J. Elliot,*

B. Schumacher, J. Zimmerman, G. Swanson, and B. Hartman.

James Elliot (Tetra Tech, Inc./USA)

A New Quantitative Passive Sampler for Vapor Intrusion Assessment: The PDMS Membrane Sampler.

H. Groenevelt, T. McAlary, T. Gorecki, and S. Seethapathy.

Hester Groenevelt (Geosyntec Consultants, Inc./CANADA)

*** Quantitative Passive Diffusive-Adsorptive Sampling Techniques for Vapor Intrusion Assessment.** *T. McAlary,*

H. Groenevelt, T. Gorecki, S. Seethapathy, P. Sacco,

D. Crump, M. Tuday, B. Schumacher, H. Hayes, and

P. Johnson.

Todd A. McAlary (Geosyntec Consultants, Inc./CANADA)

*** Quantitative Passive Samplers for Indoor and Outdoor Air Monitoring during Vapor Intrusion Assessments.**

H. Groenevelt, T. McAlary, B. Chadwick, and I. Rivera-Duarte.

Hester Groenevelt (Geosyntec Consultants, Inc./CANADA)

*** Radon as a Tracer for Vapour Intrusion into Buildings.**

B. Hvidberg, O. Kiellerich, M. Neerup Jeppesen, and

J. Bruun Petersen.

Boerge Hvidberg (Region of Central Jutland/DENMARK)

Radon Tracer as a Multipurpose Tool to Enhance Vapor Intrusion Assessment and Mitigation. *C.C. Lutes,*

R. Uppencamp, C. Singer, R. Mosley, and D. Greenwell.

Christopher C. Lutes (ARCADIS U.S., Inc./USA)

*** Soil Gas Sampling and Soil Vapor Intrusion: European Case Studies.** *D. Nuyens.*

Dirk Nuyens (ERM/France)

*** Technical Support Activities Evaluating Vapor Intrusion Impacts at a Field Demonstration Site.**

D. Grosse, R.S. Truesdale, D. Mckunas, T. McAlary,

B. Hartman, G. Plantz, and D. Digulio.

Douglas W. Grosse (U.S. EPA/USA)

Tracking Vapor Intrusion Pathways—A Tracer Gas Test.

P. Loll, P. Larsen, and C. Larsen.

Per Loll (DMR A/S/DENMARK)

*** Use of Integrated Indoor Concentrations of Tracer Gases and Volatile Organic Compounds (VOCs) to Distinguish Soil Sources from Above-Ground Sources.**

R.B. Mosley, D. Greenwell, A. Lee, K. Baylor, M. Plate,

C. Lutes, and H. Hayes.

Ronald B. Mosley (U.S. EPA/USA)

Using Multiple Lines of Evidence in a Vapor Intrusion Evaluation. *A. Goldberg Day.*

Amy E. Goldberg Day (ARCADIS/USA)

Vapor Intrusion Modeling: The Influence of Barometric Pressure Changes on Soil Gas Concentrations.

A.P. Mortensen, A.G. Christensen, L.D. Abreu, N. Durant,

L. Andersen, and M. Christophersen.

Anders G. Christensen (NIRAS A/S/DENMARK)

*** Vertical Distribution of VOCs in Soils from**

Groundwater to the Surface/Subslab. *B. Schumacher,*

J. Elliot, J. Zimmerman, G. Swanson, B. Hartman, and

C. Callahan.

Brian Schumacher (U.S. EPA/USA)

G4. UNDERSTANDING AND ACCOUNTING FOR SPATIAL AND TEMPORAL VARIABILITY IN VAPOR INTRUSION ASSESSMENT DATA COLLECTION

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Blayne Hartman (Hartman Environmental Geoscience)

Brian Schumacher (U.S. EPA)

*** Effect of Ambient Air Quality on Soil Vapor and Indoor Air Quality.** *R.J. Fiacco, K. Perritt, J. Desrosier, and*

J. Gipson.

R. Joseph Fiacco (ERM/USA)

*** Effect of Equilibration Time of Soil Vapor Probes on Soil Gas Concentrations.** *J. Zimmerman, G. Swanson, B. Schumacher, J. Elliot, and B. Hartman.*
John H. Zimmerman (U.S. EPA/USA)

*** Effect of Meteorological Variations on Soil Gas Concentrations near and under a Slab.** *B. Hartman, G. Swanson, B. Schumacher, J. Zimmerman, and J. Elliot.*
Blayne Hartman (Hartman Environmental Geoscience/USA)

*** High Purge Volume Tests for Managing Variability in Sub-Slab Soil Gas.** *P. Nicholson, D. Bertrand, T. McAlary, and G. Thrupp.*
Paul Nicholson (Geosyntec Consultants/CANADA)

Interval Indoor Air Measurements from a Dry Cleaner, a Residence, and at Vapor Intrusion Sites. *R.J. Rago and G.M. Plantz.*
Richard J. Rago (Haley & Aldrich, Inc./USA)

Long-Term Integrated Samplers for Indoor Air and Subslab Soil Gas at VI Sites. *C.C. Lutes, R. Uppencamp, H. Hayes, R. Mosley, and D. Greenwell.*
Christopher C. Lutes (ARCADIS U.S., Inc./USA)

*** A Regulator's Perspective on Methods for Managing Spatial and Temporal Variability in Vapor Intrusion Decisions.** *H. Schuver.*
Henry Schuver (U.S. EPA/USA)

Seasonal Variation of Soil Gas Concentrations near and under a Slab Over a Year. *G. Swanson, B. Schumacher, J. Zimmerman, B. Hartman, and J. Elliot.*
Gregory R. Swanson (Tetra Tech EM Inc./USA)

Typical Spatial and Temporal Variability in VI Data Sets and Implications for Regulatory Policy. *B. Eklund.*
Bart Eklund (URS Corporation/USA)

G5. LINKING VAPOR INTRUSION ISSUES WITH COST-EFFECTIVE REMEDIATION AND SUSTAINABLE REDEVELOPMENT

Platform Papers Tuesday/Posters (*) Tuesday Evening
Chairs: Bill Morris (EnviroGroup, Ltd.)
Dan W. Waddill (U.S. Navy)

Contaminated Site Utilizes Chemical-Resistant Vapor Mitigation Technology for Brownfield Redevelopment. *M. Rudolph and K. Ameli.*
Matt Rudolph (Terracon Consultants, Inc./USA)

Design and Performance of a Passive (Sustainable) Vapor Intrusion Mitigation System. *B. Morris and D. Folkes.*
Bill Morris (EnviroGroup, Ltd./USA)

Passive (Wind-Driven) Systems for Sub-Slab Venting to Mitigate Potential Vapor Intrusion. *D. Bertrand, T. McAlary, G. Corcoran, and S. Williams.*
David M. Bertrand (Geosyntec Consultants/CANADA)

*** Sub-Slab Venting of a Commercial Building.** *H. Clough and R. Rieke.*
Herb Clough (Ash Creek Associates/USA)

Sustainable Building Solutions to Vapor Intrusion Mitigation of Chlorinated and Recalcitrant Compounds. *E. Moyer, J. Lowe, D. MacPhaul, C. Etter, and L. Lund.*
Ellen E. Moyer (CH2M Hill/USA)

*** Vapor Intrusion Mitigation: Design and Operation at Large Commercial Buildings.** *J.B. Cowart.*
James B. Cowart (EnviroGroup Ltd./USA)

G6. VAPOR INTRUSION MITIGATION

Platform Papers Tuesday/Posters (*) Tuesday Evening
Chairs: Loren Lund (CH2M Hill)
Jeffrey F. Ludlow (Treadwell & Rollo, Inc.)

*** Brownfield Redevelopment—Asphalt-Latex as Gas Vapor Barrier.** *H. Nguyen and J. Di.*
Hieu Nguyen (CETCO Remediation Technologies/USA)

Comparison of Estimated Versus Actual Vapor Intrusion Management System Performance. *S. Reinis, M. Chendorain, and J.F. Ludlow.*
Sigrida Reinis (Treadwell & Rollo, Inc./USA)

*** Control of Ozone and VOC Vapor Intrusion in Off-Site Residential ISCO Applications.** *L. Kessel, J.R. Squire, and Y. Zhao.*
Yuechen Zhao (Haley & Aldrich, Inc./USA)

Decision Framework for Selecting and Implementing Vapor Intrusion Mitigation Systems. *W. Bosan, K. Burger, L. Larsen-Hallock, and D. Lofstrom.*
Dot Lofstrom (Department of Toxic Substances Control/USA)

*** Health Risk Assessment, EVS Modelling, and In Situ Remediation of Chlorinated Solvents at an Industrial Facility, Los Angeles, California.** *A. Lizzi.*
Anthony Lizzi (AECOM/USA)

An Integrated Model for Design of Soil Vapour Intrusion Mitigation Systems. *I. Hers, G. Di Marco, and G. Miller.*
Ian Hers (Golder Associates Ltd./CANADA)

*** New Methods for Dynamic and Quantitative Measurement of Chemical Permeation Rates for Gas Vapor Barriers.** *B. Mork, P. Grant, M. Azad, and K.-J. Chen.*
Benjamin Mork (Regenesis/USA)

Optimization of Engineered Controls to Prevent Vapor Intrusion. *M.T. Jordan, M. Zenker, and N.V. Shetty.*
Michael T. Jordan (AECOM/USA)

*** Performance Data from an Existing Building ("Retrofit") Vapor Intrusion Mitigation System.** *M.B. Hall, J.F. Ludlow, and S. Reinis.*
Matthew Hall (Treadwell & Rollo, Inc./USA)

*** Performance Monitoring of VOC Mitigation Systems.** *G. Tofani and K. Lea.*
Kevin Lea (GeoKinetics, Inc./USA)

*** A Pneumatic Barrier to VOC Vapor Intrusion into Residences—A Case Study.** *E. Tollefsrud and D. Richardson.*
Eric J. Tollefsrud (AMEC Geomatrix, Inc./USA)

Proof-of-Concept Study of an Engineered Aerobic Vapor Migration Barrier Beneath a Building at a Petroleum Hydrocarbon-Impacted Site. *H. Luo, P. Dahlen, P.C. Johnson, T. Peargin, M. Mitchell, and D. Lam.*
Hong Luo (Arizona State University/USA)

*** Salvation Army Kroc Center Mitigates Vapor Intrusion Risk with a VOC-Resistant Vapor Barrier.** *K. Ameli and J. Hodgkinson.*
Kelly Ameli (Land Science Technologies/USA)

*** Vapor Intrusion Flux of Methane and VOCs at Commercial Buildings Overlying a Landfill.** *J.B. Cowart and J.P. Kurtz.*
James B. Cowart (EnviroGroup Ltd./USA)

*** Vapor Intrusion Management System Monitoring Techniques for a Multi-Building Brownfields Project.** *M. Chendorain, S. Reinis, and J.F. Ludlow.*
Michael Chendorain (Treadwell & Rollo, Inc./USA)

*** Vapor Intrusion Mitigation Using Aerated Floors: Design Criteria for Passive Venting Systems.** *D. Folkes and B. Morris.*
David J. Folkes (EnviroGroup, Ltd./USA)

*** Vapor Measurements from a Sub-Slab Ventilation System Operating in Active and Passive Modes.** *R.J. Rago, G.M. Plantz, and J.R. Kastrinos.*
Richard J. Rago (Haley & Aldrich, Inc./USA)

G7. REMEDIATION OF METALS AND ARSENIC IN SOILS AND GROUNDWATER

Platform Papers Wednesday/Posters (*) Wednesday

Chairs: Stephen A. Kessel (Brown and Caldwell)
Thomas P. Hoelen (Chevron Energy Technology Company)

*** Accelerated Post-Treatment Restoration of Arsenic Stability in an Anaerobic Bioremediation Zone.** *J. Gillow, M. Skold, J. Horst, and J. Erickson.*
Jeff Gillow (ARCADIS U.S., Inc./USA)

*** Accelerated Remediation of Acid Metals-Contaminated Aquifers.** *C. Bethke, M. Wickham, and J. Waples.*
Craig Bethke (University of Illinois/USA)

Arsenic Occurrence at Petroleum Hydrocarbon-Impacted Sites. *K.E. Patterson, M.D. Zimmerman, R.A. Brown, and G.T. Ririe.*
Katrina E. Patterson (ERM/USA)

*** Biosorption of Zn(II) from Synthetic Solution by a Fungal Species Isolated from a Metal-Contaminated Site—A Comparative Study.** *A. Gupta and K. Nain.*
Asha Gupta (Guru Jambheshwar University/INDIA)

*** Case Studies on Groundwater Metal Analysis in Brazil: Total or Dissolved?** *S. Loebmann, A. Cunha, C. Aily, J. Camillo, M.C. Frasca Spilborghs, D. Brown, and R. Shuler.*
Susanne Loebmann (ERM Brasil/BRAZIL)

Challenges Associated with Arsenic Remediation in Media Affected by Multiple Metals. *P. Zawislanski, J. Horst, J. Gillow, and E. Kalve.*
Peter T. Zawislanski (ARCADIS U.S., Inc./USA)

*** Comparative Studies on the Efficacy of Biosorbents for Nickel (II) Removal from Electroplating Effluent.** *S. Goel.*
Simmi Singla Goel (Mata Gujri College/INDIA)

*** Copper Size Fractionation and Association with DOC in Surface Water Impacted by Smelter Emissions.** *J. Sueker, A. Thatcher, P. Pinson, and K. Lynnes.*
Julie K. Sueker (ARCADIS/USA)

Effectiveness of Soil Amendments for Reducing Exposure to Wildlife from Lead and Other Heavy Metals. *W. Gala, C. Baker, D. Oberle, and A. Zapp.*
William R. Gala (Chevron Energy Technology Company/USA)

Evaluating Long-Term Stability of Metals Precipitated In Situ. *J. Horst, S. Suthersan, D. Ams, J. Gillow, and R. Wilkin.*
John F. Horst (ARCADIS U.S., Inc./USA)

* **Evaluation of In Situ Treatment Amendments for Arsenic in a Shallow Alluvial Aquifer near Tacoma, Washington.** *B. Beaulieu and S. Ewing.*
Brett Beaulieu (Floyd/Snider/USA)

* **Geochemical Controls on As, Ba, and Mn in Pore Water in the Groundwater-Surface Water Transition Zone.** *T. Martin, J. Gasper, W. Locke, and D. Vlassopoulos.*
Todd Martin (Integral Consulting, Inc./USA)

* **Geochemical Fate of As, Fe, and La after $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ and $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ Plus $\text{LaCl}_3 \cdot 7\text{H}_2\text{O}$ Treatments of Arsenic-Contaminated Soils.** *G. Neupane, R.J. Donahoe, and Y. Qi.*
Ghanashyam Neupane (University of Alabama/USA)

* **Geochemical Modeling and Bench Study Testing of Nickel-Contaminated Groundwater Treatment Alternatives.** *N. Posavatz and W. Prall.*
Nancy Posavatz (Global Remediation Technologies, Inc./USA)

* **Heavy Metal Treatment Using Converted Red Mud (CRM) and Ferric Chloride: Experimental Studies.** *P.J. Dugan.*
Pamela J. Dugan (Carus Corporation/USA)

* **Identifying and Distinguishing Industrial Sources of Arsenic from Historic Fill near a Former Coal Tar Processing Facility: A Case Study.** *D. Finney, R. Glanzman, and T. Himmer.*
David S. Finney (CH2M HILL/USA)

In Situ Biotransformation of Mercury-Contaminated Groundwater Utilizing Native Bacteria in Kazakhstan. *S.A. Abdrashitova, R. Devereux, S. Jackman, and W.J. Davis-Hoover.*
Svetlana A. Abdrashitova (Institute of Microbiology and Virology/KAZAKHSTAN)

* **Low-Cost Adsorbent Media for Iron and Manganese Removal from Contaminated Groundwater.** *M.R. Boni, S. Sbaiffoni, and L. Tuccinardi.*
Silvia Sbaiffoni (University of Rome/ITALY)

Phosphate Stabilization of Lead-Contaminated Landfill Soils and Debris. *J. Weidhaas and R. Starr.*
Jennifer L. Weidhaas (North Wind, Inc./USA)

* **A Pilot Study for Reduction of Dissolved Copper in Shallow Groundwater.** *C. Gilmore, J. Hess, and F. Fadullon.*
Clare Gilmore (Innovative Technical Solutions, Inc./USA)

* **Reducing Toxicity of Pb-Contaminated Soil through EDTA Washing.** *L. d'Aprile, M. Fabbicino, and M. Guida.*
Massimiliano Fabbicino (University of Naples Federico II/ITALY)

* **Removal of Arsenic by TiO_2 Nanoparticles.** *R. Goswami, K.P. Sarma, P. Deb, and R. Thakur.*
Ritusmita Goswami (Tezpur University/INDIA)

Use of Mercury Speciation to Support Alternate Remediation Standards and Cost-Effective Remediation. *A.R. Sherman and T.L. Sorell.*
Adam R. Sherman (Brown and Caldwell/USA)

* **Using Discriminant Analysis for Differentiating Sources of Arsenic at a Former Iron Mine, U.S.A.** *J. Sueker, G. Albright, and B.J. Bussa.*
Julie K. Sueker (ARCADIS/USA)

G8. IN SITU REMEDIAL STRATEGIES FOR RADIONUCLIDES

Platform Papers Thursday/Posters (*) Wednesday

Chairs: Dawn S. Kaback (AMEC Geomatrix)
Dawn Wellman (Pacific Northwest National Laboratory)

A Case Study Where In Situ TCE Groundwater Treatment Could Have Mobilized Radiological Contaminants. *J. Myers and S. Adams.*
Jonathan Myers (Shaw Environmental, Inc./USA)

* **Enhanced Reductive In Situ Precipitation of Technetium, Uranium, and Nitrate in Groundwater at the Savannah River Site.** *C.C. Lutes, A. Frizzel, J. Beckner, and J. Gillow.*
Christopher C. Lutes (ARCADIS U.S., Inc./USA)

Photo: Monterey County CVB



* **Foam Flow in Vadose Zone Sediments and Tc-99 Immobilization by Foam-Delivered Calcium Polysulfide.** *L. Zhong, J.E. Szecsody, Z.F. Zhang, S.V. Mattigod, D.P. Jansik, and D.M. Wellman.*
Lirong Zhong (Pacific Northwest National Laboratory/USA)

* **Formulation of Reactive Carrier Foams for In Situ Remediation of Radionuclides in Deep Vadose Zone.** *S.V. Mattigod, L. Zhong, D. Jansik, and D. Wellman.*
Shas V. Mattigod (Pacific Northwest National Laboratory/USA)

* **Geochemical Evaluation of Uranium Fate and Transport, Guterl Specialty Site, New York.** *A. Lewis-Russ, B. Frederick, and J. Kaczor.*
Anne Lewis-Russ (AECOM/USA)

* **Longevity of Sr-90 Remediation by Incorporation into In Situ Precipitated Apatite.** *J.E. Szecsody, J.S. Fruchter, V.R. Vermeul, M.D. Williams, and R.C. Moore.*
Jim E. Szecsody (Pacific Northwest National Laboratory/USA)

Optimization of Aquifer pH Adjustment to Treat an Acidic Radionuclide Plume. *M. Denham, K. Vangelas, and J. Noonkester.*
Miles E. Denham (Savannah River National Laboratory/USA)

* **Overview of Deep Vadose Zone Treatability Testing at the Hanford Site, Washington.** *J.G. Morse.*
John G. Morse (U.S. Dept of Energy/USA)

Post-Biostimulation Biogenic U(IV) Reoxidation and Microbial Community Structure That Affects its Stability. *P.R. Jaffe, H.S. Moon, A.L. N'Guessan, and A.D. Peacock.*
Peter R. Jaffe (Princeton University/USA)

Remediating Uranium-Contaminated Groundwater through Engineered In Situ Precipitation. *J. Gillow, B. Clark, S. Morie, P. Preston, B. Ilgner, and J. Horst.*
Jeff Gillow (ARCADIS U.S., Inc./USA)

Remediation of Uranium in Vadose Zone Sediments Using Gas-Transported Reactants. *J.E. Szecsody, M.J. Truex, L. Zhong, and S.C. Smith.*
Jim E. Szecsody (Pacific Northwest National Laboratory/USA)

Requirements for Sustainable In Situ Remediation of Metals and Radionuclides. *T.K. Tokunaga and J. Wan.*
Tetsu K. Tokunaga (Lawrence Berkeley National Laboratory/USA)

* **U(VI) Sorption and Diffusion in Packed Cells of Hanford Silt/Clay Material.** *J. Bai, C. Liu, and W.P. Ball.*
William P. Ball (The Johns Hopkins University/USA)

Panel Discussion. Approaching Sites with Metal- and Radionuclide-Contaminated Soils and Groundwater: A Paradigm Shift Thursday/Track G

Moderator: Brian B. Looney (Center for Sustainable Soil and Groundwater Solutions, Savannah River National Laboratory)

Panelists:

Craig Bethke (University of Illinois)
Pat Brady (Sandia National Laboratory)
Richard Brown (ERM)
Miles Denham (Center for Sustainable Soil and Groundwater Solutions, Savannah River National Laboratory)
Richard Wilkin (U.S. EPA)

The goal of this panel is to spur dialogue on metal and radionuclide contamination remediation approaches that emphasize long-term sustainability—how to plan for it, achieve it, and verify it. There are technical, regulatory, and overall cost issues to be explored. Technical issues include how to stabilize or detoxify these contaminants in ways consistent with a waste site's natural geochemical evolution and how to verify performance over extended timeframes. Regulatory issues include how to improve remedial objectives to be protective and practical, to effectively blend removal actions and attenuation-based remedies, and to deal with the inevitable uncertainty accompanying increasingly long timeframes. Cost issues go beyond fiscal concerns and include evaluating overall costs to the environment of different remedial strategies versus the risk posed by the contaminants.

The assumption underlying this panel discussion is that all in situ stabilization of metals and radionuclides ultimately must rely on natural attenuation processes because some contaminant will be left in place. This assumption is supported by the number of Records of Decision that identify monitored natural attenuation (MNA) as the end-state. Yet, for many of these, the site characterization and active remedy are not efficiently aligned with this end state. A desired outcome of the discussion is to begin formulating a paradigm for addressing metal- and radionuclide-contaminated sites in which a natural attenuation end-state guides characterization and active remediation decisions.

G9. CHROMIUM

Platform Papers Thursday/Posters (*) Wednesday

Chairs: Robert E. Hinchee (Integrated Science & Technology, Inc.)

Benny Dehghi (Honeywell International Inc.)

* **Catalyzed Sodium Bisulfide Treatment for Hexavalent Chromium.** A.V. Zapp, D. Schroder, D. Oberle, and D. Biehle.

Anthony V. Zapp (Stantec Consulting/USA)

* **A Comparative Bench-Scale Study of Five Chemical Reducing Agents for In Situ Geochemical Fixation of Hexavalent Chromium in Groundwater.** V. Murt, R. Olsen, T. Burgesser, and D. Cutt.

Victoria Murt (U.S. Army Corps of Engineers/USA)

A Comparative In Situ Pilot Study of Lactate and Calcium Polysulfide for Geochemical Fixation of Hexavalent Chromium in Groundwater. V. Murt, K. Yun, F. Tsang, R. Olsen, and D. Cutt.

Victoria Murt (U.S. Army Corps of Engineers/USA)

* **Differentiating between Geogenic and Anthropogenic Chromium in Groundwater at a Site in the Sacramento Valley, California.** A. Verce, M. Stallard, and R. Devany.

Anja Verce (Weiss Associates/USA)

* **Evaluation of Bioremediation and Chemical Reduction for Chromium (VI) in the Unsaturated Zone.** S. Abrams, N. Rivers, G. Ranganathan, and C. Schaefer.

Stewart H. Abrams (Langan Engineering and Environmental Services/USA)

* **Evaluation of Hexavalent Chromium Treatment Using Iron-Chelate and Calcium Polysulfide in Conjunction with ISCO.** Y. Chin and P. Kakarla.

Yan Chin (In-Situ Oxidative Technologies (ISOTEC)/USA)

Fate of Arsenic and Chromium in an Iron Oxide-Amended Soil. S.S. Nielsen, P. Kjeldsen, and R. Jakobsen.

Sanne Skov Nielsen (Technical University of Denmark/DENMARK)

* **In Situ Chromium(VI) Removal by Zero-Valent Iron or Iron(II) Sulphate—Results of a Site Investigation, Treatability, and Feasibility Study Checking Different Remedial Options.** V. Birke, C. Schuett, H. Burmeier, and C. Poggendorf.

Volker Birke (Ostfalia University/GERMANY)

In Situ Groundwater Remediation of Heavy Metals in an Active Manufacturing Facility. P.J. McCall, L.A. Bagby, and J.E. Blocker.

Patti J. McCall (GeoTrans, Inc., a Tetra Tech Company/USA)

In Situ Remediation of CR(VI)-Impacted Vadose-Zone Soils. K.S. Houston, B.J. Wuerl, F. Lenzo, and J. Horst.

Kelly S. Houston (ARCADIS/USA)

In Situ Treatment of Hexavalent Chromium in Perched Groundwater. G.G. Alexander and P. DeLong.

Gordon G. Alexander (AMEC Geomatrix/USA)

* **Long-Term Permanence of In Situ Cr(VI) Treatment.**

J. Horst, F. Lenzo, M. Gentile, and J. Gillow.

John F. Horst (ARCADIS U.S., Inc./USA)

* **A Method for Complete Treatment of Chromite Ore Processing Residue.** J. Horst, D. Ams, J. Gillow, and D. Liles.

John F. Horst (ARCADIS U.S., Inc./USA)

* **Monitored Natural Attenuation as a Remedial Option for Hexavalent Chromium in Estuarine Sediments in Australia.** C. Jewell and D. Egelton.

Chris Jewell (C.M. Jewell & Associates Pty Ltd./AUSTRALIA)

* **Novel Synthesis of Nanoscale Iron Particles Using Natural Polyphenols for Enhanced Chromate Removal from Water.** J.-H. Kim, J.-R. Jeon, S.-H. Cho, E.-J. Kim, Y.-S. Chang, and J.-W. Lee.

Jae-Hwan Kim (POSTECH/SOUTH KOREA)

* **Optimization for Least-Cost Design for CR(VI) Containment at Facility Boundary.** T. Fox, S. Bowen,

S. Regmi, N. Voorhies, R. Porges, T. Battenhouse, and L. Deschaine.

Tad C. Fox (SAIC/USA)

Pilot Testing of Hexavalent Chromium Plume Treatment by Reductant Injection at a Tinker AFB Site.

M.L. Alexander, A. Will, and S. Bowen.

Matthew L. Alexander (SAIC/USA)

* **Simulation of Pilot-Scale In Situ Fixation of Hexavalent Chromium at the Puchack Well Field Superfund Site.** M. Gamache, R.P. Schreiber, V. Murt, F. Tsang, and D. Cutt.

Matthew Gamache (CDM, Inc./USA)

Photo: Monterey County CVB



H1. REMEDIATION OF NITRATE IN SOIL AND GROUNDWATER

Platform Papers Monday/Posters (*) Monday Evening

Chairs: William H. DiGuseppi (AECOM)

Kirk Williams (Crop Production Services, Inc.)

Biological Remediation of a Mixed Urea, Ammonia, and Nitrate Plume. *J. Haselow, G. Babb, and J. Mueller.*
John S. Haselow (Redox Tech, LLC/USA)

Dealing with the Elephant: Nitrate-Contaminated Groundwater, a Regulatory Perspective. *B. Faris.*
Bart H. Faris (New Mexico Environmental Dept./USA)

Gaseous Electron Donor Injection Technology (GEDIT) for Treatment of Oxidized Contaminants in Vadose Soil. *P. Evans and R. Fricke.*
Patrick J. Evans (CDM/USA)

*** Impacts of Agriculture on Nitrates in Soil and Groundwater in the Southeastern Coastal Plain.** *R.K. Hubbard.*
Robert K. Hubbard (USDA-ARS/USA)

*** Lab- and Field-Scale Evaluation of Supplying Dissolved H_2 to Stimulate In Situ Reduction of Nitrate and Uranium.** *J. Cabezas, Y. Gamboa, W. Fernandez, S. Wang, L. Clapp, D. McCoig, R. Grant, and C. Bartels.*
Jose Cabezas (Texas A&M University-Kingsville/USA)

Nitrate Reduction Using Emulsified Vegetable Oil Injections. *S. Truesdale and J. Hatton.*
Steven Truesdale (AECOM/USA)

H2. STRATEGIES FOR GROUNDWATER REMEDIATION IN FRACTURED BEDROCK AND LOW-PERMEABILITY FORMATIONS

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Mark Kluger (Dajak, LLC)

Allen M. Shapiro (U.S. Geological Survey)

*** Bioaugmentation for TCE DNAPL Remediation in Fractured Bedrock.** *M.F. deFlaun and S. Drew.*
Mary F. deFlaun (Geosyntec Consultants, Inc./USA)

Characterization of Chlorinated Ethenes in Fractured Mudstone Using Real-Time Matrix Diffusion Data. *J.J. Frederick, D.J. St. Germain, J.E. Karn, A.R. Vitolins, K.J. Goldstein, D. Cutt, K.E. Maas, C.E. Williams, and A.F. Darpinian.*
Jeffrey J. Frederick (Malcolm Pirnie, Inc./USA)

Comparing Chemical Oxidation and Bioaugmentation for Treating DNAPL in Rock Fractures. *C. Schaefer and R. Towne.*
Charles Schaefer (Shaw Environmental, Inc./USA)

*** Construction of a Tunnel/Drain Collection System to Control Contaminant Migration in Fractured Bedrock.** *J.R. Bridge, J. Leerkes, C. Tallon, J.F. Baltz, A. Sheehan, J.H. Guswa, D. Tripp, J. Smith, and E. LaPoint.*
Jonathan R. Bridge (GeoTrans, Inc./USA)

*** Enhanced Bioremediation of a TCE Source and Plume in Fractured Bedrock.** *G. Scholes, P. Dollar, E. Cox, M. Auger, and M. McMaster.*
Grant Scholes (Geosyntec Consultants/CANADA)

Enhanced Reductive Dechlorination in Fractured Clayey Till—Challenges and Limitations. *J.C. Chambon, P.J. Binning, M.M. Broholm, C.M. Christiansen, I. Damgaard, G. Lemming, and P.L. Bjerg.*
Julie C. Chambon (Technical University of Denmark/DENMARK)

*** Full-Scale Pneumatic Fracturing to Enhance Soil Vapor and Free Product Recovery at a Large Fuel Release in Low-Permeability Formation.** *S. Chen and C. Hitchens.*
Chester Hitchens (Delta Consultants/USA)

*** In Situ Bioremediation of a Persistent TCE Plume within a Clayey Layer.** *K.D. MacFarlane, D.A. Cacciatore, D.P. Leigh, L.A. Correa, and C.D. Nathe.*
Kim D. MacFarlane (Shaw Environmental, Inc./USA)

*** Interpretation of Progress of In Situ Remediation of TCE-Contaminated Clayey Till by Enhanced Reductive Dechlorination—Monitoring Aspects.** *M.M. Broholm, C. Christiansen, P.L. Bjerg, C. Westergaard, M. Christophersen, and J. Petersen.*
Mette M. Broholm (Technical University of Denmark/DENMARK)

Lessons Learned from Full-Scale Implementation of In Situ Chemical Oxidation in Fractured Bedrock. *J. Konzuk, S. O'Hara, L. MacKinnon, K. Berry-Spark, M. Watling, and E. Cox.*
Julie Konzuk (Geosyntec Consultants/CANADA)

*** Modeling of Tracer Test Data Improves Characterization of Bedrock Fracture System Hydraulics.** *D.S. Lipson and M.J. Gefell.*
David S. Lipson (ARCADIS/USA)

*** Performance of Direct-Push and Hydraulic Fracturing for Enhanced Injection in Clayey Till.** *I. Damgaard, C. Maymann Christiansen, T. Kessler, M. Broholm, P.L. Bjerg, K.E. Klint, B. Nilsson, H. Kern-Jespersen, and C. Bagge Jensen.*
Ida Damgaard (Technical University of Denmark/DENMARK)

*** Pilot Test of In-Well Stripping Technology in Fractured Bedrock.** *M. Eversman and M. Odah.*
Mike Eversman (Environmental Resources Management/USA)

Remedy for PCB DNAPL Seeps in a Fractured Bedrock Creekbed. *K.A. White, M.J. Gefell, and M. Thuman.*
Keith A. White (ARCADIS U.S., Inc./USA)

*** Rethinking LNAPL Mobility and Recoverability in Fractured Rock.** *D.S. Lipson, M.J. Gefell, and E.M. Nichols.*
David S. Lipson (ARCADIS/USA)

Retrospective Reexamination of Two In Situ Chemical Oxidation (ISCO) Remediation Projects in Fractured Bedrock. *W. Brandon.*
William C. Brandon (U.S. EPA/USA)

*** A Transport System for Systematically Reproducing Rebound and Evaluating Remedial Technologies to Remove TCE from Low-Permeability Zones.**
C. Chokejaroenrat, C. Sakulthaew, S.D. Comfort, and Y. Li.
Chanat Chokejaroenrat (University of Nebraska-Lincoln/USA)

*** Water Flood Tracer Study Using Discrete Interval Monitoring.** *C. Beal, K. Rice, S. Pearson, S. Elliott, J. Bouch, E. Tennyson, R. Edwards, and G. Sanchez.*
Christopher Beal (Portage Environmental/USA)

H3. MUNITIONS CONSTITUENT CHARACTERIZATION AND TREATMENT AT AMMUNITION PLANTS, TRAINING RANGES, AND MUNITIONS RESPONSE SITES

Platform Papers Tuesday/Posters (*) Monday Evening
Chairs: Les Clarke (Battelle)
Wilson S. Clayton (Aquifer Solutions, Inc.)

*** Characterization of Munitions Impacts at a Former Island Bomb Target.** *M. Skeeane, T. Roth, R. Clore, J. Nielsen, and J. Myers.*
Michael Skeeane (CH2M HILL/USA)

*** Comprehensive Analysis of RDX Biodegradation in Groundwater Amended with Sodium Acetate at IAAAP.** *M. LePuil, R. Britto, S. Muffler, B. Caldwell, M. Geraghty, R. Arnseth, T. Mattes, J. Livermore, F. Crocker, and K. Indest.*
Michael LePuil (Tetra Tech, Inc./USA)

Demolition of Improved Conventional Munitions (ICMs) Using an Experimental Demolition Enclosure. *M. Fletcher, P. Greene, N. Flaherty, H. Hubbard, M. Crull, T. Crone, and T. Llewellyn.*
Mark Fletcher (ARCADIS/USA)

*** Development of an In Situ Remediation Technology for Energetic Compounds (TNT, RDX, TATP, and Nitrocellulose).** *R. Fidler Albo, T. Legron, C.L. Geiger, and C.A. Clausen.*
Cherie L. Geiger (University of Central Florida/USA)

*** Distribution of RDX and TNT from Composition-B Explosive in Rainfall Runoff.** *R.A. Price, M. Bourne, J. Lindsay, and J. Cole.*
Ellen M. Bourne (U.S. Army Corps of Engineers/USA)

Effects of Prescribed Burns on Reducing Composition-B Residues in Military Training Areas. *R.A. Price, M. Bourne, J. Lindsay, and J. Cole.*
Richard A. Price (U.S. Army Corps of Engineers/USA)

*** Evaluation of Lime Addition, Moisture, and Soil Tilling on TNT Legacy Soil.** *A. Morrow, S. Waisner, and V. Medina.*
Agnes Morrow (U.S. Army ERDC/USA)

*** Fate and Transport of Colloidal Energetic Residues.** *M.E. Fuller, C.E. Schaefer, V. Lazouskaya, Y. Jin, and S. Fallis.*
Mark E. Fuller (Shaw Environmental, Inc./USA)

*** Field-Scale Study of RDX Biodegradation with High-Fructose Corn Syrup at IAAAP.** *M. LePuil, R. Britto, S. Muffler, B. Caldwell, T. Downey, R. Arnseth, J. Biggerstaff, and S. Minkin.*
Michael LePuil (Tetra Tech, Inc./USA)

Full-Scale Alkaline Hydrolysis Treatment of TNT and DNT in Soil. *R. Britto, M. Patel, and M.L. Spangberg.*
Ronnie Britto (Tetra Tech, Inc./USA)

Isolation of Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX)-Utilizing Microorganisms from Groundwater and Activated Sludge. *K.-C. Cho, M. Fuller, P. Hatzinger, and K.-H. Chu.*
Kung-Hui (Bella) Chu (Texas A&M University/USA)

Laboratory Microcosms and Field Injection Test for Enhanced Bioremediation of Perchlorate and RDX in a Fractured Rock Aquifer. *M.M. Lorah, F.E. Gebhardt, J. Fedorowski, W.R. LaCourse, and D. Graves.*
Michelle M. Lorah (U.S. Geological Survey/USA)

*** Microbial Community Responses to In Situ Acetate Amendment of RDX-Contaminated Groundwater.** *J. Livermore, T. Mattes, R. Britto, M. LePuil, S. Muffler, B. Caldwell, M. Geraghty, and R. Arnseth.*
Joshua Livermore (University of Iowa/USA)

Quantitative Metrics to Gage the Effects of an Enhanced Biodegradation Program, Iowa Army Ammunitions Plant, Middletown, Iowa. *M. Geraghty, B. Caldwell, T. Downey, R. Britto, and R. Arnseth.*
Melissa Geraghty (Tetra Tech, Inc./USA)

*** RDX Biodegradation in Groundwater.** *M.E. Fuller, P.B. Hatzinger, C.W. Condee, J. Hawari, K.-H. Chu, and N.C. Sturchio.*
Mark E. Fuller (Shaw Environmental, Inc./USA)

Remediation Challenges and Successes for RDX and TNT in Soil: Field-Scale Biotreatment and Chemical Treatment at IAAAP. *S. Muffler, R. Britto, M. Patel, M. LePuil, and R. Arnseth.*
Steve Muffler (Tetra Tech, Inc./USA)

*** Residential Quality Assurance Approach to MEC Remediation Former Fort Ord, California.** *C. Spill, K. Reimer, M. Houlemard, L. Temple, and J. Swanson.*
Christopher Spill (LFR, Inc., an ARCADIS Company/USA)

*** Statistical Evaluations of Iron and Nitrate Influence on RDX Reduction.** *T. Downey, B. Caldwell, R. Britto, M. Geraghty, and R. Arnseth.*
Tiffany N. Downey (Tetra Tech, Inc./USA)

Strategy for Remediation of Dinitroxyline (DNX) at Munitions-Contaminated Sites. *F. Gao, L. Gui, and R.W. Gillham.*
Fei Gao (University of Waterloo/CANADA)

*** Technology Evaluation and Selection for Removing RDX from a Production Wastewater Stream.** *D.B. Gent, J.L. Johnson, D.R. Felts, S.L. Larson, G. O'Connor, and B. Winstead.*
David B. Gent (U.S. Army Corps of Engineers/USA)

H4. SAMPLING, ANALYSIS, AND REMEDIATION STRATEGIES FOR EDCs, CO₂, AND OTHER EMERGING CONTAMINANTS

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: Robert J. Steffan (Shaw Environmental, Inc.)
Ronald W. Falta (Clemson University)

*** Aerobic Biodegradation of Fluorotelomer Alcohols.** *M. Kim and K.-H. Chu.*
Kung-Hui Chu (Texas A&M University/USA)

Biotransformed Nanoparticles. *W.J. Davis-Hoover, R. Devereux, R.F. Herrmann, J.P. Schubauer-Berigan, and J.E. Rogers.*
Wendy J. Davis-Hoover (U.S. EPA/USA)

*** Comparison of Different Removal Mechanisms of Estrogens during Oxidative Treatment.** *A. Zgajnar Gotvajn, J. Nakrst, J. Zagorc-Koncan, M. Bistan, and T. Tisler.*
Andreja Zgajnar Gotvajn (University of Ljubljana/SLOVENIA)

*** Detection of 1,4-Dioxane by Passive Soil Gas Sampling.** *J.W. Hodny and D. D'Apolito.*
Jay W. Hodny (W.L. Gore & Associates, Inc./USA)

Experimental and Numerical Studies of CO₂-Brine Systems for CO₂ Capture and Sequestration. *M. Krause, J.-C. Perrin, C.-W. Kuo, and S. Benson.*
Michael H. Krause (Stanford University/USA)

Fate and Transport of Dissolved CO₂. *R.W. Falta, J.-C. Perrin, and S.M. Benson.*
Ronald W. Falta (Clemson University/USA)

Identification of Active Triclosan-Degrading Microbial Community in a Triclosan Enrichment Culture. *D.G. Lee and K.-H. Chu.*
Kung-Hui Chu (Texas A&M University/USA)

*** Innovative, Onsite Analysis of 1,4-Dioxane at Regulatory Standard Levels Using Solid-Phase Microextraction and GC/MS.** *M. Rossi, D. Crosby, and S. Pitkin.*
Michael Rossi (Stone Environmental, Inc./USA)

*** LC-MS/MS Analysis of Perfluorinated Alkyl Acids in Drinking Water.** *J. Wang and C. Neslund.*
Chuck J. Neslund (Lancaster Laboratories, Inc./USA)

Sequestration of Carbon Dioxide in Deep Geological Formations. *S.M. Benson.*
Sally M. Benson (Stanford University/USA)

*** Stimulating Cometabolic Oxidation of NDMA, CFCs and Chlorinated Solvents with Benzene, Methane, and Propane.** *J. Weidhaas, R.R. Dupont, and M. Zigmond.*
Jennifer L. Weidhaas (North Wind, Inc./USA)

*** Use of Soil Analytical Data to Estimate In Situ Groundwater Oxygenate Concentrations as a Cost-Saving Measure during Site Investigation Activities.** *F.S. Muramoto, M. Adamski, K. Luka, and D. Baker.*
Frank S. Muramoto (AECOM/USA)

H5. TOXICOLOGY, ASSESSMENT, AND REMEDIATION OF 1,4-DIOXANE

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: Thomas K.G. Mohr (Santa Clara Valley Water District)
Ed Meyers (AECOM)

* **Development of EPA Method 522 for the Analysis of the Solvent Stabilizer 1,4-Dioxane in Drinking Water.** *P.E. Grimmer and J.W. Munch.*
Paul E. Grimmer (U.S. EPA/USA)

* **Evaluating 1,4-Dioxane in Groundwater Using Different Analytical Methods—A Case Study in Brazil.** *J. Camillo, M.C. Spilborghs, S. Avena, and S. Loebmann.*
Juliana Camillo (ERM Brasil/BRAZIL)

* **Evaluation of Natural Attenuation at a 1,4-Dioxane-Contaminated Site.** *D. Chiang, E. Glover, and D. Woodward.*
Dora Sheau-Yun Chiang (AECOM/USA)

In Situ 1,4-Dioxane and VOC Remediation in HVOC Sites. *W.B. Kerfoot.*
William B. Kerfoot (Kerfoot Technologies, Inc./USA)

Innovative Assessment of TCE and 1,4-Dioxane Natural Attenuation in Aerobic Aquifer. *D. Chiang, R. Mora, B. DiGiuseppi, and G. Davis.*
Dora Sheau-Yun Chiang (AECOM/USA)

Laboratory Investigation of Mechanisms for 1,4-Dioxane Destruction by Ozone in Water. *A.L. Sumner and M. Simon.*
Ann L. Sumner (Battelle/USA)

1,4-Dioxane Biodegradation in Arctic Groundwater. *M. Li, S. Fiorenza, J. Chatham, S. Mahendra, and P. Alvarez.*
Shaily Mahendra (University of California/USA)

1,4-Dioxane in Drinking Water: Evaluating Risk. *B. Locey, J.R. Clarkson, L. Yu, L. Sweeney, and S. Sager.*
Betty J. Locey (ARCADIS/USA)

* **Technical Bases for the ART Technologies Success in Treating Petroleum, Chlorinated Compounds and 1,4-Dioxane.** *M. Odah.*
Mohamed Odah (Accelerated Remediation Technologies/USA)

* **Treatment System Optimization Using Advanced Oxidation Processes for 1,4-Dioxane.** *J. Perdicaris, E. Meyers, L. Davies, N. Scroggins, M. Martin, S. Ulbrik, and P. Christenson.*
Jason Perdicaris (AECOM/USA)

* = poster presentation

* **Using 1,4-Dioxane as a Tracer to Demonstrate Discharge of Groundwater to Surface Streams.**

B. Dahlgren, E. Glover, and J. Peterman.
Bryon Dahlgren (AECOM/USA)

H6. REMEDIATION OF MGP SITES

Platform Papers Wednesday/Posters (*) Tuesday Evening

Chairs: Michael J. Gefell (ARCADIS U.S., Inc.)
Bernard H. Kueper (Queen's University)

* **Accelerated Attenuation of PAHs in Groundwater Using Source Containment and Oxygen Injection at an MGP Site.** *M. Levinson.*
Matthew Levinson (GEI Consultants, Inc./USA)

* **The Composition and Properties of FMGP Tars: Relationship to Manufacturing Process and Sample Location.** *S.C. Hauswirth, P. Schultz Birak, D.V. Rognstad, and C.T. Miller.*
Scott C. Hauswirth (University of North Carolina at Chapel Hill/USA)

* **Comprehensive Leachability Evaluation of MGP Soils Following In Situ Stabilization.** *R.G. Schaar.*
Ralph G. Schaar (WRScompass/USA)

* **The Effect of Partial Source Removal on Groundwater Quality at MGP Sites.** *G.R. Brubaker and C. Mixon.*
Gaylen R. Brubaker (AECOM/USA)

* **Groundwater and NAPL Extraction and Treatment System at a Former Manufactured Gas Plant.** *R. Ferree, G. Zellmer, and R. Whiting.*
Robert A. Ferree (ARCADIS/USA)

In Situ Bioremediation of an MGP Site Using Bioaugmentation, Biostimulation, and Hydraulic Control. *R.K. Sillan, P.T. Maher, E. Preast, B. Timmins, and B. Foster.*
Randall K. Sillan (ARCADIS U.S., Inc./USA)

In Situ Geochemical Stabilization (ISGS) for NAPL Management. *J. Mueller, J. Moreno, J. Valkenburg, G. Council, J. Erickson, M. Slenska, and M. Brouman.*
James G. Mueller (Adventus Group/USA)

In Situ Ozone Injection to Treat Dissolved Constituents from a Former MGP Site. *K. Saravanan, M. O'Neil, J. Parillo, J. Mendez, and W. Ryan.*
Matthew O'Neil (GEI Consultants, Inc./USA)

In Situ Thermal Treatment of MGP Waste and Creosote. *R.S. Baker, J.M. Bierschenk, J. LaChance, G. Heron, D. Phelan, and W.R. Leach.*
Ralph S. Baker (TerraTherm, Inc./USA)

*** Injectable Organically Modified Clay—In Situ Treatment Alternative for NAPLs?** *J. Darlington, Z. Wang, and M.J. Gefell.*
Jerry Darlington (CETCO/USA)

Mechanisms of Mobilization of FMGP Tars by Alkaline Flushing. *S.C. Hauswirth, P. Schultz Birak, J.A. Pedit, and C.T. Miller.*
Scott C. Hauswirth (University of North Carolina at Chapel Hill/USA)

*** Mobilization of FMGP Tars Using Alkaline Flushing.** *P. Schultz Birak, S.C. Hauswirth, J.A. Pedit, and C.T. Miller.*
Pamela Schultz Birak (University of North Carolina at Chapel Hill/USA)

*** Organoclay are Useful for Remediation of MGP Sites.** *G.R. Alther.*
George Alther (Biomim, Inc./USA)

*** Passive NAPL Barriers—Design Process and Full-Scale Results at MGP Sites.** *M.J. Gefell and B.H. Kueper.*
Michael J. Gefell (ARCADIS U.S., Inc./USA)

Permeable Reactive Barriers for Groundwater Remediation at Contaminated Former Manufactured Gasworks Plants and Related Sites: Design Features, Performances Achieved, and Outlook. *V. Birke, C. Schuett, L. Vigelahn, H. Burmeier, S. Maenz, I. Schlenges, W.-U. Palm, and W.K.L. Ruck.*
Volker Birke (Ostfalia University/GERMANY)

*** Remediation of Aged FMGP Soil Using Cosolvent Flushing.** *P. Schultz Birak, A.P. Newman, S.R. Richardson, S.C. Hauswirth, J.A. Pedit, and C.T. Miller.*
Pamela Schultz Birak (University of North Carolina at Chapel Hill/USA)

Self-Sustaining Treatment for Active Remediation (STAR): In Situ Field Application for the Treatment of Coal Tar in Soils. *G.P. Grant, D. Major, J.I. Gerhard, J.L. Torero, C. Switzer, and P. Pironi.*
Gavin P. Grant (Geosyntec Consultants/CANADA)

*** Self-Sustaining Treatment for Active Remediation (STAR): Introduction of a New Technique for the Remediation of MGP Sites.** *J.I. Gerhard, J.L. Torero, C. Switzer, P. Pironi, G. Rein, G.P. Grant, and D. Major.*
Jason I. Gerhard (University of Western Ontario/CANADA)

*** Self-Sustaining Treatment for Active Remediation (STAR): Numerical Modelling of a New Technique for the Remediation of MGP Sites.** *S.L. MacPhee, J.I. Gerhard, G. Rein, and P. Pironi.*
Stephanie L. MacPhee (University of Western Ontario/CANADA)

*** Triad Investigation of CHC- and MGP-Related Contaminants in Poland.** *B. Eccarius, U. Desery, and J. Krackiewicz.*
Bernd Eccarius (ERM/GERMANY)

*** Use of Organophilic Clay as an Admix to Cement-Based Solidification/Stabilization at MGP Sites.** *J. Olsta and C. Hornaday.*
James T. Olsta (CETCO/USA)

H7. NAPLs: PLUME CHARACTERIZATION AND REMEDIATION STRATEGIES

Platform Papers Thursday/Posters (*) Wednesday
Chairs: Kurt Herman (Gradient Corporation)
Frank Stolfi (Vironex, Inc.)

*** Anaerobic Biooxidation Associated with Hydrocarbon Releases from Up-Stream Petroleum Production.** *D. Vance and A. Reed.*
David B. Vance (ARCADIS U.S., Inc./USA)

*** Applications of Forensics Techniques in Petroleum Hydrocarbons Site Characterization.** *J. Lu.*
Jun Lu (AECOM/USA)

*** Biodegradation Efficiency of Bacterial Consortium of Newly Isolated Bacterial Strains for the Crude Oil.** *S. Ahmed, Z. Ali Malik, and A. Hameed.*
Safia Ahmed (Quaid-i-Azam University/PAKISTAN)

*** Characterization and Enhanced Aerobic Bioremediation of Vertically Extensive Gasoline, Diesel, and MTBE Plumes.** *K. Schliewen, J.S. Seyfried, E.M. MacLeod, J. Triolo, L. Goldstein, and L. Cover.*
Katrin Schliewen (ARCADIS/USA)

*** Characterization and Risk Assessment of Large Tank Farm Adjacent to Channel Water.** *H. Benfield, K. Johnson, and D. Liu.*
Heather E. Benfield (Tetra Tech, Inc./USA)

*** Characterization of Residual DNAPL within Low-Permeability Soils.** *P. Cross, J. Klingshirn, and D. Baird.*
Paul E. Cross (CDM/USA)

Detailed Longitudinal Transect Assessment of DNAPL Architecture, Dissolution, and Bioremediation at the SABRE Site. *M. Rivett, R. Deardon, G. Wealthall, and P. Zeeb.*

Michael O. Rivett (University of Birmingham/UK)

*** Downgradient Response to Source Treatment at a Site with Complex Lithology and a Mixed DNAPL Source Zone.** *A. Gilmore, S. Chapman, and B. Parker.*

Adam Gilmore (University of Guelph/CANADA)

*** Estimating the Impact of Bioremediation on DNAPL Source Area Longevity.** *M. Harkness, A. Fisher, J. Roberts, S. Dworatzek, M. Lee, P. Zeeb, G. Wealthall, and R. Dearden.*

Mark R. Harkness (GE Global Research/USA)

Field Characterization of Mass Transfer in a NAPL Source Zone. *L. Stewart, M. Widdowson, J. Nyman, R. Deeb, M. Kavanaugh, and J. Mercer.*

Lloyd Stewart (PRAXIS Environmental Technologies, Inc./USA)

*** Field Experiment Quantifies TCE DNAPL Depletion Using Enhanced In Situ Bioremediation.** *P. Zeeb, G. Wealthall, R. Deardon, M. Harkness, M. Rivett, M. Lee, and L. Houlden.*

Peter J. Zeeb (Geosyntec Consultants, Inc./USA)

*** Full-Scale Remediation of LNAPL at a Railyard—A Case Study.** *J. Culp, F. Myerski, M. Zenker, and P. Zottola.*

James Culp (AECOM/USA)

*** Investigation and Characterization of TCE DNAPL at Plume 4-1, Alameda Point, Alameda, California.**

M.M. Yeh, J. McGuire, D.A. Cacciatore, D.P. Leigh, C.E. Schaefer, C.M. Moss, G.P. Brooks, and M.D. Annable.
Michelle M. Yeh (Shaw Environmental & Infrastructure, Inc./USA)

The ITRC's Integrated DNAPL Source Zone Strategy Team. *P.W. Hadley and N. Akladiss.*

Paul W. Hadley (California Dept of Toxic Substances Control/USA)

LNAPL Characterization Using Laser-Induced Fluorescence to Update a Conceptual Site Model.

K.A. Morris, G. Smoot, K. Saum, and C. Hess.
Kevin A. Morris (ERM/USA)

LNAPL Tracer Testing to Measure LNAPL Mobility: Field Results for Two Sites. *B. Koons, J. Smith, C. Divine, and T. Sale.*

Brad W. Koons (ARCADIS/USA)

*** Modeling Plume Longevity Following Partial NAPL Source Remediation.** *M. Widdowson, M. Mobile, L. Stewart, J. Nyman, R. Deeb, M. Kavanaugh, and J. Mercer.*

Mark A. Widdowson (Virginia Polytechnic Inst & State Univ/USA)

*** Occurrence of Overland LNAPL Migration with Subaerial Exposure at a Former Petroleum Refinery.**

B.J. Harding and J.D. Spruit.
Barry J. Harding (AECOM/USA)

*** Real-Time Observation of DNAPL TCE Migration in a Limestone Fracture Using Positron Emission Projection Imaging.** *M. Rivett, N.J. King, R.B. Greswell, D.J. Parker, and X. Fan.*

Michael O. Rivett (University of Birmingham/UK)

*** Refined Field Procedures for Performing LNAPL Bardown Testing.** *A. Kirkman, T. Andrews, and C. York.*

Andrew Kirkman (AECOM/USA)

A Review of Methods and Recent Data for Estimation of Residual NAPL Saturation. *I. Hers and M. Malander.*

Ian Hers (Golder Associates Ltd./CANADA)

Subsurface LNAPL Behavior in a Tidal Zone: A Case Study. *E. Wannamaker, K. Herman, E. Butler, C. Petiot Boyce, and J. Jakubiak.*

Eric Wannamaker (Gradient Corporation/USA)

*** Surface Geophysics for Noninvasive Characterization of Shallow LNAPL and DNAPL.** *B.L. Clark and J. Cloonan.*

Boyce Clark (ARCADIS/USA)

Tiered Approach to Evaluate LNAPL Transmissivity and Prioritize LNAPL Recovery. *A. Kirkman, T. Andrews, C. York, and M. Adamski.*

Andrew Kirkman (AECOM/USA)

*** An Uncertainty-Based Method for Quantifying DNAPL Mass Removal during Enhanced In Situ Bioremediation.**

G. Wealthall, M. Cave, R. Dearden, J. Chambers, P. Zeeb, M. Rivett, and L. Houlden.
Gary P. Wealthall (British Geological Survey/UK)

*** Use of Combined Hydraulic Profiling and High-Resolution Groundwater Profile Sampling to Evaluate DNAPL Presence and Back Diffusion from Low-K Layers.** *S. Pitkin, S. Chapman, and B. Parker.*

Seth Pitkin (Stone Environmental, Inc./USA)

A Weight-of-Evidence Approach to Assess NAPL Mobility. *A. Bittner.*

Andrew Bittner (Gradient Corporation/USA)

H8. ADVANCES IN DETECTION AND REMEDIATION OF PCBs, DIOXINS, AND FURANS

Platform Papers Thursday/Posters (*) Wednesday

Chairs: Michael J. Borda (Golder Associates Inc.)

Scott D. Warner (AMEC Geomatrix)

* Application of a Bimetallic Solvent Paste Technology for PCB Removal from Older Structures on DoD Facilities.

J. Quinn, C. Clausen, C. Geiger, J. Captain, N. Ruiz, S. O'Hara, and T. Krug.

Suzanne O'Hara (Geosyntec Consultants/CANADA)

Biodegradation of PCBs in Contaminated Sediments Using Periodic Amendments of Iron.

A.P. Khodadoust, A.S. Varadhan, D. Bogdan, and R.C. Brenner.

Amid P. Khodadoust (University of Illinois at Chicago/USA)

Comparison of In Situ POM and Ex Situ SPME Methods to Determine Dissolved PCB Concentrations in Sediment Pore Water.

S.B. Hawthorne, D.J. Miller, and C.B. Grabanski.

Steven B. Hawthorne (University of North Dakota/USA)

Implementation of Ozone-Based In Situ Remediation of a PCB-Laden Total Petroleum Hydrocarbon Release.

J.C. Dey, I.A. Khan, and J.M. Mateo.

Jeffrey C. Dey (The Resource Companies/USA)

Implications of Sorption and NAPL in PCB Sediment/Soil Systems.

M. Olson, T. Sale, J. Zimbron, and M. Petersen.

Mitchell Olson (Colorado State University/USA)

Magnesium and Acetic Acid/Ethanol Solution for Degradation of Polychlorinated Biphenyls: From Laboratory Kinetics to Application.

P. Maloney, S. Novaes-Card, E. Saitta, C. Geiger, and C. Clausen.

Simone Novaes-Card (University of Central Florida/USA)

* Methanogenic Potential in Batch Reactors Feed with Askarel.

R.C. Correa, H. Altero, T. Hamamoto, J.S. Hirasawa, M.A. Tallarico Adorno, M.B.A. Varesche.

Regiane C. Correa (University of Sao Paulo/BRAZIL)

* Organic Pollutants (PCBs, PAHs, Dioxins...) Spatial Distributions in Topsoil of France: Analogies and Contrasts.

E. Villanneau, N.P.A. Saby, D. Arrouays, C.C. Jolivet, L. Boulonne, G. Caria, E. Barriuso, A. Bispo, and O. Briand.

Olivier Briand (AFSSET/FRANCE)

* PCB Forensics: Fingerprinting, Finger-Pointing, and a Case for Background Values.

B. Hitchens and S. Williams.

Brian R. Hitchens (Geosyntec Consultants/USA)

Usability of Dioxin Data at Concentrations below the Minimum Level of EPA Method 1613B.

S. Gormley, A. Bernhardt, B. Johnson, M. Hoyt, E. Schaefer, J. Spadaro, and M. Bevier.

Sean F. Gormley (AMEC Earth & Environmental, Inc./USA)

Photo: Monterey County CVB

