

TECHNICAL PRESENTATIONS

Sessions and Panels

The technical program is composed of 63 sessions and 2 panels, which are grouped 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 17, when this listing was compiled. In each entry, 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.

A I. Advances in Source and Solvent Plume Characterization

Platform Papers Monday/Posters (*) Monday Evening

Chairs: James G. Mueller (Adventus Americas Inc.)
Mitchell D. Brouman (Beazer East, Inc.)

* **Application of a Characterization Methodology of DNAPL Contaminant Episodes Based on the Integration of Field and Laboratory Tools.** *D. Puigserver, J.M. Carmona, A. Cortes, M. Arce, J. Barker, M. Vandergriendt, M. Himi, M. Viladevall, X. Font, and L. Rivero*
Diana Puigserver (Universitat de Barcelona/SPAIN)

* **Application of Compound-Specific Isotope Analysis to Identify Chlorinated Ethene Plume Source.**
C. Moore, V. Mankad, P. Sharma, and K. Sorenson
Carolyn Moore (CDM/USA)

Baffles May Allow Effective Multilevel Sampling in Traditional Monitoring Wells. *S. Britt and M. Calabria*
Sanford L. Britt (ProHydro, Inc./USA)

* **Case Study on Characterization of PCE and TCE Impacts in Karst Limestone Aquifer in France.**
D. Nuyens and J. Trub
Jennifer D. Trub (ERM/FRANCE)

* **Effects of the Variation of Select Sampling Parameters on Soil Vapor Sample Concentrations.**
B.A. Schumacher, J.H. Zimmerman, B. Hartman, D.S. Springer, R.J. Elliott, and M.C. Rigby
Brian Schumacher (U.S. EPA/USA)

Electrical Resistivity and Induced Polarization Geophysics for Noninvasive High-Resolution Characterization of DNAPL Distribution.

B.L. Clark, C. Fontenot, and J. Cloonan
Boyce Clark (ARCADIS/USA)

Evaluation of Three DNAPL Field-Screening Test Methods. *Y. Song, K. White, B. Loebner, and K. Gerber*
Ying Song (Earth Tech, Inc./USA)

* **Forensic Investigation of Nitrate Occurrence in Carbon Tetrachloride-Contaminated Groundwater.**
R.W. Lee, V. Malott, and S.R. Silva
Roger W. Lee (ERM, Inc./USA)

* **Groundwater Plume Source and Risk Identification Using Passive Soil Gas.** *J.E. Odencrantz and H. O'Neill*
Joseph E. Odencrantz (Beacon Environmental Services, Inc./USA)

Impact of Historical Well Construction on LNAPL Cleanup Strategy. *M. Stevens and A. Spencer*
Michael W. Stevens (Ash Creek Associates/USA)

* **Impact of TCE Screening Level Reduction on Characterization of Multiple Chlorinated Solvent Plumes.** *J.R. Dickson, R. Stenson, and J.T. Kelley*
James R. Dickson (CTI and Associates, Inc./USA)

Investigation of Carbon Tetrachloride DNAPL at the 216-Z-9 Trench, DOE Hanford Site, Washington.
J. Morse, A. Tortoso, W. Bratton, K. Moser, and R. Holm
Wesley L. Bratton (Vista Engineering Technologies/USA)

Multidisciplinary Characterization of Chloroethene Subsurface Contamination in Sedimentary Bedrock.
J. Machackova, Z. Wittlingerova, S. Trapp, and M. Larsen
Jirina Machackova (Earth Tech CZ/CZECH REPUBLIC)

* **Multiple-Increment TCE Vadose Zone Investigation.**
A.D. Hewitt, S.R. Bigl, and C.A. Ramsey
Alan D. Hewitt (U.S. Army Corps of Engineers/USA)

* **Off-Site Source Identification Using Modified Waterloo Profiler.** *B. Eccarius, U. Desery, G. Demers, and M. Ravella*
Bernd Eccarius (ERM GmbH/GERMANY)

Quantifying DNAPL Compounds in the Subsurface As Affected by Sampling Method and Environmental Conditions. *R.C. Oesterreich, R.L. Siegrist, and M.L. Crimi*
Ryan Christopher Oesterreich (Colorado School of Mines/USA)

* **Stable Isotope Analysis to Determine Groundwater Contamination Source(s).** *D. Goldman, B. Maidrand, J. Gabry, D. Newton, and W. Doctor*
Dennis Goldman (Tetra Tech EC, Inc./USA)

The Use of Collaborative Datasets to Characterize Overburden DNAPL Source Areas. *M. Ravella, R.J. Fiacco, J. D'Agostino, L. Burkhardt, D. Wanty, and S. Sacco*
Michael Ravella (ERM/USA)

* **Use of Hydraulic Profiling Tool to Identify Preferential Pathways for Chloride-Impacted Groundwater Migration.** *J.L. Binder*
Jeffrey L. Binder (Burns & McDonnell Engineering Company/USA)

Use of Passive Flux Meter (PFM) Technology to Refine a Conceptual Site Model for Chlorinated Solvent Nature and Extent Characterization, MCRD Parris Island, South Carolina: A Field Demonstration. *L. Hackett, R. Howe, and Y. Burhan*
Logan Hackett (Tetra Tech, Inc./USA)

* **Using Geochemical Characterization to Determine Sources of Unexpected Organic Contaminants.** *T.N. Downey and J. Zbozinek*
Tiffany N. Downey (GeoTrans, Inc./USA)

A2. Emerging Contaminants

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: William H. DiGuseppi (Earth Tech, Inc.)
Thomas K.G. Mohr (Santa Clara Valley Water District)

* **Bioreactors for Treatment of Dioxane.** *P.J. Evans, I. Lo, R.E. Parales, and J.V. Parales*
Patrick J. Evans (CDM/USA)

* **The Cradle-to-Grave Aspects of POPs, PIEs, and NanoMats.** *R.A. Brown, D. Ritts, and S.C. Peterson*
Richard A. Brown (ERM/USA)

Emerging Contaminants—The New Frontier.

P.J. Yaroschak
Paul J. Yaroschak (Office of the Deputy Under Secretary of Defense/USA)

* **Emerging Contaminants: New Challenges for the Remediation Community.** *R.J. Steffan*
Robert J. Steffan (Shaw Environmental, Inc./USA)

Evaluation of Bioremediation Options for N-Nitrosodimethylamine Using Propane-Oxidizing Bacteria. *P.B. Hatzinger, C. Condee, S. Streger, D. Fournier, and J. Hawari*
Paul B. Hatzinger (Shaw Environmental, Inc./USA)

* **Fate and Transport of Wastewater Indicators During Pond Infiltration.** *J.-F. Debroux, E. Litwiller, and M. Reinhard*
Jean-Francois Debroux (Kennedy/Jenks Consultants/USA)

* **Full-Scale Treatment of 1,4-Dioxane Using a Bioreactor—Progress Report.** *W. Plaehn, T. Shangraw, D. Wilmoth, and S. Richtel*
William A. Plaehn (Parsons/USA)

In Situ 1,4 Dioxane Remediation in HVOC Sites. *W.B. Kerfoot*
William B. Kerfoot (Kerfoot Technologies, Inc./USA)

* **Monitoring of Brominated Flame Retardants (BFRs) in the Czech Republic Environment.** *M. Stavelova, V. Brenner, and J. Hajslova*
Monika Stavelova (Earth Tech CZ/CZECH REPUBLIC)

Occurrence, Fate, and Transport of NDMA in California Groundwater. *P.S. Stanin, S. McCraven, and W. Motzer*
Phyllis Stanin (Todd Engineers/USA)

* **1,4-Dioxane: The Impact of Analytical Method—A Case Study.** *P.J. Linton, J.C. Alonso, and T. Armstrong*
P. James Linton (ARCADIS BBL/USA)

A3. Visualization and Modeling to Assess Solvent Plume Migration

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: R. Joseph Fiacco (ERM)
Arul Ayyaswami (Gannett Fleming, Inc.)

* **Application of the Triad Approach to Characterize a Complex DNAPL Site in Germany.** *B. Muller, U. Desery, R.J. Fiacco, D. Wanty, and S. Sacco*
Beate Muller (ERM GmbH/GERMANY)

* **Challenges for Modeling Groundwater Remediation: Dehalogenation Kinetics of Trichloroethene Vary between Batch and Column Experiments.** *P.J. Haest, D. Springael, and E. Smolders*
Pieter J. Haest (I.W.T. - K.U. Leuven/BELGIUM)

* **Combining Soil Gas Sampling and MIP Investigation to Optimize a Conceptual Site Model.** *P. Valle, P. Dijkshoorn, and J.W. Hodny*
Paulo Valle (ERM Belgium/BELGIUM)

* **Conceptual Model for DNAPL Migration at a MegaSite in South Africa.** *M. Daly, R.J. Fiacco, J. Kotze, J. Smit, and V. Hulley*
Matthew H. Daly (ERM/USA)

Development of a Three-Dimensional Groundwater Flow and Contaminant Transport Model for NASA's Launch Complex 34. *D. Thompson, J. Langenbach, J. White, and M. Deliz*
Donald Thompson (Geosyntec Consultants/USA)

Effective Delineation of Jet Fuel-Contaminated Groundwater Using Background Fluorescence Analysis (BFA). *M.H. Otz, R.C. Sents, J.S. Fox, D.W. Myers, and J. Wells*
Martin H. Otz (ERM/USA)

* **Natural Transport of Volatile Organic Compounds Due to Annual Variation of Soil Temperature.** *T.R. Abbas and R.H. Al-Suhaili*
Talib R. Abbas (University of Baghdad/IRAQ)

Numerical Simulation of Substrate-Limited Degradation: Comparison to Field Data. *F. Mohsen and A. Ayyaswami*
Farrukh Mohsen (Exponent/USA)

* **SVE and Modeling: Insights for NAPL Remediation Beneath a Former Solvent Evaporation Pit.** *J. Stovall, A. Katyal, T. Fox, and L. Deschaine*
Jeff Stovall (BWTX Pantex LLC/USA)

* **TarGOST® Delineation of Coal Tar in Site Soils and River Sediments—Remediation Implications.** *D. Finney, S. Saroff, T. Metcalf, L. Tseng, and K. Goldenberg*
David S. Finney (CH2M HILL/USA)

UTCHEM Model Simulations of Various Treatment Technologies for Chlorobenzenes-DDT-DNAPL. *D. Yaffe*
Denise Yaffe (Earth Tech/USA)

* **Utilization of Background Fluorescence Analysis (BFA) and Fluorescent Dyes to Evaluate Contaminant Distribution and Groundwater Flow.** *J. Mohlin and M.H. Otz*
John Mohlin (ERM/USA)

* **Where Did My Plume Go? Modeling Enhances Plume Delineation Efforts in Fractured Bedrock.** *R.T. Wroblewski, H. He, D. Ighemat, and D. Tomlinson*
Richard T. Wroblewski (ERM/USA)

A4. Recovery or Treatment of DNAPL in Fractured Media

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Kenneth J. Goldstein (Malcolm Pirnie, Inc.)
Grant Anderson (U.S. Army Corps of Engineers)

Activated Persulfate Injection to Treat Chlorinated Solvents within a Fractured Granitic Aquifer. *T. MacHarg, H. Holbrook, G. Tessier, and P. Schiff*
Tara MacHarg (Earth Tech/USA)

* **Case Study of Mixed-Contaminant Plume Characterization in a Fractured Rock Aquifer Environment.** *V. Hulley, J. Smit, and J. Kotze*
Vierah Hulley (Sasol Technology/SOUTH AFRICA)

* **Case Study: Investigation and Remedial Design of TCE-Contaminated Fractured Bedrock.** *C. Malaniak and G. Jamieson*
Charles Malaniak (Tetra Tech EC, Inc./USA)

* **Characterization of Groundwater Flow and Contaminant Distribution in a Fractured Karst Bedrock System.** *M. Singer, K. Dobson, B. McElroy, J. Glasgow, J. Hilliard, and E.F. Davis*
Michael P. Singer (CH2M HILL/USA)

* **Chemical Oxidation of Chloroethenes in Tropically Weathered and Fractured Rock.** *S. Eskes, B. Sciulli, F. Alves, and S. Hart*
Sander Eskes (ERM/BRAZIL)

* **Chromium and TCE Cleanup of a Fractured Bedrock Aquifer in Southern California.** *S.W. Bilodeau*
Sally W. Bilodeau (ENSR/USA)

* **Detailed Characterization of a Fractured Clay Till: Practical Implications for Fracturing as a Remediation-Assisting Technology.** *C. Christiansen, M.M. Broholm, P. Bauer-Gottwein, P.L. Bjerg, C. Riis, A.G. Christensen, S.B. Christensen, K.E.S. Klint, and J.S.A. Wood*
Camilla Christiansen (Technical University of Denmark/DENMARK)

* **DNAPL Dissolution in Fractures and Fracture Networks.** *C. Schaefer, A. Callaghan, J. King, K. Christensen, and J. McCray*
Charles Schaefer (Shaw Environmental, Inc./USA)

Enhanced In Situ Bioremediation Trials for a Mixed Contaminant Plume in a Fractured Rock Aquifer, South Africa. *I.S. Cameron-Clarke, D.M. Duthe, and D. Hunkeler*
Diana M. Duthe (SRK Consulting/SOUTH AFRICA)

* **Enhanced Reductive Dechlorination Using a Vegetable Oil Emulsion in a Fractured Bedrock Aquifer.** *D. Steckler, S.G. Kawchak, and M. Liskowitz*
Steven Kawchak (Shaw Environmental & Infrastructure, Inc./USA)

* **Evaluating Treatment of Chlorinated Compounds in Fractured Bedrock Underlying a Bioreactor.** *B. Vanderglas, C. Beal, R. Edwards, and G. Sanchez*
Brian R. Vanderglas (Parsons Corporation/USA)

Field-Scale TCE Oxidation in Sedimentary Bedrock: Extended Pilot Application Update. *M.J. Gefell, D. Szuch, and E. Kolodziej*
Michael J. Gefell (ARCADIS U.S., Inc./USA)

In Situ Oxidation of TCE Using Permanganate via Blast Fracture Trenches in the Preakness Basalt. *B.A. Blum, M.E. Poland, E.M. Sterzinar, G.M. Fisher, and A.F. McKown*
Brian A. Blum (Langan Engineering & Environmental Services/USA)

Permanganate Remediation of Chlorinated Ethenes in Fractured Shale: Source Zone Characterization and Full-Scale Remediation. *K.J. Goldstein, A.R. Vitolins, D. Navon, S.W. Chapman, B.L. Parker, T.A. Al, and G.A. Anderson*
Andrew R. Vitolins (Malcolm Pirnie, Inc./USA)

Pilot Study Using Emulsified Oil Substrate® in Fractured Granitic Bedrock. *M.A. Boysun, R.H. Mora, S. Grossi, and P. Hallman*
Melissa A. Boysun (Earth Tech, Inc./USA)

Reductive Dechlorination of Chloroform in Fractured Bedrock Aquifer: A Success Story. *B. Dahlgren*
Bryon Dahlgren (Earth Tech/USA)

Reductive Dechlorination of VOCs in Fractured Bedrock Using In Situ Bioaugmentation. *J. Rinehart, B. Hitchens, S. Williams, S. O'Hara, and B. Pulver*
Jessica R. Rinehart (Geosyntec Consultants/USA)

* **Taking Advantage of Leaky Disposal Trenches in Fractured Bedrock.** *K. Rice, G. Sanchez, C. Beal, and R. Edwards*
Ken R. Rice (Parsons/USA)

Testing and Design of a Full-Scale Chemical Oxidation System in Fractured Bedrock. *J. Konzuk, L. MacKinnon, S. O'Hara, E. Hood, and E. Cox*
Julie Konzuk (Geosyntec Consultants/CANADA)

* **Treatability Studies Using EZVI for Dissolved-Phase and DNAPL-Chlorinated Solvents.** *M.D. Lee, R.L. Raymond, S. Fiorenza, and J.W. Schuetz*
Michael D. Lee (Terra Systems, Inc./USA)

A5. Managing Thin Layers of LNAPL

Platform Papers Wednesday/
Posters (*) Tuesday Evening

Chairs: Douglas C. Downey (CH2M HILL)
Stephanie Fiorenza (BP)

Biosparging Using Horizontal Wells at Columbus AFB, Mississippi. *M. Strong, R. Carlisle, and A. Reed*
Mark Strong (CH2M HILL/USA)

Closing Sites with Measurable LNAPL: It Is All about the Risk. *D.W. Tomlinson and W.A. Butler*
Derek W. Tomlinson (ERM/USA)

Determining the Feasibility of LNAPL Free Product Recovery: Strategies, Methods, Practicalities. *P.E. Haas*
Patrick E. Haas (P.E. Haas & Associates, LLC/USA)

* **Elimination of LNAPL Pump-and-Treat Systems at a Former MGP Site in Baltimore, Maryland.** *D.A. Norden, K. Getz, K. Wesselman, J.A. Bourdeau, D.R. Foster, and A. Briggs*
Jacob A. Bourdeau (Key Environmental, Inc./USA)

* **Fast-Track Implementation of an LNAPL Cutoff System under Complex Subsurface Conditions.** *P.R. Petrino*
Patricia R. Petrino (Brown and Caldwell/USA)

* **ISCO Treatment of Residual LNAPLs Using Activated Persulfate and Air Sparging.** *J.P. Siegal, K. Eggers, A.A. Rees, and R. Hobbs*
Joan P. Siegal (Earth Tech, Inc./USA)

Management of a Floating Product Plume beneath Active Residential and Commercial Areas. *J.W. Ratz, W.A. Plaehn, L.G. Lund, R.N. Miller, and P. Madrigal*
John W. Ratz (Parsons/USA)

* **Practical Challenges of Enhanced Hydraulic Recovery of LNAPL.** *S. Garg*
Sanjay Garg (Shell Global Solutions/USA)

* **Source Abatement Using Granular Zero-Valent Iron at a Manufacturing Facility in Michigan.** *C. Petropoulou, B. Bodine, M. DeFlaun, and D. Elliott*
Chriso Petropoulou (Geosyntec Consultants/USA)

* **Two Rapid Enhanced-Flushing NAPL Recovery Methods.** *J.A. Jacobs, L. Nelson, and J. Begley*
James A. Jacobs (Environmental Bio Systems/USA)

Use of LNAPL-Soluble Tracer to Resolve LNAPL Stability. *T. Smith and T. Sale*
Tim Smith (Colorado State University/USA)

A6. Assessment and Remediation of PAH-Contaminated Sites

Platform Papers Wednesday/
Posters (*) Wednesday Afternoon

Chairs: Michael J. Gefell (ARCADIS U.S., Inc.)
Bernard H. Kueper (Queen's University)

* **Assessment of Aerobic Biodegradation Rate of NAPL at a Former Manufactured Gas Plant.** *M.R. Klemmer, R.A. Ferree, K. Wilson, and R.C. Whiting*
Mark R. Klemmer (ARCADIS/USA)

Bioavailability of Residual PAHs in Creosote-Contaminated Soil Following Pilot-Scale Bioremediation. *A. Juhasz, E. Smith, and J. Weber*
Albert L. Juhasz (University of South Australia/AUSTRALIA)

* **Efficacy of Product Removal on the Indicators of Long-Term Success of MNA of PAHs.** *K. Fromme, N. Misquitta, T. Jordan, M.D. Brouman, and M. Slenska*
Karen Fromme (Key Environmental, Inc./USA)

* **Fast-Track Investigation and Ex Situ Bioremediation of Soil Contamination from Wood-Treating Operations.** *L. Thomas, M.J. Borda, P.S. Finn, C. Eng, H.A. Lin, B.S. Johnson, M. Snyder, and K. Henry*
Michael J. Borda (Golder Associates, Inc./USA)

* **Full-Scale Aboveground Treatment of Creosote and PCP NAPLs.** *R. Britto and M. Patel*
Ronnie Britto (Tetra Tech/USA)

Hydraulic Gradient Magnification in NAPL Pools: Implications for MGP NAPL Vertical Mobility. *M.J. Gefell, J. Shi, and B.H. Kueper*
Michael J. Gefell (ARCADIS U.S., Inc./USA)

ISCO Using Activated Persulfate for MGP Sites. *M.C. Marley, J.M. Parikh, B. Smith, and A.J. Coleman*
Michael C. Marley (XDD, LLC/USA)

NAPL Mass Removal at Wood-Treating Sites. *N.J. Misquitta, D.R. Foster, and M.D. Brouman*
Neale J. Misquitta (Key Environmental, Inc./USA)

* **Passive NAPL Barrier Design and Construction.** *M. Carrillo-Sheridan, K. White, T. Blazicek, J. Molina, and C. Ryan*
Margaret Carrillo-Sheridan (ARCADIS BBL/USA)

* **Predicting the Endpoints of PAH Bioremediation Using Bioavailability Assays.** *A. Juhasz, E. Smith, J. Weber, N. Waller, and R. Stewart*
Albert L. Juhasz (University of South Australia/AUSTRALIA)

* **A Unique Cap/MNA Remedy for Wood-Treating Residues Adjacent to the Fraser River.** *M. King, C. Patterson, A. Fowler, M. Tischuk, and S. Karnis*
Mark King (Groundwater Insight, Inc./CANADA)

* **Use of Organophilic Clay for NAPL Remediation at MGP Sites.** *J. Olsta and J. Darlington*
James T. Olsta (CETCO Remediation Technologies/USA)

* **Using Modified Fenton Chemistry to Emulsify and Chemically Destroy Coal Tar.** *M. Durham and D. Cassidy*
Daniel P. Cassidy (Western Michigan University/USA)

A7. Remediation of Recalcitrant Petroleum Hydrocarbons

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: M. Talaat Balba (Conestoga-Rovers & Associates)
Scott Saroff (CH2M HILL)

* **Biodegradation of Heavy Oil Sludge by Amendment Addition and Landfarming.** *T. Balba, S. Dore, D. Pope, J. Smith, and A. Weston*
Sophia Dore (Conestoga-Rovers & Associates/USA)

* **Biopile Pilot Study for Remediation of Soil Containing Creosote Free Product.** *S. Thompson, J. Gliem, B. Hodge, and J. Haselow*
Shanna Thompson (ERM/USA)

* **Bioremediation of Soil Impacted with Weathered Shale Oil.** *T. Balba, S. Dore, D. Pope, J. Smith, and A. Weston*
Sophia Dore (Conestoga-Rovers & Associates/USA)

* **Combination of Physical and Biological Methods in Bulk Terminal Remediation.** *M. Stevens and A. Spencer*
Michael W. Stevens (Ash Creek Associates/USA)

Degradation of PAHs in DNA Soil Washing with a Pure Culture of *Sphingomonas* sp. *R.R. Navarro, H. Ichikawa, Y. Iimura, and K. Tatsumi*
Ronald R. Navarro (National Institute of Advanced Industrial/JAPAN)

Distribution and Bioremediation of PAHs among Different Particle Classes Found in a Contaminated Surface Soil. *J.W. Talley, X. Cui, L.G. Wolfe, and P. Berveiler*
Jeffrey W. Talley (University of Notre Dame/USA)

Fate of Aliphatic, Aromatic, and Polar Petroleum Compounds during Biodegradation and Phytoremediation. *S. Bragg-Flavan, L. Rastegarzadeh, and Y. Nelson*
Sarah Bragg-Flavan (Cal Poly State University/USA)

Humic Acid and Earthworm Effect on the Removal of Weathered Hydrocarbons. *C. Garcia-Diaz, R. Ferrera-Cerrato, H. Poggi-Valardo, and J. Barrera-Cortes*
Josefina Barrera-Cortes (CINVESTAV-IPN/MEXICO)

In Situ Thermal Treatment: Hot Water-Enhanced Viscous DNAPL Recovery. *W.S. Clayton, M. Meyer, and S. Seitz*
Wilson S. Clayton (Aquifer Solutions, Inc./USA)

* **Mathematical Model of Hydrocarbon Bioremoval in Rotating Drum Reactors.** *M.A. Rodriguez-Meza, A.M. Mendoza-Martinez, H.M. Poggi-Varaldo, and J. Barrera-Cortes*
Josefina Barrera-Cortes (CINVESTAV-IPN/MEXICO)

Mechanisms of Natural Attenuation of Weathered Petroleum Compounds at the Groundwater/Wetland Interface. *L. Rastegarzadeh and Y. Nelson*
Laleh Rastegarzadeh (California Polytechnic State University/USA)

* **Monitoring Dual-Pump Remediation of a Crude-Oil Spill Site.** *G. Delin, W. Herkelrath, and S. Lounsbury*
Geoffrey Delin (U.S. Geological Survey/USA)

A Pilot-Scale Study of Magnesium Sulfate-Enhanced Biodegradation of Naphthalene in Groundwater. *S. Thompson, J. Bilkert, J. Gliem, M. Leahy, and J. Haselow*
Shanna Thompson (ERM/USA)

* **Potential of Humic Acids as an Additive for PAH Bioremediation.** *V. Jirku, J. Masak, A. Cejkova, and T. Krulikovska*
Vladimir Jirku (Institute of Chemical Technology (ICT)/CZECH REPUBLIC)

* **Prediction of Bioremediation Results in PAH-Polluted Soils Using Bioavailability Estimation by Supercritical Fluid Extraction.** *T. Cajthaml*
Tomas Cajthaml (Academy of Sciences of the Czech Republic/CZECH REPUBLIC)

* **Process Evaluation for Surfactant Reuse by Selective Adsorption Using Activated Carbon in Soil Washing.** *C.K. Ahn, Y.M. Kim, J.M. Park, and S.H. Woo*
Jong Moon Park (Pohang University of Science & Technology/SOUTH KOREA)

* **Remediation of a Benzene-Contaminated Groundwater Using Sulfate Addition.** *J. Pardue, D. McInnis, D. Cormier, H.-W. Lee, and S. Mbuligwe*
John H. Pardue (Louisiana State University/USA)

* **Study of Permeability of Refined Petroleum Products in Soil.** *Y. Zhang, L. Liu, and J. Hao*
Yiling Zhang (R&D Center of PetroChina Pipeline Company/CHINA)

Treatment of Weathered Oil-Contaminated Soil in Kuwait: Large-Scale Field Demonstration. *R. Al-Daher, N. Al-Awadhi, M.T. Balba, T. Al-Surrayai, H. Al-Mansour, and A. Yateem*
Reyad Al-Daher (Kuwait Institute for Scientific Research/KUWAIT)

A8. MTBE and Other Oxygenates

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: Patrick J. Evans (CDM)
Robert J. Steffan (Shaw Environmental, Inc.)

Anaerobic Remediation Using Nitrate at a Former MTBE Refinery Site. *A.R. Fischer, C. Oehm, M. Selle, and P. Werner*
Axel R. Fischer (Technische Universität Dresden/GERMANY)

Bioaugmentation to Remediate Methyl tert-Butyl Ether (MTBE)-Contaminated Groundwaters: From Lab to Pilot Scale. *L. Bastiaens, Q. Simons, W. Boenne, L. Debor, and J. Gemoets*
Leen Bastiaens (VITO/BELGIUM)

Biodegradation of Ether-Containing Pollutants. *K. McClay, C. Condee, D. Yarger, R.J. Steffan, H. Masuda, and G.J. Zylstra*
Robert J. Steffan (Shaw Environmental, Inc./USA)

* **Biodegradation of Gasoline under Microaerophilic Conditions.** *K. Acuna-Askar, J.N. Martinez-Ochoa, R. Tijerina-Menchaca, M.T. Garza-Gonzalez, H. Rodriguez-Fuentes, G. Buitron, and B. Chavez-Gomez*
Karim Acuna-Askar (Universidad Autonoma de Nuevo Leon/MEXICO)

* **Characterization of MTBE/TBA Degradation by a Bacterial Consortium for Use in Inoculated Bioreactors.** *L. Debor, L. Bastiaens, I. Smets, J. Van Impe, and D. Springael*
Leen Bastiaens (VITO/BELGIUM)

Cometabolic Oxygenate Biodegradation by *Pseudonocardia tetrahydrofuranoxydans* K1. *M. Hyman, C. Smith, J. McKelvie, and B. Sherwood Lollar*
Michael R. Hyman (North Carolina State University/USA)

* **In Situ Bioremediation of a Large Residential Gasohol Release in a Fractured Rock Environment.** *L.L. Hartig and D.S. Woodward*
Leslie L. Hartig (Earth Tech, Inc./USA)

In Situ Remediation of MTBE in a Multilevel Aquifer by Integrating Air Sparging and Groundwater Circulation. *C.B. Drizin, K.P. Hoban, J.A. Hannaleck, and J. Chaney*
Craig B. Drizin (Weber, Hayes & Associates/USA)

* **Microbial Consortium Shifts Induced by Oxygen Amendment at Multiple MTBE and Benzene Sites.** *E. Roberts, G.A. Davis, F.X. Markert, and R. Tabachow*
Eric P. Roberts (Excalibur Group, LLC/USA)

* **Optimizing High-Flow Pulsed Air Sparging for Remediation of MTBE and TBA in the Source Area.**

X. Yang, S. Subramanian, T. Dull, and T. Tunnickliff
Shankar Subramanian (URS Corporation/USA)

* **Rapid Site Characterization Utilizing the Membrane Interface Probe as a Field Screening Tool for MTBE.**

A.D. Melody and R. Rueber
Roland Rueber (SHN Consulting Engineers & Geologists, Inc./USA)

* **Stable Isotope Probing with ¹³C-MTBE- and ¹³C-TBA-Amended Bio-Sep® Beads in Sulfate-Reducing Microcosms.**

J. Busch-Harris, K. Sublette, J.T. Wilson, C. Adair, X. Yang, T. Kuder, P. Philip, G. Davis, D. McElroy, W.E. Holmes, and D. Harris
Kerry L. Sublette (University of Tulsa/USA)

Subsurface Microbial Ecology of MTBE and TBA Biodegradation in a Gasoline-Contaminated Aquifer.

J. Busch-Harris, K. Sublette, K.P. Roberts, C. Landrum, A. Peacock, G. Davis, D. Ogles, W.E. Holmes, C. Ota, and X. Yang
Kerry L. Sublette (University of Tulsa/USA)

Using Carbon and Hydrogen Stable Isotope Analysis to Quantify MTBE/TBA Biodegradation during Air Sparging.

X. Yang, S. Subramanian, T. Kuder, and T. Tunnickliff
Xiaomin Yang (BP America/USA)

BI - Source Area Bioremediation (SABRE) Project

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Peter J. Zeeb (Geosyntec Consultants, Inc.)
Perry L. McCarty (Stanford University)

Advances in DNAPL Source Zone Characterization.

G. Wealthall, M. Lelliott, M. Cave, C. Cheney, M. Rivett, R. White, and P. Zeeb
Gary P. Wealthall (British Geological Survey/UNITED KINGDOM)

* **Alkalinity Requirement for Enhanced Anaerobic TCE Bioremediation.**

C. Robinson, D.A. Barry, I. Kouznetsova, and J.I. Gerhard
Clare E. Robinson (Ecole Polytechnique Federale de Lausanne/SWITZERLAND)

* **Characterizing the Microbial Community in a TCE DNAPL Site: SABRE Microcosm, Column, and Field Studies.** *S. Dworatzek, R.F. Herrmann, T. Dahling, C.M. Acheson, D.W. Major, M. Harkness, M. Lee, and E.E. Mack*
Sandra M. Dworatzek (SiREM/CANADA)

* **Column Simulation of Reductive Dechlorination of TCE Around DNAPL Source Zones.**

M. Harkness, A. Fisher, E.E. Mack, S. Dworatzek, M.D. Lee, C.M. Acheson, J. Gerhard, and B. Sleep
Mark R. Harkness (GE Global Research/USA)

* **Detailed Process Interaction Simulated in TCE DNAPL Bioremediation Column Experiments.**

I. Kouznetsova, J.I. Gerhard, X. Mao, C. Robinson, D.A. Barry, M. Harkness, E.E. Mack, and S. Dworatzek
Irina Kouznetsova (University of Edinburgh/UNITED KINGDOM)

* **Effect of Sulfate on Aqueous-Phase TCE Dechlorination and Electron Donor Utilization in Laboratory Column Studies.**

E.E. Mack, J. Payne, R.C. Landis, C.L. Bartlett, S. Dworatzek, M. Harkness, M.D. Lee, C.M. Acheson, J. Gerhard, and B. Sleep
E. Erin Mack (DuPont/USA)

* **Implications of Secondary Source Zones to Aquifer Remediation.**

M. Lelliott, G. Wealthall, C. Cheney, and R. Wilson
Mike R. Lelliott (British Geological Survey/UNITED KINGDOM)

* **Increasing Confidence in Treatment Performance Assessment Using Geostatistical Methods.**

Z. Cai, R. Wilson, and M. Simon
Michelle A. Simon (U.S. EPA/USA)

Laboratory Column Studies of TCE Dechlorination in DNAPL and Downgradient Plume Zones.

M. Harkness, A. Fisher, E.E. Mack, J. Payne, S. Dworatzek, J. Roberts, M.D. Lee, C.M. Acheson, J. Gerhard, B. Sleep, and P. McCarty
Mark R. Harkness (GE Global Research/USA)

Multiscale Modeling of Enhanced Anaerobic Bioremediation of Trichloroethene.

A. Kokkinaki, B.E. Sleep, C.L. Bartlett, I. Kouznetsova, J.I. Gerhard, X. Mao, C. Robinson, and D.A. Barry
Irina Kouznetsova (University of Edinburgh/UNITED KINGDOM)

Results from the SABRE Field Pilot Test:

Bioremediation of a TCE DNAPL Source Zone. *P. Zeeb, G. Wealthall, M. Lelliott, R. White, M. Rivett, S. Dworatzek, M. Harkness, M. Lee, D. Raymond, D. Ellis, and L. Houlden*
Peter J. Zeeb (Geosyntec Consultants, Inc./USA)

* **Results from the SABRE Field Pilot Test: Multilevel Sampler Network Assessment of Bioremediation.**

M. Rivett, R. White, G. Wealthall, M. Lelliott, P. Zeeb, S. Dworatzek, M. Harkness, M. Lee, D. Raymond, D. Ellis, and L. Houlden
Michael O. Rivett (University of Birmingham/UNITED KINGDOM)

* **Simulation of TCE DNAPL Distribution and TCE Anaerobic Reductive Dechlorination in Soil Columns.**

A. Kokkinaki, B.E. Sleep, C.L. Bartlett, M. Harkness, E.E. Mack, and S. Dworatzek
Amalia Kokkinaki (University of Toronto/CANADA)

System Design for Enhanced Biological Treatment of Chlorinated Solvent DNAPL.

P.L. McCarty

Perry L. McCarty (Stanford University/USA)

* **TCE DNAPL Bioremediation Using Partitioning**

Electron Donors. *J. Roberts, S. Dworatzek, D. Major, E. Hood, M. Harkness, E.E. Mack, M.D. Lee, C.M. Acheson, X. Mao, and B. Sleep*

Jeff D. Roberts (SiREM/CANADA)

B2. Advanced Detection Methods for Bioremediation

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Timothy E. Mattes (The University of Iowa)
Carmen A. Lebron (U.S. Navy)

Advanced Quantitative PCR Techniques for Groundwater Microbial Monitoring.

K.M. Ritalahti, S. Henry Thomas, A. Nevins, and F.E. Loeffler

Kirsti M. Ritalahti (Georgia Institute of Technology/USA)

Application of ¹⁵N Stable Isotope Probing to Identify Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX)-

Degrading Microorganisms. *C.-P. Yu, H. Roh, M. Fuller, and K.-H. Chu*

Kung-Hui (Bella) Chu (Texas A&M University/USA)

* **Application of Stable Isotopes, Fluorinated Analogs and Molecular Biological Tools to Elucidate the Roles of Both Reductive and Dechlorination and Anaerobic Oxidation in cDCE Biodegradation.**

E.C. Hince, E. Sullivan, G. Davis, D. Ogles, A. Peacock, K. Sublette, J. Busch-Harris, and E. Jennings

Eric C. Hince (Geovation Engineering, P.C./USA)

* **Comparative Phylogenetic Microarray Analysis of Microbial Communities in TCE-Contaminated Soils.**

A. Nemir, M.M. David, R. Perrussel, B. Remenant, A. Sapkota, J.-M. Monier, and T.M. Vogel

Maude M. David (Universite de Lyon/France)

* **Demonstrating Monitored Natural Attenuation Using Bio-Trap® Samplers.**

G. Davis, D. Ogles, K. Sublette, B. Pirkle, and P. McLoughlin

Greg Davis (Microbial Insights Inc./USA)

Detection of Dehalogenase Activity in Crude Protein Extracts from 1,2-Dichloroethane-Contaminated

Groundwater. *I. Lyman, R. Reiss, and P. Guerra*

Isis Lyman (New Mexico Tech/USA)

* **Development of a Real-Time PCR Technique to Enumerate Aerobic, VC-Degrading Bacteria in**

Environmental Samples. *Y.O. Jin, T. Mattes, and S. Fogel*
Timothy E. Mattes (The University of Iowa/USA)

From Individuals to Community: Molecular Tools Shed Lights into the Environmentally Relevant Organisms.

P.K.H. Lee, L. Alvarez-Cohen, E.L. Brodie, G.L. Andersen, T.W. Macbeth, K.S. Sorenson, and R.A. Deeb

Patrick Lee (University of California - Berkeley/USA)

* **Metagenomic and Proteomic Approaches to Site Characterization and Monitoring of Chlorinated**

Solvent-Contaminated Aquifers. *R. Reiss and P. Guerra*
Rebecca A. Reiss (New Mexico Institute of Mining & Technology/USA)

* **Microbial Fuel Cell Technology for Bioremediation.**

J.M. Tront, J.D. Fortner, M. Ploetze, J. Hughes, and A. Puzrin

Jacqueline M. Tront (ETH Zurich/SWITZERLAND)

* **A Synoptic Study of Laboratory Probes for Cometabolic Enzymes: Assessing Aerobic Natural**

Attenuation? *M.H. Lee, B.B. Looney, K.M. Vangelas, D. Dettmers, and B.A. Moore*

Brian B. Looney (Savannah River National Laboratory/USA)

B3. Physical, Geochemical, and Microbiological Inhibitors to Bioremediation

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: Rebecca H. Mora (Earth Tech, Inc.)
David W. Major (Geosyntec Consultants)

Application of Bioaugmentation Cultures under Challenging Conditions.

S. Dworatzek, J. Webb, J. Roberts, P. Dennis, and M. McMaster

Sandra M. Dworatzek (SiREM/CANADA)

Bioaugmentation Overcomes Inhibitory Conditions Resulting in Complete TCA and TCE Dechlorination in

Fractured Rock. *C.J. Voci, M.S. Kozar, M. Findlay, and S. Fogel*

Christopher J. Voci (O'Brien and Gere/USA)

Challenges of Bioremediation at Low PCE Levels in an Aerobic Sand Aquifer.

D. Groher, A. Taddeo, S. Wright, and L. McAdams

Art Taddeo (ENSR Corporation/USA)

* **Effect of Bioremediation Amendments on Geochemical Parameters Affecting Anaerobic**

Dechlorination. *T.W. Macbeth, J. Weidhaas, R.R. Dupont, and T. Garvey*

Tamzen W. Macbeth (North Wind, Inc./USA)

The Effects of pH on Enhanced Reductive Dechlorination: Growth vs. Activity. *R.L. Kelley and W. Farone*
Robert L. Kelley (Regenesis/USA)

Evaluating the Geochemical and Microbial Response to ERH and Implications for Bioremediation. *T.W. Macbeth, M.J. Truex, W.S. Blackmore, J.A. Jackson, R. Wilson, and K. Lynch*
Tamzen W. Macbeth (North Wind, Inc./USA)

THE TENTH INTERNATIONAL
**IN SITU
AND ON-SITE
BIOREMEDIATION
SYMPOSIUM**
Baltimore, Maryland
May 5-8, 2009

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 Ninth Bioremediation Symposium (Baltimore, May 2007) brought together 950 international stakeholders, practitioners, and experts from industry, academia, and government. Nearly 500 platform and poster presentations and panel discussions provided an opportunity for in-depth discussions of emerging topics.

The 2009 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 co-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, 2008. Abstracts will be due in summer 2008. The Symposium is sponsored and organized by Battelle.

* **Laboratory Tests to Determine Aquifer pH Neutralization Requirements for Bioremediation.** *P. Dennis, J. Roberts, I. Acheson, S. Dworatzek, and D. Graves*
Philip C. Dennis (SiREM/CANADA)

Lack of Daughter Product Formation during TCE Dechlorination in Groundwater with High Sulfate. *M.C. Morley, M. McDonald, K. Condie, K. Gerber, and C. Sandefur*
Matthew C. Morley (MWH Americas, Inc./USA)

Overcoming Challenges Associated with Whey Powder for Enhanced Bioremediation of TCE. *R.H. Mora, T. MacHarg, J. Gundarlahalli, H. Holbrook, T.W. Macbeth, and P. Schiff*
Rebecca H. Mora (Earth Tech, Inc./USA)

* **Potential Complications from the Injection of Organic Substrate for Enhanced Reductive Dechlorination.** *D. Chiang, G.L. Carter, and D. Woodward*
Dora Sheau-Yun Chiang (Earth Tech, Inc./USA)

Remediation of a Mixed Chlorinated Solvents Source Using a Biodegradable Cosolvent and Bioaugmentation Cultures. *I. Tawney, J. Wang, N. Durant, J. Roberts, S. Dworatzek, T. Etter, and P. Brookner*
Ilisa Tawney (Geosyntec Consultants/USA)

* **Successful Full-Scale Bioremediation of a 500-ppm 1,1,1 TCA Source.** *S.A. Fam, D. Falatko, G. Pon, L.J. Burkhardt, and J. Hone*
Sami A. Fam (Innovative Engineering Solutions, Inc./USA)

B4. Enhanced Bioremediation

Platform Papers Tuesday/Posters (*) Monday Evening
Chairs: Heather V. Rectanus (Battelle)
Gregory J. Smith (Thermal Remediation Services, Inc.)

* **Assessment of Augmented Biostimulation Source Toxicity to Indigenous Rhizobium Cupriavidus taiwanensis.** *B.-Y. Chen*
Bor-Yann Chen (National I-Lan University/TAIWAN)

* **Biologically Enhanced GAC for Treatment of Vinyl Chloride.** *D. Gandhi, P. Bennett, M. Einarson, P. Lacey, and M. Wheeler*
Deepa Gandhi (Geomatrix Consultants, Inc./USA)

* **Bioremediation of HCB and HCBP Using Indigenous Bacteria and Cyclodextrins.** *S.J. Cathum and C.E. Brown*
Shamil J. Cathum (SAIC Canada/CANADA)

* **Characterization of Biodegradable Plastic-Producing Bacterial Strains: Pseudomonas CMG607w.** *N. Jamil, N. Ahmed, D.H. Edwards, and S. Hasnain*
Nazia Jamil (University of the Punjab/PAKISTAN)

* **Combined Remedial Technologies to Facilitate Site**

Cleanup. *G. Frearson and A. Bain*
Guy Frearson (Metcalf & Eddy, Inc./USA)

* **Determination of the Elemental Composition of Molasses and Its Suitability as a Carbon Source for Growth of SRBs.** *D. Teclu, M. Laing, G. Tivchev, and M. Wallis*

Daniel G. Teclu (University of KwaZulu-Natal (PMB)/SOUTH AFRICA)

* **Enhanced Anaerobic Dechlorination in a High-Groundwater Velocity Environment.** *S.A. Fam, D. Falatko, G. Pon, and M. Gaudette*

Sami A. Fam (Innovative Engineering Solutions, Inc./USA)

Enhanced Bioremediation as a Final Step of a Soil and Groundwater Remediation to Reach Site Closure.

G.L. Carter, P. Kareth, and P. Long
Gregory L. Carter (Earth Tech/USA)

* **Enhanced Bioremediation Using Oxygen Infusion at Former Mom-and-Pop Stations.** *F.R. Coll, D.R. Gray, R.A. Moore, and B.A. Carosone*

Frederic R. Coll (URS Corporation/USA)

Enhanced In Situ Bioremediation Utilizing Existing Site Infrastructure. *D.R. Gray, F.R. Coll, R. Fasano, and D. Raymond*

Douglas R. Gray (URS Corporation/USA)

* **Enhancement of the Biodegradation Capacity of *Rhodococcus erythropolis*.** *A. Cejkova, J. Masak, V. Jirku, O. Schreiberova, T. Krulikovska, and M. Patek*

Alena Cejkova (Institute of Chemical Technology (ICT)/CZECH REPUBLIC)

Experience with Enhanced Bioremediation: Observed Half Lives and Their Variation in Time and Space.

J. Moreno, A. Przepiora, T. Bellehumeur, J. Mueller, F. Lakhwala, J. Molin, and J. Valkenburg
Joanna Moreno (Adventus Americas Inc./USA)

Four Case Studies of Enhanced Biodegradation of RDX, TNT, Chlorinated VOCs, and Freon-113 in Similar Geology Using Identical Carbon Amendment.

B. Caldwell, R. Arnseth, R. Britto, and S. Muffler
Brian Caldwell (Tetra Tech, Inc./USA)

Halo-respiration versus Methanogenesis: Effects of Substrate Load and Implications for Source Zone Remediation. *M.J. Dybas, J.W. Sheahan, J.W. Parker, M.J. Barcelona, and E.S. Semkiw*

Michael J. Dybas (Michigan State University/USA)

* **The Impact of Electron Donor Zeta Potential and Hydrophile/Lipophile Balance on Subsurface Distribution.** *B. Kelley, B. Mork, and S.B. Wilson*

Robert L. Kelley (Regenesis/USA)

* **Implementation and Optimization of Full-Scale Bioremediation for Chloroethenes at Naval Weapons Station Seal Beach, Site 40.** *M.E. Losi, H. Hamparsumian, S. Le, and P.-F. Tamashiro*

Mark E. Losi (Tetra Tech EC, Inc./USA)

In Situ Bioremediation Pilot Test Using Laughing Gas as Nutrient Donor. *O. Henseler, K. Schnell, and U. Desery*

Ole Henseler (ERM GmbH/GERMANY)

* **In Situ Biostimulation of a 1,1,1-TCA Plume to Achieve Regulatory Cleanup Levels.** *B. Cote, T. Ladaa, and R. Larkin*

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

* **In Situ Halo-respiration Optimized.** *J.W. Sheahan, J.W. Parker, B.K. Beltman, M.J. Dybas, M.J. Barcelona, and E.S. Semkiw*

Joel W. Parker (Ground Water Solutions, Inc./USA)

Pure versus Complex Electron Donors: Dechlorination Efficiency, Field Implementation, and Economic Advantage. *K. Scherr, J. Grotz, R. Braun, and A.P. Loibner*

Kerstin Scherr (University of Natural Resources and Applied Life Sciences/AUSTRIA)

* **Results of Long-Term Biosparging on Extensive Jet-Fuel Contamination in Sedimentary Bedrock.** *J. Machackova, F. Hercik, S. Proksova, Z. Wittlingerova, and K. Vlk*

Jirina Machackova (Earth Tech CZ/CZECH REPUBLIC)

* **Side-By-Side Field Testing of Molasses and Lactate for Enhanced PCE and PCP Biodegradation.** *J.P. Martin, S. Ramaley, A. Faulkner, J. Namey, F.C. Payne, and J.P. Messier*

Jennifer P. Martin (ARCADIS U.S., Inc./USA)

Stimulated Reductive Dechlorination of 1,1,1-Trichloroethane in Mixed Chlorinated Solvent Contamination in Clayey Till: Integrated Treatability Tests and Field Site Characterization. *M.M. Broholm, C. Scheutz, P.L. Bjerg, N. Tuxen, D. Hunkeler, P. Dennis, N. Durant, H. Kern-Jespersen, and C. Bagge*

Mette M. Broholm (Technical University of Denmark/DENMARK)

Sustainable Bioremediation: Distillers-Dry-Grains-with-Solubles as a Novel Electron Donor for Bioremediation. *K.T. Finneran and J. Popovics*

Kevin T. Finneran (University of Illinois/USA)

- * **Treatment of Chlorinated Ethenes in Low-pH Groundwater with Microscale ZVI and Molasses.** *M.R. Schnobrich, J.P. Martin, K.A. Beil, D.L. Johnston, M.C. McCaughey, and J.M. McKeon*
Jennifer P. Martin (ARCADIS U.S., Inc./USA)
- * **Understanding the Biodegradation of Chloroethenes in the Subsurface Environment.** *S. Jackman, R. Barnes, I. Thompson, and M. Cliff*
Simon A. Jackman (University of Oxford/UNITED KINGDOM)
- * **Using Spent Compost of Mushroom *Pleurotus pulmonarius* to Remove Mixed Pollutants in Sediment.** *T. Gao and S.-W. Chiu*
Ting Gao (The Chinese University of Hong Kong/CHINA)

B5. Bioaugmentation

Platform Papers Wednesday/
Posters (*) Tuesday Evening

Chairs: Lisa Alvarez-Cohen
(University of California-Berkeley)
Joseph Hughes (Georgia Institute of Technology)

- * **Application of a Biocatalyst to the Aerobic Bioremediation of TCE-Impacted Soils.** *W.R. Mahaffey, P.M. Digrazia, T. Kimura, S. Yoneda, C.E. Mickel, and D. Evans*
William R. Mahaffey (Pelorus EnBiotech Corporation/USA)
- Aroclor 1260-Contaminated Soil Shows Potential for Bioaugmentation.** *B.V. Kjellerup, K.R. Sowers, P. Paul, U. Ghosh, and H.D. May*
Birthe V. Kjellerup (University of Maryland Biotechnology Institute/USA)
- * **Assessment of Chemical Reductants for Anaerobic Water Preparation for Use in Bioremediation.** *J. Roberts, K. Morden, S. Dworatzek, E. Hood, and M. McMaster*
Jeff D. Roberts (SiREM/CANADA)
- * **Bench-Scale Treatability Study of TCE and CCl₄ Using Two DHE Cultures.** *P. Chang, C. Aguirre, G. Moss, and A. Klavans*
Christine Aguirre (ERM/USA)
- Bioaugmentation Following Surfactant Flushing for PCE-DNAPL Source Zone Treatment.** *N.L. Capiro, B.K. Amos, K.E. Fletcher, F.E. Loeffler, and K.D. Pennell*
Natalie L. Capiro (Georgia Institute of Technology/USA)
- Bioaugmentation in a Low-Permeability Formation: 3-D Numerical Modeling, Design, and Full-Scale Implementation.** *C. Drummond, K. Watson, R. Bretnall, E. Petrovskis, and M. McMaster*
Chad D. Drummond (HSW Engineering, Inc./USA)

- * **Bioaugmentation of a Mixed Trichloroethene and 1,1,2,2-Tetrachloroethane Site Using the WBC-2 Dechlorinating Culture.** *J. Roberts, S. Dworatzek, D. Graves, D. Nelson, M. Perlmutter, and M. Dobbs*
Jeff D. Roberts (SiREM/CANADA)

Bioaugmentation to Remediate a Combined TCE/TCA Plume in Groundwater. *K.A. Morris and S. Fogel*
Kevin A. Morris (ERM/USA)

- * **Case History of Pilot Study for Bioaugmentation of a TCE Plume.** *J.W. Logan, R.F. Simcik, M.P. Speranza, and M.E. Davidson*
Joseph W. Logan (Tetra Tech NUS, Inc./USA)

- * **Comparison of the Cometabolic Biodegradation of 2,4,6-Trichlorophenol (TCP) in a Packed-Bed Reactor Using Two Different Support Materials.** *F. Javier Romano Baez, L. Leyva Amezcua, A. Salmeron Alcocer, N. Ruiz Ordaz, J. Galindez Mayer, and H. Poggi-Valardo*
Juvenio Galindez Mayer (Instituto Politecnico Nacional/MEXICO)

Comparison of 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)

- * **Comparison of Two Bioaugmentation Cultures for Trichloroethene Reductive Dechlorination in the Presence of Chloroform and Trichloroethane.** *I. Lo, P.J. Evans, R.A. Wymore, K.S. Sorenson, and R.R. Subramanian*
Ian Lo (CDM, Inc./USA)

- * **Enrichment and Application of an Indigenous Dechlorinating Culture for Bioaugmentation in Hawaii.** *D.P. Leigh, T. Ladaa, J. Venuta, T. Lanning, and W. Grannis*
Daniel P. Leigh (Shaw Environmental, Inc./USA)

Full-Scale Bioaugmentation of the Downgradient Portion of a PCE Plume. *J. Gliem, E. Hollifield, J. Frazier, S. Thompson, and J. Haselow*
Jennifer Gliem (ERM/USA)

Implementation and Monitoring of Post-SEAR Bioaugmentation at a TCE Source Area, Hill AFB. *R.R. Dupont, J. Zhou, D. Sorensen, J. Ervin, K. Gorder, C. Holbert, and T. Mehraban*
R. Ryan Dupont (Utah State University/USA)

- * **In Situ Bioaugmentation Strategies Used for the Reduction of Chlorinated Ethenes Using the SDC-9 Dechlorination Culture.** *R.E. Mayer, T.I. Ladaa, D.C. Pohlmann, R. Kurth, J.G. Johnson, and L. Combass*
Robert E. Mayer (Shaw Environmental, Inc./USA)

- * **Microbial Composition Analysis in TCE Biostimulation and Bioaugmentation.** *J. Zhou, R.R. Dupont, J. Ervin, D.L. Sorensen, J.M. Norton, and J.E. McLean*
Jing Zhou (Earth Tech, Inc./USA)

Treatability and Field Pilot Testing of a Broad-Spectrum Dechlorinating Consortium for In Situ Bioremediation. *E.H. Majcher, M.M. Lorah, S. Dworatzek, and D. Graves*
Emily H. Majcher (Geosyntec Consultants/USA)

Treatment of High Concentrations of Chloroform by Bioaugmentation. *H. Shan and D.L. Freedman*
Huifeng Shan (Clemson University/USA)

B6. Phytoremediation

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chair: Erik Dettenmaier (Utah State University)

* **Analytical and Molecular Descriptors for Heavy Metals Decontamination in Poplar.** *C. Rustichelli, G. Visioli, M. Marmiroli, E. Maestri, and N. Marmiroli*
Marta Marmiroli (University of Parma/ITALY)

* **Arsenic Uptake by Poplars and Implications for Use in Hydraulic Control of Groundwater.** *A. Lewis-Russ, R. Henning, E. Hicks, J. Haramut, M. Goan, J. Perkins, and C. Bury*
Anne Lewis-Russ (Earth Tech, Inc./USA)

* **Comparison of Root and Shoot in Metallicolous and Non-Metallicolous Ecotypes of *Thlaspi caerulescens* Growing in Mine Soils of Mibladen and Zaida (Northwest of Morocco).** *S. Berrah El Kheir, A. Bouabdli, and N. Saidi*
Safae Berrah El Kheir (Ibn Tofail University/MOROCCO)

* **Contribution of Endophytic Microorganisms to TCE Degradation in Endogenous Trees at HAFB in Ogden, Utah.** *J. Ervin, R. Winters, W.J. Doucette, R.R. Dupont, and K. Gorder*
Jared Ervin (Utah State University/USA)

* **Effect of Dairy Shed Effluents on Willow Biomass and Elements Composition.** *M. Marmiroli, B. Robinson, B. Clothier, N. Bolan, N. Marmiroli, and R. Schulin*
Marta Marmiroli (University of Parma/ITALY)

Fate Processes in a Pilot-Scale Natural Treatment System for Chlorinated VOCs. *J. Pardue, M. Worthy, F. Symmes, and M. Last*
John H. Pardue (Louisiana State University/USA)

* **A Pilot-Scale Demonstration of a Natural Treatment System for Chlorinated VOCs.** *M. Worthy, J. Pardue, F. Symmes, and M. Last*
Michael Worthy (ENSR/USA)

* **Plant-Influenced Variation of ORP in Soil and the Effect on Perchlorate Bioremediation.** *G.C. Struckhoff and G.F. Parkin*
Garrett C. Struckhoff (University of Iowa/USA)

* **Rapid Site Investigation Using Vegetation Sampling: Novel In Planta Methods.** *J.G. Burken, E. Sheehan, P. Mayer, U. Karlson, and C. Legind*
Joel G. Burken (Missouri University of Science & Technology/USA)

* **Rates of Uptake by Plant Species Selected for Phytoextraction of Arsenic in Northwest Ohio.** *J. Rofkar and D.F. Dwyer*
Jordan Rofkar (The University of Toledo/USA)

Reexamining the Relationship between Plant Uptake of Organic Chemicals and Octanol Water Partition Coefficients. *E. Dettenmaier, W.J. Doucette, B. Bugbee, and A. Hall*
Erik M. Dettenmaier (Utah State University/USA)

* **Removal of Monochlorobenzene and Perchloroethene in Laboratory- and Pilot-Scale Constructed Wetlands.** *M. Braeckevelt, P. Kuschik, H. Paschke, E. Seeger, A. Wiessner, and M. Kastner*
Mareike Braeckevelt (Helmholtz Center for Environmental Research - UFZ/GERMANY)

* **Removal of Trichloroethylene from Shallow Subsurface Environments: Volatilization from Trees and Soil Surface versus Groundwater Interception Trench.** *W. Doucette, R. Winters, K. Gorder, and B. Bugbee*
Rachel Winters (Utah State University/USA)

* **Sampling and Analysis of Cranberries in an Area of Plume Discharge.** *N. Tindall, J. Davis, and P. de Groot*
Nigel Tindall (CH2M HILL/USA)

* **Trichloroethene in Tree-Core Samples Collected at the X-749/X-120 Phytoremediation Area of the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio.** *D.E. Rieske and A.C. Lewis*
David E. Rieske (CDM Federal Services, Inc./USA)

* **200 Weeks Later: Rhizodegradation of Trimethylbenzenes in Soil at a Former Refinery.** *B.J. Harding, J.D. Spruit, and D.P. Cassidy*
Barry J. Harding (Earth Tech/USA)

Photo: Monterey County CVB



B7. Advances in Bioremediation of Chlorinated Solvents

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: James J. Kang (URS Corporation)
Katherine Greene (U.S. Army Corps of Engineers)

* **Adaptation of Aerobic Ethene-Degrading Bacteria to Vinyl Chloride as a Growth Substrate.** *Y.O. Jin and T. Mattes*

Yang Oh Jin (The University of Iowa/USA)

* **Anaerobic Degradation of Chlorinated Ethanes Using Sequencing Batch Reactor.** *S.K. Gupta and S.C. Mali*
Sudhir K. Gupta (Indian Institute of Technology Bombay/INDIA)

Comparison of In Situ Groundwater Bioremediation Technologies at a Dry Cleaner Release Site. *J.P. Kraycik and G.L. Kirkpatrick*

Joseph P. Kraycik (Environmental Standards, Inc./USA)

* **Discontinuing Sucrose Supplementation Did Not Negatively Affect Performance of a Bioreactor Treating a Mixture of 2,4,6-Trichlorophenol and Phenol.** *D. Barcenas-Torres, J. Garcia-Mena, and H.M. Poggi-Varaldo*
Diego Barcenas-Torres (CINVESTAV del IPN/MEXICO)

Drycleaning Solvent Contamination in Florida—An Update. *B. Linn*

Bill Linn (Florida Dept. of Environmental Protection/USA)

* **The Effects of Organic Soils on Attenuation and Treatment of a Trichloroethene Plume in Glacial Sediments.** *B.J. Kappen, B. Meinen, J. Roberts, M. Seaman, and M.C. Leahy*
Brian J. Kappen (ERM, Inc./USA)

Eight Years of Progressive Case Histories Using Aerobic Cometabolism for Degradation of Halogenated Hydrocarbons. *D. Blackert, J. Cibrik, and D. Foster*
Don W. Blackert (KEY Environmental, Inc./USA)

Evaluation of Enhanced In Situ Bioremediation for Chlorinated Solvents and Perchlorate in Groundwater at Edwards AFB. *R. Kohlhardt, T. Battey, and K. Curtis*
Robert Kohlhardt (Earth Tech/USA)

Implications of *cis*-DCE Partitioning on Aqueous-Phase Concentrations within Bioactive DNAPL Source Zones. *S.R. Douglas, C.A. Ramsburg, and J.A. Christ*
Scott R. Douglas (Tufts University/USA)

* **Transformation of 4-Chloroaniline and Aniline in Contaminated Aquifer Sediments and Aquatic Sediments from an Industrial Site.** *Y. Li, W. Huang, and D.E. Fennell*

Yun Li (Rutgers University/USA)

* **Trichloroethene Biodegradation: Sulfate-Reducing Conditions vs. Halo-respiration in Hydrothermal-Vent Sediments.** *R. Alfán-Guzman, L. Rosas-Rocha, and C. Guerrero-Barajas*

Claudia Guerrero-Barajas (UPIBI-Instituto Politecnico Nacional/MEXICO)

B8. Molecular Biological Tools for Remediation

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: Hans F. Stroo (HGL, Inc.)
M. Hope Lee (North Wind, Inc.)

Application of Nucleic Acid-Based Tools for Monitoring Bioremediation at Chlorinated Solvent Sites. *C. Lebron, E. Petrovskis, F. Loeffler, K. Ritalahti, and K. Henn*
Erik A. Petrovskis (Geosyntec Consultants/USA)

* **Applying Advanced Diagnostics to Site Management, Assessment and Closure.** *S. Koenigsberg, J. Simon, D. Sarr, S. Haitz, and M. Burns*
Stephen S. Koenigsberg (WSP Environmental Strategies/USA)

* **Applying Environmental Biotechnology Tools to a VCUP Program for the Remediation of a Mixed Chlorinated Solvent Plume.** *W.R. Mahaffey, V.E. Barlock, P.M. Digrazia, D. Wanty, and M. Miller*
William R. Mahaffey (Pelorus EnBiotech Corporation/USA)

* **Association between *Dehalococcoides* spp. Concentrations and Other Site Parameters.** *G. Davis and D. Ogles*
Greg Davis (Microbial Insights Inc./USA)

BioReD: Biomarkers and Tools for Reductive Dechlorination Site Assessment, Monitoring, and Management. *F. Loeffler, K. Ritalahti, E. Edwards, N. Lee, and C. Lebron*
Frank E. Loeffler (Georgia Institute of Technology/USA)

* **Exploring the Correlation between Halo-respirer Biomarker Concentrations and TCE Dechlorination Rates.** *M.L.B. Da Silva and P.J.J. Alvarez*
Marcio L.B. Da Silva (Rice University/USA)

* **Genome-Enabled Studies for Management Strategies in Bioremediation of PAHs by Soil Mycobacteria.**

C.D. Miller, C. Zhang, Y. Liang, R. Child, R.C. Sims, and A.J. Anderson

Anne J. Anderson (Utah State University/USA)

* **Molecular Biology of Microbial Communities from Contaminated Aquifers in the Czech Republic.**

M.V. Brennerova, A. Benakova, V. Libova, J. Josefiova, M. Praveckova, M. Stavelova, J. Machackova, and V. Brenner
Maria V. Brennerova (Institute of Microbiology/CZECH REPUBLIC)

Molecular Biology-Based Strategy for Site Remediation. *M.M. David, P. Simonet, and T.M. Vogel*
Maude M. David (Universite de Lyon/France)

* **Molecular Tools and Their Utility: The Good, the Bad, and the Ugly.** *J. Weidhaas, T.W. Macbeth, and M.H. Lee*
Jennifer Weidhaas (North Wind, Inc./USA)

Molecular Tools Provide New Genomic and Transcriptomic Insights into *Dehalococcoides* spp.
D.R. Johnson, K.A. West, and L. Alvarez-Cohen
Lisa Alvarez-Cohen (University of California/USA)

Perchlorate-Reducing Gene Targets for Bioremediation Applications. *S.K. De Long, M.J. Kirisits, and K.A. Kinney*
Susan De Long (University of Texas at Austin/USA)

Potential to Use Stable Isotopes to Differentiate Biotic/Abiotic Degradation. *B. Sherwood Lollar, N. VanStone, G. Lacrampe-Couloume, S. Mabury, and M. Elsner*
Barbara Sherwood Lollar (University of Toronto/CANADA)

* **Reductive Dechlorination of Tetrachloroethene to *trans*- and *cis*-1,2-Dichloroethenes by *Dehalococcoides* species.** *D. Cheng, W.L. Chow, and J. He*
Jianzhong He (National University of Singapore/SINGAPORE)

Spatial and Temporal Quantification of Multiple *Dehalococcoides* Strains throughout the Stages of Reductive TCE Dechlorination. *J.A. McElhoe and R.A. Brennan*
Jennifer A. McElhoe (The Pennsylvania State University/USA)

* **Standardized Procedures for Use of Nucleic Acid-Based Tools for Microbial Monitoring.** *C. LeBron, D. Major, M. Duhamel, P. Dennis, F. Loeffler, E. Edwards, E. Petrovskis, and C. Acheson*
David W. Major (Geosyntec Consultants/CANADA)

* **Summit on Biogeochemical Processes in the Degradation of Chlorinated Solvents.** *E.S.K. Becvar, C. Lebron, J. Wilson, A. Leeson, R. Miller, H. Stroo, R. Wymore, and P. Evans*
Erica S.K. Becvar (U.S. Air Force/USA)

* **Visualization of Subsurface Bacteria Using Fluorescence In Situ Hybridization Tools—Potential and Limits.** *N.M. Lee, M. Pavlekovic K. Hauer, H. Sun, D. Meisinger, F.E. Loeffler, B. Amos, K. Fletcher, K. Ritalahti, S. Spring, I. Nijenhuis, H.H. Richnow, E. Edwards, and C. Lebron*
Natuschka M. Lee (Technical University Munich/GERMANY)

CI - Barriers to VOC Vapor Intrusion into Buildings

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Jeffrey F. Ludlow (Treadwell & Rollo, Inc.)
Bart Eklund (URS Corporation)

* **Approaches for High-Tier Assessments on Vapor Intrusion.** *E. Nixon and C. Shan*
Elizabeth A. Nixon (Northgate Environmental Management, Inc./USA)

Brownfield Vapor Barriers: Chemical Compatibility, Testing, and Advancements in Materials Science.
S. Wilson and B. Mork
Scott Wilson (Regenesis/USA)

* **Canisters versus Sorbent Tubes: Vapor Intrusion Test Method Comparison.** *J.E. Odencrantz and H. O'Neill*
Joseph E. Odencrantz (Beacon Environmental Services, Inc./USA)

Case Studies for Mitigation of Vapor Intrusion.
J.C. Trask and R.L. Studebaker
Jennine Trask (ARCADIS/USA)

* **Case Study: Triad Used to Conduct Vapor Intrusion Assessments at Active Military Installations.** *S. Moore, K. Lynch, T. Bussey, M. Connally, B. Hartman, and M. Truex*
Sheri Moore (U.S. Army Corps of Engineers/USA)

* **Chlorinated Solvent Remediation for Residential Development of Oil Waste Disposal Facility.**
C.E. Robinson, J. Manning, M. Schuetz, R. Ahlers, and K. Lim
Charles E. Robinson (LFR Inc./USA)

Engineered Controls to Prevent VOC-Vapor Intrusion into Structures and Residual Impacts by Contaminated Building Materials: Two Case Studies. *M.T. Jordan, S.G. Watkins, and N.V. Shetty*
Michael T. Jordan (ENSR Corporation/USA)

Estimating VOC Emissions from Vapor Management Systems for Air District Permit Exemption. *S. Reinis and J.F. Ludlow*
Sigrida Reinis (Treadwell & Rollo, Inc./USA)

* **Estimation of Vapor Migration Rates to the Interior of Buildings.** *G. Tofani*
Glenn Tofani (GeoKinetics/USA)

Evaluation of Vapor Intrusion Impacts Using Induced Building Depressurization. *T.E. McHugh, T.N. Nickels, S. Brock, and K. Gorder*
Thomas E. McHugh (GSI Environmental/USA)

Everything You Knew about Methane Action Levels Was Wrong. *H. Avery and J. Sepich*
John Sepich (Brownfield Subslab, LLC/USA)

* **Importance of ZVI Curtain in Preventing Vapor Intrusion.** *R. Rolon, M. Higgins, P. Juriasingani, S. Downes, and M. Kershner*
Roberto Rolon (Tetra Tech, Inc./USA)

* **Incorporating Engineered Controls into Vapor Intrusion Evaluations.** *A. Goldberg Day and W. Carson*
Amy E. Goldberg Day (LFR, Inc./USA)

Installation and Monitoring of a VOC Vapor Mitigation System. *T.M. Kinney, D. Gatrell, and S. Robinson*
Thomas M. Kinney (Conestoga-Rovers & Associates, Inc./USA)

* **New Analytical Tools for Vapor Intrusion Assessments: On-Site TO-15 and Automated Analyzers.** *B. Hartman, J.E. Picker, and J.D. Villarreal*
Blayne Hartman (H&P Mobile Geochemistry/USA)

* **A New Model for Transient Soil Vapor Intrusion.** *C. Shan and E. Nixon*
Chao Shan (Northgate Environmental Management, Inc./USA)

Practical Considerations in the Design of Barriers to Indoor Vapor Intrusion. *J. Otter and H. Van Den Berg*
Jeff Otter (ENSR/USA)

* **Prevention of Off-Site VOC Vapor Intrusion through On-Site Soil Vapor Extraction.** *M. Mehran, D. Hogshead, B. Rogers, and G. Sylvester*
Mohsen Mehran (Rubicon Engineering Corporation/USA)

* **Recommendations on Soil Gas Sampling and Analysis for Vapor Intrusion Assessments.** *D.C. DiGiulio, B. Hartman, and D.W. Grosse*
Dominic C. DiGiulio (U.S. EPA/USA)

* **Remediation Due to Indoor Air Climate Risks—Is the Basis for Remedial Action Correct?** *J. Alroe Steen, T.F. Chemnitz, S.G. Nielsen, T. Heron, C. Andersen, S.A.V. Nielsen, A. Riiber Hoj, and B. Hvidberg*
Jesper Alroe Steen (NIRAS/DENMARK)

A Tiered Approach to Designing Vapor Management Systems at a Building Complex with Spatially Different TCE Concentrations in Soil Gas. *R. Arulanantham, C.M. Mok, J.F. Ludlow, and S. Reinis*
Ravi Arulanantham (Geomatrix Consultants/USA)

* **Unprecedented RI/FS on Vapor Intrusion at a Superfund Site to Address Commercial and Residential Settings.** *E.H. Haddad*
Elie H. Haddad (Locus Technologies/USA)

C2. Biobarriers

Platform Papers Tuesday/Posters (*) Monday Evening
Chairs: Travis Williamson (Battelle)
Bruce M. Henry (Parsons)

Biobarrier for High Concentrations of Ketones, Alcohols, and VOCs. *S.A. Fam, D. Falatko, G. Pon, and M. Gaudette*
Sami A. Fam (Innovative Engineering Solutions, Inc./USA)

* **Case Studies: Closing Solvent Sites Using Activated Carbon Impregnated with Iron.** *T.A. Harp*
Thomas A. Harp (LT Environmental, Inc./USA)

* **Changes of Groundwater NOM during Treatment in Permeable Reactive Barrier.** *A.S. Ruhl, D. Titze, M. Steiof, and M. Jekel*
Aki S. Ruhl (Technische Universität Berlin/GERMANY)

Enhanced Biodegradation Following 12 Years of Pump-and-Treat. *L. Lehmicke, J. Schwall, M. Palmer, and E. Modiano*
Leo G. Lehmicke (Hargis + Associates, Inc./USA)

* **Evaluation of Dairy Whey as a Complex Electron Donor Material for Enhanced TCE Biodegradation.** *E.S. Semkiw and M.J. Barcelona*
Elizabeth Semkiw (Western Michigan University/USA)

* **Evaluation of Support Matrices for Immobilisation of Sulphate-Reducing Bacteria (SRB).** *D. Teclu, M. Laing, G. Tivchev, and M. Wallis*
Daniel G. Teclu (University of KwaZulu-Natal (PMB)/SOUTH AFRICA)

Full-Scale Application of a Mulch Biowall to Treat Perchlorate in Groundwater. *K.A. Morris*
Kevin A. Morris (ERM/USA)

* **Groundwater Treatment behind a DNAPL Cut-Off Wall to Prevent an Immediate Threat to Surface Water.** *F.W. Blickle, G. Hotchkiss, B. Landale, and K.A. Richards*
Frederick W. Blickle (Conestoga Rovers & Associates, Inc./USA)

C3. Advances in Permeable Barrier Construction and Materials

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Ronnie Britto (Tetra Tech)
J. Hhan Olsen (MWH Americas, Inc.)

* **Bibliometric Analysis of the IronRefs Database: Status and Trends in Published Research on Remediation Applications of Zero-Valent Metals.** *R.L. Schneider, J. Lou, and P.G. Tratnyek*
Paul G. Tratnyek (Oregon Health & Science University/USA)

* **Design of Multifunctional Permeable Reactive Barriers (Multibarriers) for Treatment of Mixed Contamination Plumes: Two Cases.** *L. Bastiaens, T. Van Nooten, Q. Simons, and L. Diels*
Leen Bastiaens (VITO/BELGIUM)

A Dual Permeable Reactive Barrier System for Treating TCE and Perchlorate: Performance Evaluation from Laboratory to the Field. *S.D. Warner, Y. Hashimoto, D. Gandhi, P. Bennett, F. Szerdy, S. Neville, C. Fennessy, K. Scow, and M. Nozawa-Inoue*
Scott D. Warner (Geomatrix Consultants, Inc./USA)

Electrolytic Reactive Barriers (e-Barriers) for Treatment of Energetic Compounds in Groundwater. *D. Gilbert, T. Sale, and M. Petersen*
Dave Gilbert (Colorado State University/USA)

* **Evaluation of Prealloyed Zero-Valent Iron to Enhance Reactivity of TCE and Vinyl Chloride.** *J. Hamill and J. Liskowitz*
Jack Hamill (Hepure Technologies, Inc./USA)

Installation of a ZVI PRB Using an Innovative Jetting Technique. *D. Nelson, M. Perlmutter, and M. Dobbs*
David Nelson (CH2M HILL/USA)

Interaction of FeS PRBs and Carbonate: Implications for PRB Longevity. *A.D. Henderson and A.H. Demond*
Andrew D. Henderson (University of Michigan/USA)

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

* **Microcosm Study of Chlorinated Solvent Degradation by Synthetic Green Rust Minerals.** *C. Su and R.T. Wilkin*
Chunming Su (U.S. EPA/USA)

* **Micron-Scale Zero-Valent Iron to Remediate Chlorinated Aliphatic Hydrocarbons.** *N. Shetty, A. Keskar, B.W. Diepeveen, M.J. Gerdenich, and M.R. Torgerson*
Nanjun V. Shetty (ENSR Corporation/USA)



Photo: Monterey County CVB

In Situ Reductive Immobilization of Dissolved Metals Using Iron and Organic Substrate. *A. Przepiora, D. Hill, and A. Seech*
Andrzej Przepiora (The Adventus Group/CANADA)

* **Long-Term Change of Enhanced Natural Attenuation Effect by Biobarrier.** *M. Nakashima*
Makoto Nakashima (Kokusai Kogyo Co. Ltd./JAPAN)

Long-Term Performance of a PRB to Treat Arsenic, Boron, Chromium, and Selenium. *R. McGregor and D. Blowes*
Rick McGregor (Vertex Environmental Solutions, Inc./CANADA)

Organic Content Biowalls for Chlorinated Solvent Groundwater Remediation. *M.S. Leeper*
Mark Leeper (Defense Logistics Agency/USA)

Performance and Longevity of Mulch Biowalls for Remediation of Chlorinated Solvents in Groundwater. *B.M. Henry, D.R. Griffiths, E.S.K. Becvar, and J.R. Gonzales*
Bruce M. Henry (Parsons/USA)

* **Protocol for Enhanced Anaerobic Bioremediation of Chlorinated Solvents Using Permeable Mulch Biowalls.** *E.S.K. Becvar, J.R. Gonzales, B.M. Henry, D.R. Griffiths, and J.R. Hicks*
Erica S.K. Becvar (U.S. Air Force/USA)

Rejuvenation of Biowalls Used to Treat Perchlorate in Groundwater. *M. Perlmutter, T. Beisel, and M. Craig*
Michael W. Perlmutter (CH2M HILL/USA)

* **Sediment Biobarriers for Chlorinated Aliphatic Hydrocarbons in Groundwater Reaching Surface Water.** *K. Hamonts, M. Maesen, A. Ryngaert, J. Vos, J. Bronders, W. Dejonghe, J. Dijk, D. Springael, M. Sturme, H. Smidt, J. Kuklik, P. Kozubek, T. Kuhn, R. Meckenstock, H. Kalka, and N.-H. Peters*
Winnie Dejonghe (VITO/BELGIUM)

* **Site-Wide Approach to Remediate a TCE Groundwater Plume Using Biobarriers and Biozones.** *D.R. Beck, M.S. Kovacich, M. Noel, M. Zack, and M. Canaert*
David R. Beck (GeoTrans, Inc./USA)

* **Perchlorate Bioremediation and Process Modeling Using an In Situ Fe(0) Permeable Reactive Barrier.** *M.R. London, L.E. Katz, and G.E. Speitel*
Mara R. London (University of Texas at Austin/USA)

Performance Assessment of a Pilot-Scale ZVI PRB Installed with Hydraulic Fracturing. *S. Fiorenza and K. Christie*
Stephanie Fiorenza (BP/USA)

Performance Evaluation of Two Funnel-and-Gate Systems Installed to Treat PCB- and Zinc-Impacted Groundwater. *F.W. Blickle and K. Richards*
Frederick W. Blickle (Conestoga Rovers & Associates, Inc./USA)

Permeable Reactive Barrier Design Evaluation. *R.L. Hauger and H. Van Den Berg*
Roy Hauger (ENSR/USA)

* **PRB Installation Using Direct-Push Techniques to Guide Placement.** *D. Nelson, C. Mowder, J. Cherry, T. Llewellyn, M. Kladias, D. Cabellero, K. Menken, and S. Burnell*
Carol S. Mowder (ARCADIS/USA)

Reductive Dechlorination of 1,2-Dichloroethane in a Reactive Iron Barrier. *J. Stening, A. Przepiora, and J. Vogan*
James Stening (Orica Australia Pty Ltd./AUSTRALIA)

* **Study on PRB with Zero Iron and Zeolite for Cleanup of 2,4-DCP.** *K. Zhu and H.-L. Ning*
Kun Zhu (Lanzhou Jiaotong University/CHINA)

* **Transformation of Chlorobenzene by Pyrite under Aerobic Condition.** *P.T. Hoa, J. Hara, K. Suto, and C. Inoue*
Pham Thi Hoa (Tohoku University/JAPAN)

* **Treatment of Carbon Disulphide by Use of a Permeable Reactive Barrier.** *G. Boshoff, S. Buss, P. Morgan, and R. Thurgood*
Stephen Buss (ESI Ltd./UNITED KINGDOM)

* **Use of CPT/MIP Data to Optimize Remedial Design of a Zero-Valent Iron Permeable Reactive Barrier.** *B. Bjorklund, J. Warner, A. Chemburkar, K. Lake, J. Moe, and J. Ortman*
Brian Bjorklund (ERM/USA)

* **Using a Flux-Based Approach to Evaluate the Treatment Efficiency of a Permeable Reactive Barrier.** *N. Muchitsch, M.P. Jensen, and P. Kjeldsen*
Peter Kjeldsen (Technical University of Denmark/DENMARK)

C4. Nanoscale ZVI

Platform Papers Wednesday/
Posters (*) Tuesday Evening

Chairs: Sandip Chattopadhyay (Tetra Tech EMI)
Wei-Xian Zhang (Lehigh University)

Aging of Iron Nanoparticles in Water: Effects on Structure and Reactivity. *P.G. Tratnyek, V. Sarathy, J.T. Nurmi, D.R. Baer, J.E. Amonette, C. Chun, R.L. Penn, and E.J. Reardon*
Paul G. Tratnyek (Oregon Health & Science University/USA)

Amended nZVI Injection for Chloroethenes Remediation. *D.W. Elliott, C.A. Doughty, S.R. Drew, C.R. Elder, and W.-X. Zhang*
Cynthia A. Doughty (Geosyntec Consultants/USA)

Chemistry of nZVI. *W.-X. Zhang*
Wei-Xian Zhang (Lehigh University/USA)

* **Degradation of 2,4,6-Trinitrotoluene with Nanoscale Zero-Valent Iron: Kinetics and Reduction Intermediates.** *R. Welch and R.G. Riefler*
Regan Welch (Brown and Caldwell/USA)

Effect of Nanoparticle Aggregation, Polydispersity, and Concentration on Transport of Surface-Modified NZVI in Saturated Porous Media. *G.V. Lowry, T. Phenrat, F. Fagerlund, H.-J. Kim, T. Illangsekare, and R.D. Tilton*
Gregory V. Lowry (Carnegie Mellon University/USA)

* **Effect of Nanoscale Zero-Valent Iron Treatment on the Characteristics of a DNAPL Source Zone in Sandy Soils.** *F. Fagerlund, T. Illangsekare, B. Snacken, T. Phenrat, H.-J. Kim, and G.V. Lowry*
Gregory V. Lowry (Carnegie Mellon University/USA)

Environmental Application of Nanotechnology and Challenges. *S. Chattopadhyay*
Sandip Chattopadhyay (Tetra Tech EMI/USA)

A Field Study of In Situ Nanoscale ZVI Treatment for Vinyl Chloride and 1,2-Dichloroethane. *Y.-T. Wei, S.-C. Wu, C.-H. Che, H.-L. Lien, D.-H. Huang, and M.-L. Chang*
Yu-ting Wei (National Taiwan University/TAIWAN)

Implementation of a Nanoscale Zero-Valent Iron-Reactive Zone for the Treatment of TCE in a Deep Aquifer, Quebec City, Canada. *S. Hains, D. Millette, C. Gosselin, M. Barbeau, and A. Boutin*
Sylvain Hains (Golder Associates Ltd./CANADA)

* **A Novel Method for Uniform Delivery of nZVI into Heterogeneous and Low-Permeability Media.** *D. Thomas, K. Mackenzie, and D. Reynolds*
David G. Thomas (Golder Associates Pty. Ltd./AUSTRALIA)

* **NZVI Treatability Study for a TCE Source Area at Alameda Point, CA.** *G.V. Lowry, T. Phenrat, D. Schoenfelder, M. Losi, J. Yi, and S.A. Peck*
Gregory V. Lowry (Carnegie Mellon University/USA)

* **Pilot-Scale Chemical Reduction of Chlorinated Compounds Using an Injectable Nanoscale Metallic Reductant.** *P.R. Chang*
Paula R. Chang (ERM, Inc./USA)

Reactivity of Newly Synthesized Nanoscale ZVI for Perchlorate Degradation. *K.C.K. Lai, L.E. Katz, H.M. Liljestrand, and M.R. London*
Keith C.K. Lai (The University of Texas at Austin/USA)

* **Remediation of Trichloroethylene by Nanosized Pd/Fe Slurry and Electrokinetics.** *G.C.C. Yang and D.-G. Chang*
Gordon C.C. Yang (National Sun Yat-Sen University/TAIWAN)

* **Selection, Design, and Construction of Nanoscale ZVI Permeable Reactive Barrier in Loess and Till.** *C.L. Kiker, W.J. Griswold, and W.C. Hardison*
Wayne C. Hardison (Haley & Aldrich/USA)

* **Synthesis of Fe-Nano Particles Obtained by Borohydride Reduction with Solvent.** *J.-M. Lee, J.-H. Kim, J.-W. Lee, Y.-S. Chang, and P.G. Tratnyek*
Yoon-seok Chang (POSTECH/SOUTH KOREA)

Transport and Reactivity of Lactate-Modified RNIP in Subsurface Soil. *K.R. Reddy, A.P. Khodadoust, and K. Darko-Kagya*
Krishna R. Reddy (University of Illinois at Chicago/USA)

C5. Advances in Thermal Remediation Technologies

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: Tamzen W. Macbeth (North Wind, Inc.)
Ralph S. Baker (TerraTherm, Inc.)

* **Electrical Resistance Heating for DNAPL Removal at Three Plumes.** *S.A. Peck, D.A. Cacciatore, and J. McGuire*
David A. Cacciatore (Shaw Environmental, Inc./USA)

* **In Situ Electrothermal Remediation of Chlorinated VOCs: Full-Scale Evaluation.** *M.M. Mejac, K.L. Brehm, J.M. Tarvin, and B.C.W. McGee*
Mark M. Mejac (STS/AECOM/USA)

* **In Situ Steam-Enhanced Extraction (SEE) for CVOC Removal and NAPL Recovery.** *K.D. Dyson, P.J. Palko, and G. Heron*
Kevin D. Dyson (Panther Technologies, Inc./USA)

In Situ Thermal Remediation at Sub-Boiling Temperatures. *R. Johnson*
Richard L. Johnson (Oregon Health & Science University/USA)

In Situ Thermal Remediation of LNAPL at a Former Bulk Fuel Terminal. *D.R. Malone, C. Kalinowski, C. Itin, M. Bennett, R. Field, J. Darby, B. Winder, M.A. Parcher, W. Benni, and R. Shoemaker*
Donald R. Malone (ARCADIS/USA)

* **Low-Temperature Hydrolysis of Halogenated Fumigants.** *M. Niemet, G. Hickman, and P. Seday*
Michael Niemet (CH2M HILL/USA)

* **Microwave Technology for Superfund Site Remediation.** *C.Y. Cha and P.G. Vergnani*
Chang Yul Cha (CHA Corporation/USA)

* **Remediation of a Chlorinated Solvent DNAPL-Impacted Site Using Electrical Resistance Heating (ERH).** *A. Taddeo, R. Flatley, D. Groher, and J. Sturza*
Art Taddeo (ENSR/USA)

* **Successful DNAPL Using Radio Frequency Heating Remediation and Return to Thermal Equilibrium.** *R.J. Fiacco, K. Brody, A. Kabir, M. Duquoc, and R. Kasevich*
R. Joseph Fiacco (ERM/USA)

Use of Thermal Conduction Heating for the Remediation of DNAPL in Fractured Bedrock. *J. LaChance, G. Heron, and R. Baker*
Gorm Heron (TerraTherm, Inc./USA)

Use of Thermal Conduction Heating for the Removal and Controlled Mobilization of a Mixed-Waste DNAPL Source Zone. *J. LaChance, G. Heron, and R. Baker*
John C. LaChance (TerraTherm, Inc./USA)

C6. Combining Thermal with Other Remediation Technologies

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: David Fleming (Thermal Remediation Services, Inc.)
Paul C. Johnson (Arizona State University)

* **The Availability of Electron Donors for Reductive Dechlorination Following Thermal Treatment.** *K.E. Fletcher, J. Costanza, K.D. Pennell, and F.E. Loeffler*
Kelly E. Fletcher (Georgia Institute of Technology/USA)

Case Studies (UK and USA) Compare Results of Soil Vapor Extraction (SVE) to Thermally Enhanced Soil Vapor Extraction (TESVE). *J.M. Bierschenk, J. LaChance, G. Heron, J. Galligan, and S. Langford*
John M. Bierschenk (TerraTherm, Inc./USA)

* **Combining ERH and ISCO for Treatment of PCE-Contaminated Soils.** *J. Costanza, G. Otano, J. Callaghan, and K.D. Pennell*
Jed Costanza (Georgia Institute of Technology/USA)

* **Coupled In Situ Thermal/Chemical Oxidation of DNAPL Source Zones Using Persulfate.** *R. Johnson*
Richard L. Johnson (Oregon Health & Science University/USA)

* **DNAPL Characterization and Removal with Electrical Resistance Heating and Bioremediation.** *V. Chan, D. Cacciatore, D. Leigh, M. Yurovsky, and S. Anderson*
Vincent Chan (Shaw Environmental/USA)

* **Effective Chlorinated Solvent Source Reduction Using In Situ Heating and Chemical Oxidation.** *P.J. Linton, M.G. Davidson, J.C. Alonso, and J. Ramirez*
P. James Linton (ARCADIS BBL/USA)

Electrical Resistance Heating of a TCE Source Zone beneath an Active Stormwater Detention Basin. *J.R. Ninteman, C.L. Jacob, K.J. Reid, B. Jonsson, Y.N. Garson, A.K. Sugino, D.C. McCormack, K.L. Lewis, C.D. Crownover, T.D. Powell, and G.L. Beyke*
Jerry R. Ninteman (Landau Associates, Inc./USA)

* **Enhanced Hydrolysis of 1,1,1-Trichloroethane in Groundwater Using Hot Water Injection/Recirculation.** *R.J. Ellis, D. Malone, C. Kalinowski, M. Kladias, K. Houston, and J.P. Messier*
Robert Ellis (ARCADIS US, Inc./USA)

* **Feasibility of Remediation by Steam-and-Iron Enhanced In Situ Soil Mixing.** *H. Faircloth, M. Kershner, and J.P. Matthews*
Harlan Faircloth (CORE Engineering and Construction/USA)

First Remediation in UK Utilizing ERH and Dual-Phase Extraction. *S. Gleadall, A. Fraser, J. Pezzullo, B. Heath, and M. Kolle*
Steve Gleadall (Terra Vac Ltd./UNITED KINGDOM)

First Thermal Remediation Using a Combination of Steam and ISTD. *S. Griepke Nielsen, T. Heron, H. Steffensen, G. Heron, H. Skou, N. Just, and L. Dissing*
Steffan Griepke Nielsen (NIRAS/DENMARK)

Implementation of a Combined Thermal Remedy at a Residentially Located Drum Disposal Site. *T.J. Phelan, C.R. Elder, D.G. Larson, R.R. Swift, and P.J. Zeeb*
Thomas J. Phelan (Geosyntec Consultants/USA)

* **Smouldering Technology for Aquifer Remediation (STAR): A Novel Remediation Technique for Pooled and Residual NAPL.** *C. Switzer, P. Pironi, A. Fuentes, G. Rein, J.L. Torero, and J.I. Gerhard*
Christine Switzer (University of Edinburgh/UNITED KINGDOM)

* **Substantial Revision of a DNAPL Site Conceptual Model and Remediation Approach by an Adaptive Investigation.** *G.A. Kirkpatrick, M.B. Moore, D. Finan, and R. Macklin*
Glen A. Kirkpatrick (The Johnson Company, Inc./USA)

* **Subsurface Thermal Recovery Following the Enhanced Removal of DNAPL.** *D.G. Jackson, J.J. Kuper, and T.F. Kmetz*
Dennis G. Jackson (Savannah River National Laboratory/USA)

* **Thermal Conductive Heating in Fractured Rock: Assessing the Cooling Influence of Groundwater Influx.** *D. Baston and B. Kueper*
Daniel P. Baston (Queen's University/CANADA)

Use of Triad Work Strategy and Performance-Based Contracting to Manage Uncertainty Associated with DNAPL Source Remediation. *K. Lynch, E. Pitre, J. Powers, T. Powell, J. Sturza, and J. Gillie*
Kira Pyatt Lynch (U.S. EPA/USA)

C7. Assessing Performance of Thermal Treatments

Platform Papers Thursday/
Posters (*) Wednesday Afternoon
Chairs: Val Jurka (U.S. Navy)
Kathleen Gerber (U.S. Air Force)

* **Comparison of Performance Assessment Techniques for In Situ Electrical Resistance Heating Treatment of TCE DNAPL.** *M. Truex, K. Lynch, J. Powers, E. Pitre, and J. Gillie*
Michael J. Truex (Pacific Northwest National Laboratory/USA)

* **The Competition between Reaction and Vaporization During Thermal Remediation: A Critical Review of the Data.** *E.L. Davis*
Eva L. Davis (U.S. EPA/USA)

* **Cost-Effective Full-Scale Remediation of Hazardous Soil Using Ex Situ Thermal Desorption.** *J.P. Cleary, J.W. Smith, P.D. Rohde, and C.R. Donnerberg*
Paul D. Rohde (CH2M HILL/USA)

* **Dominating Processes during DNAPL Removal from the Saturated Zone Using Thermal Wells.** *U. Hiester, H.-P. Koschitzky, O. Trotschler, M. Muller, A. Farber, L. Yang, R. Baker, G. Heron, J. LaChance, and M. Kuhlman*
Uwe Hiester (Universitat Stuttgart/GERMANY)

Electrical Resistance Heating Remediation of Tetrachloroethene DNAPL and Groundwater Contamination. *J.A. Sundquist and D.J. Chiusano*
Jon A. Sundquist (URS Corporation/USA)

* **In Situ Thermal Treatment of Trichloroethene at Marshall Space Flight Center.** *J. Cole, W.J. McElroy, J. Glasgow, G. Heron, J. Galligan, K. Parker, and E.F. Davis*
Jason D. Cole (CH2M HILL/USA)

* **In Situ Thermal Treatment System Performance at Fort Lewis, Washington.** *J.G. Powers, E. Pitre, K. Lynch, M. Truex, T. Powell, J. Sturza, and J. Gillie*
Jefferey G. Powers (U.S. Army Corps of Engineers/USA)

* **Lessons Learned—Full-Scale Underwater Application of Electrical Resistance Heating with Contingent Biotreatment.** *C.L. Jacob, J.R. Ninteman, K.J. Reid, B. Jonsson, Y.N. Garson, A.K. Sugino, D.C. McCormack, K.L. Lewis, C.D. Crownover, T.D. Powell, and G.L. Beyke*
Clinton L. Jacob (Landau Associates, Inc./USA)

Lessons Learned from In Situ Resistive Heating of TCE at Fort Lewis, Washington. *K. Lynch, J. Powers, E. Pitre, T. Powell, J. Sturza, and J. Gillie*
Kira Pyatt Lynch (U.S. EPA/USA)

* **Reactivity of Chlorinated Ethenes during Thermal Treatment.** *K. Pennell, J. Costanza, F. Loeffler, K. Fletcher, N. Ramaswamy, G. Otano, and J. Callaghan*
Kurt D. Pennell (Georgia Institute of Technology/USA)

* **The Significance of Data Representation for Evaluating Treatment Effectiveness Using Thermal Treatment Technology.** *P. Juriasingani, M. Higgins, A. Jenkins, S. Downes, and M. Kershner*
Michael Higgins (Tetra Tech Inc./USA)

Steam Remediation of PCE in a Fast-Flowing Alluvial Aquifer. *T.H. Larsen, K. Andersen, M. Skov, N. Just, and L. Dissing*
Thomas H. Larsen (Orbicon/DENMARK)

Symbiotic Effects of Biodegradation during Electrical Resistance Heating. *G.J. Smith*
Gregory J. Smith (Thermal Remediation Services, Inc./USA)

Update on the Dynamic Underground Stripping Project at the Savannah River Site (SRS), Aiken, SC. *J.J. Kubar, J.P. Kanzleiter, T.F. Kmetz, and D.L. Parkinson*
James J. Kubar (Bechtel Savannah River, Inc./USA)

D1. Improving In Situ Chemical Oxidation Treatability Studies

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Terry H. Feng (CH2M HILL)
Richard J. Watts (Washington State University)

Activated Persulfate Treatability Study Leads to ISCO Groundwater Treatment of 1,4-Dioxane, TCE, and Freon. *J.E. Studer, D. Carvel, P. Sones, S. Zachary, J. Scott, and Y.N. Garson*
James E. Studer (Haley & Aldrich, Inc./USA)

Bench-Scale Evaluation of Catalyst versus Alkali-Activated Persulfate. *Y. Chin and P. Kakarla*
Yan Chin (In-Situ Oxidative Technologies, Inc./USA)

Bench-Scale Treatability Study of ISCO for DNAPL Treatment—Effects of pH and Sodium Citrate. *M. Crimi, B. Marvin, J. Duran, N. Thomson, and B. Anderson*
Michelle L. Crimi (East Tennessee State University/USA)

Bio-ISCO-Bio Treatment of a Soil with High Oxidant Demand Contaminated by Aromatic Amines and PAH. *A. Nardella, G. Capotorti, I. Innocenti, and R. Baciocchi*
Alessandro Nardella (ENI SpA/ITALY)

Chemical Oxidation and Reduction of Dioxins, Furans, and PCP with Calcium Peroxide. *M. Durham and D. Cassidy*
Daniel P. Cassidy (Western Michigan University/USA)

* **Chemical Oxidation of Chlorinated DNAPL Using Activated Persulfate, Botany Bay, Australia.** *J. Fairweather, J. Stening, G.E. Hoag, K. Huang, G. Miller, W. Clayton, B. Marvin, and K. Brungard*
James Stening (Orica Australia Pty Ltd./AUSTRALIA)

Comparison of Seven In Situ Technologies for Treatment of Residual CT and PCE DNAPL: Bench-Scale Studies. *J. Rail, S. Jorgensen, G. Coghlan, M. Kasim, A. Lee, and T. Sale*
Gunarti H. Coghlan (CH2M HILL/USA)

* **Degradation of Polychlorinated Dibenzo-p-Dioxins/Furans Using Heat-Activated Persulfate.** *J.-H. Kim, J.-M. Lee, J.-W. Lee, Y.-S. Chang, and P.G. Tratnyek*
Yoon-seok Chang (POSTECH/SOUTH KOREA)

* **Effective Removal of Recalcitrant Contaminants Using Peroxide-Coated Microbubbles.** *W.B. Kerfoot, B. Scheffer, and E. van de Ven*
William B. Kerfoot (Kerfoot Technologies, Inc./USA)

* **Electrokinetically Enhanced Oxidant Flooding of Low-Permeability Media.** *D.A. Reynolds, E.H. Jones, and D.G. Thomas*
David A. Reynolds (University of Western Australia/AUSTRALIA)

Extensive Treatability Study and Field Application of Stabilized Catalyzed H₂O₂ Propagations (CHP) at a Former Automobile-Dismantling Facility. *M.K. Foget, J. Largent, R. Rueber, and R. Watts*
Michael K. Foget (SHN Consulting Engineers & Geologists, Inc./USA)

In Situ Chemical Oxidation of Chlorobenzene, Nitrobenzene, and Aniline. *V. Shea, R. Dulcey, M. Carver, and R.A. Brown*
Vincent Shea (ERM, Inc./USA)

* **In Situ Percarbonate-Based Chemical Oxidation of PCE beneath an Active Chemical Facility Granted a Municipal Setting Designation.** *A. Kunkel, R. Legrand, K. High, C. Schwarzlose, and J.W. Smith*
Anna Kunkel (URS Corporation/USA)

* **ISCO Treatability Study Evaluation and Optimization.** *G. Smith, M. Blanchard, S. Pittenger, and R. Schock*
Glen Smith (Earth Tech, Inc./USA)

Using SVE, ISCO with NaMnO₄ and ISCO with Na₂S₂O₈ to Treat PCE- and Chloroform-Contaminated Soil and Groundwater in Brazil. *M. Naves, F. Rossato, M. Singer, D.S. Wilson, F. Legall, G. Demers, M. Daly, D. Brown, M. Sapanara, J. Clark, and P. Sheehan*
Matheus Naves (ERM/BRAZIL)

D2. In Situ Chemical Oxidation Full-Scale Applications

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Prasad K. Kakarla (ISOTEC)
Neal D. Durant (Geosyntec Consultants)

* **Activated Persulfate Injection to Treat Dissolved Fuel Contaminants in a Fractured Granitic Aquifer.** *J. Sheldon, T. Macharg, K. Menta, J. Gunderson, and P. Schiff*
Joel Sheldon (Earth Tech, Inc./USA)

Application of Catalyzed Persulfate of Chlorobenzenes in Glacial Till and Bedrock, Corinna, Maine. *I.T. Osgerby and K. Sperry*
Ian T. Osgerby (U.S. Army Corps of Engineers/USA)

Case Study Comparison of Multiple Activation Methods for Sodium Persulfate ISCO Treatment. *G. Cronk*
Gary Cronk (JAG Consulting Group, Inc./USA)

* **Challenges with an ISCO Application in the Unsaturated Zone: Case of the Missing Permanganate.** *S. Borchert, J. Raphael, L. Tatar, and B. Kanzler*
Susanne M. Borchert (CH2M HILL/USA)

Design and Analysis of a Database of Sites Where Remediation Has Involved In Situ Chemical Oxidation. *F.J. Krembs, R.L. Siegrist, B. Petri, M. Crimi, T.A. Palaia, M. Singletary*
Friedrich J. Krembs (Colorado School of Mines/USA)

* **Evaluation of Field Application Potassium Permanganate for TCE under Performance-Based Contract.** *D.C. Pohlmann, R. Rogers, and M. Rose*
Dirk C. Pohlmann (Shaw Environmental, Inc./USA)

Full-Scale Remediation of a Confined Aquifer Using Multiple ISCO Technologies. *M. Kirchenbauer, J. Knight, M. Temple, and F. Otto*
Michael Kirchenbauer (BEM Systems, Inc./USA)

Full-Scale Treatment Using Modified Fenton's Reagent at a Superfund Site. *C. Smith, P. Vagt, and D. Powers*
Chad Smith (MWH/USA)

In Situ Chemical Oxidation of TCE in Low-Permeability Soils. *T.M. Kinney, F.W. Blickle, T.H. De Fouw, and G. Tafla*
Thomas M. Kinney (Conestoga-Rovers & Associates, Inc./USA)

* **In Situ Chemical Oxidation Remediation of a Chlorinated Solvent-Contaminated Site in Australia.** *S. McKeown, J. Clay, L. Contos, and R. Lewis*
Stephen McKeown (ERM/AUSTRALIA)

* **In Situ Chemical Oxidation via Perozone™ at a Multiple-Remedy UST Site.** *F.R. Coll and R.A. Moore*
Frederic R. Coll (URS Corporation/USA)

* **In Situ Remediation of PCE and TCE in Groundwater Using Permanganate.** *K.D. Dyson, P.J. Palko, and C. Elmendorf*
Kevin D. Dyson (Panther Technologies, Inc./USA)

Initial Results of ISCO for a Large TCE DNAPL Source Area. *P.E. Cross and D. Baird*
Paul E. Cross (CDM/USA)

* **ISCO of Petroleum-Contaminated Soils and LNAPL Using Activated Persulfate.** *A.A. Rees, J.G. Smith, and H. Rauch*
Assaf A. Rees (Earth Tech, Inc./USA)

ISCO-Generated Total Dissolved Solids: Regulatory Issues and Mitigation Measures: A Case Study. *P. Sones, S. Zachary, J.E. Studer, M. Mehran, J. Scott, and Y.N. Garson*
Paul Sones (Haley & Alrich, Inc./USA)

* **#6 Fuel Oil NAPL Remediation Using CHP-Activated Sodium Persulfate.** *I.M. Aboulafia, D.D. Carvel, and L.D. Rader*
Isaac M. Aboulafia (MECX, LLC/USA)

* **PCE Remediation Using Select In Situ Chemical Oxidant at Active Facility.** *S. Saxena, E. Nuttall, and M. Burns*
Eric Nuttall (Kleinfelder/USA)

* **RemOx® EC Stabilization Reagent for In Situ Biogeochemical Stabilization and NAPL Flux Reduction.** *K. Frasco, M. Dingens, P. Vella, J. Mueller, A. Seech, D. Foster, J. Zubrow, and M. Brouman*
Kelly Frasco (Carus Corporation/USA)

* **Successful Unsaturated-Zone Treatment of PCE with Sodium Permanganate.** *J. Hesemann, T. Zychinski, D. Nicoski, K. Frasco, and M. Dingens*
John Hesemann (Burns & McDonnell/USA)

* **Treatment Effectiveness of In Situ Chemical Oxidation on 1,2-Dibromoethane (Ethylene Dibromide) and 1,2-Dichloroethane.** *S.J. Bhuyan, M.R. Latin, and J.T. Gibbs*
James T. Gibbs (Brown and Caldwell/USA)

Use of Multiple ISCO Reagents for Remediation of High Concentrations of Chlorinated Solvents. *F.R. Symmes, J.J. Soukup, and G. Vierkant*
Frederick R. Symmes (Weston Solutions, Inc./USA)

D3. Improved In Situ Chemical Oxidation Decision-Making

Platform Papers Tuesday/Posters (*) Tuesday Evening
Chairs: Tom Palaia (CH2M HILL)
Michelle L. Crimi (East Tennessee State University)

Adaptive Remediation: Using an MIP to Enhance Efficacy of Permanganate Application in Real Time. *M. Ravella, R.J. Fiacco, T. Pac, R. Lewis, and L. Burkhardt*
Michael Ravella (ERM/USA)

* **Application of Models for Design and Optimization of Hydraulic Containment and In Situ Oxidation.** *M. Mehran, D. Hogshead, S. Zachary, P. Sonos, and N. Garson*
Mohsen Mehran (Rubicon Engineering Corporation/USA)

* **Bench-Scale Study as an Optimization Tool for the Activated Persulfate Field-Scale Remediation of 1,2,4-TCB in Clay.** *G. Coghlan, E. French, P. Favara, T. Sword, A. Lee, and A. Gutberlet*
Gunarti H. Coghlan (CH2M HILL/USA)

* **Characterization of a CHC Source Zone and Feasibility Study of an ISCO Remediation in a Fractured Porous Rock.** *E. Gierlich, K. Schnell, P. Blum, U. Dannwolf, J. Fiacco, and A. Herch*
Klaus Schnell (ERM/GERMANY)

* **Comparative Analysis of Peroxygen Compounds Relating to Cost and Treatment Performance.** *D. Ochs*
Don Ochs (Legacy Environmental Services, LLC/USA)

Contaminant Rebound—What Does it Really Mean? *R.C. Luhrs*
Robert C. Luhrs (Raytheon Company/USA)

Design of ISCO Injections to Address Lithology and Hydrogeology. *R.L. Lewis, T.J. Pac, R.A. Brown, and M. Otz*
Richard L. Lewis (ERM/USA)

* **Design, Modeling, and Evaluation of an In Situ Chemical Oxidation Pilot Test.** *R. Forbes, J. Glass, and M. O'Reilly*
John P. Glass (CH2M HILL/USA)

Designing Efficient Permanganate Injection Systems in Heterogeneous Aquifers. *K.Y. Cha, A. Weispenning, R.C. Borden, G. Mahinthakumar, M. Crimi, and J. Heiderscheidt*
Robert C. Borden (North Carolina State University/USA)

* **Development of a Protocol and Decision-Support Tools for Screening ISCO Technologies for Groundwater Remediation.** *B. Petri, R. Siegrist, F. Krembs, T. Illangasekare, J. Munakata-Marr, K. Lowe, T. Simpkin, T. Palaia, A. Wren, M. Crimi, N. Ruiz, and M. Singletary*
Benjamin G. Petri (Colorado School of Mines/USA)

* **The Effect of Chemical Oxidation on Reductive Dechlorination of TCE by *Dehalococcoides ethenogenes*.** *M. Durham and D. Cassidy*
Daniel P. Cassidy (Western Michigan University/USA)

* **Electron Acceptor Concentrations Following In Situ Chemical Oxidation: Impact on Anaerobic Bioremediation.** *D. Bryant*
Daniel J. Bryant (Geo-Cleanse International, Inc./USA)

* **Fate and Remediation of 1,2,3-Trichloropropane.** *P.G. Tratnyek and V. Sarathy*
Paul G. Tratnyek (Oregon Health & Science University/USA)

* **Hexavalent Chromium-Free Ozone Sparging.** *W.B. Kerfoot and C.J. Watt*
William B. Kerfoot (Kerfoot Technologies, Inc./USA)

* **Implications of the Scientific Literature for Field Applications of ISCO.** *B.G. Petri, R.L. Siegrist, and M. Crimi*
Benjamin G. Petri (Colorado School of Mines/USA)

* **Investigation of Soil Effects on Sodium Persulfate Activation.** *D. Root, X. Zhai, and E. Lay*
Duane K. Root (Shaw Environmental & Infrastructure, Inc./USA)

ISCO Best Practices. *T. Palaia and M. Crimi*
Tom Palaia (CH2M HILL/USA)

ISCO Decision Tree: Managing Expectations and Costs.
M. Marley, B.A. Smith, and M. Walsh
Michael C. Marley (XDD, LLC/USA)

* **Learning from Published ISCO Case Studies: A Quantitative Literature Review.** *W.S. Clayton*
Wilson S. Clayton (Aquifer Solutions, Inc./USA)

* **Optimization of Full-Scale Permanganate ISCO System Operation: Laboratory and Numerical Studies.**
J.L. Heiderscheidt, M. Crimi, R.L. Siegrist, and M.A. Singletary
Jeffrey L. Heiderscheidt (Air Force Institute of Technology/USA)

The Permanganate Natural Oxidant Demand: A New ASTM Protocol. *K. Frasco, M. Urynowicz, P.A. Vella, and B. Vlastnik*
Philip A. Vella (Carus Corporation/USA)

* **A Protocol for Conceptual Design of an In Situ Chemical Oxidation Treatment System.** *T. Simpkin, R.C. Borden, and M. Crimi*
Thomas J. Simpkin (CH2M HILL/USA)

* **A Protocol for Implementation, Monitoring, and Optimization of an In Situ Chemical Oxidation Treatment System.** *T. Palaia and M. Singletary*
Tom Palaia (CH2M HILL/USA)

A Protocol for In Situ Chemical Oxidation Screening, Design, and Implementation. *R. Siegrist, M. Crimi, B. Petri, T. Simpkin, T. Palaia, F. Krembs, J. Munakata-Marr, T. Illangasekare, G. Ng, M. Singletary, and N. Ruiz*
Robert L. Siegrist (Colorado School of Mines/USA)

D4. Advances in Persulfate Applications for In Situ Chemical Oxidation

Platform Papers Wednesday/
Posters (*) Tuesday Evening
Chair: Cannon F. Silver (Battelle)

* **Accelerated Destruction of Persistent DNAPLs via Surfactant-Enhanced Chemical Oxidation Using Alkaline Persulfate.** *K.-C. Huang, G.E. Hoag, J.B. Collins, and C.R. Miceli*
Kun-Chang Huang (VeruTEK Technologies, Inc./USA)

An In-Depth Examination of Base-Catalyzed Persulfate.
R.A. Brown, M. Daly, G. Demers, F. Legall, B.H. Kueper, and E. Dimitrovic
Richard A. Brown (ERM/USA)

Interaction of Chemical Oxidants with Aquifer Solids.
N.R. Thomson, X. Xu, and K.S. Sra
Neil R. Thomson (University of Waterloo/CANADA)

Persistence of Peroxide-Activated Persulfate: A Multiscale Investigation. *K.S. Sra, N.R. Thomson, and J. Barker*
Kanwatej S. Sra (University of Waterloo/CANADA)

* **The Persulfate Oxidant Demand Test: Key Parameters and Interpretation of Results for This Important Design Tool.** *D. Sethi, D. Deng, and P. Block*
Philip Block (FMC Corporation/USA)

Recent Advances in Persulfate Activation for In Situ Chemical Oxidation. *R.J. Watts, J.F. Corbin, O.S. Furman, A.M. Ocampo, J.I. Reed, S.W. Seo, M.K. Kim, R.E. Vaughan, A.L. Teel, R.A. Brown, and P.A. Block*
Richard J. Watts (Washington State University/USA)

D5. Advances in Fenton's Reagent Applications for In Situ Chemical Oxidation

Platform Papers Wednesday/
Posters (*) Tuesday Evening

Chairs: Richard S. Greenberg (ISOTEC)
Anthony Searls (Shaw Environmental & Infrastructure, Inc.)

Application of Modified Fenton's Reagent for the Treatment of Chlorinated Organics. *J. Sykes, M. Saks, and J. McGovern*
Maura Saks (Tetra Tech EC, Inc./USA)

Bench- and Full-Scale Applications of Stabilized Hydrogen Peroxide. *B.A. Smith and M. Marley*
Brant A. Smith (XDD, LLC/USA)

* **Case Study of Techniques to Optimize the Application of Fenton's Reagent in Low-Permeability Soil.** *T. Cox, C. Frey, and G. Graening*
Tina M. Cox (Brown and Caldwell/USA)

Fenton-Like Treatment of Contaminated Sediments: Influence on Organic Matter Content and Heavy Metal Mobilization. *R. Mecozzi, L. Di Palma, and P. De Filippis*
Roberta Mecozzi (Universita degli Studi di Roma "La Sapienza"/ITALY)

* **Fenton's Reagent Treatment of Dissolved Chlorinated Ethenes and Ethanes in a Diffuse Groundwater Plume.**

P.T. Zawislanski and F.F. Flint
Peter T. Zawislanski (LFR Inc./USA)

* **In Situ Chemical Oxidation of Chlorobenzene at a Former Air Force Base.** *M. Temple and P. Kakarla*
Michael Temple (In-Situ Oxidative Technologies, Inc./USA)

Modified Fenton's Treatment of PCE Source Area—Chemical Sales Superfund Site. *A. Schmeising*
Andrew Schmeising (Talus Environmental Consulting, LLC/USA)

* **Remediation of an Active Gasoline Service Station under an Expedited Schedule.** *M. Temple, T. Andrews, and P. Kakarla*
Michael Temple (In-Situ Oxidative Technologies, Inc./USA)

* **Remediation of Petroleum Hydrocarbons in Source Area Soils Using the Modified Fenton's Process.** *B.K. O'Neal and P.K. Kakarla*
B. Kevin O'Neal (In-Situ Oxidative Technologies, Inc./USA)

Using Modified Fenton's Reagent to Remediate a Gasworks Plant. *A.C. Kanen and S.J. Boogert*
Antoine Kanen (Mourik Groot-Amers/THE NETHERLANDS)

D6. In Situ Chemical Reduction

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

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

* **Anticipating Secondary Concerns with In Situ Chemical Reduction: Data from an Integrated Pilot Study of EHC™ and KB-1™.** *J. Peale, E. Bakkom, F. Lakhwala, J. Mueller, and J. Molin*
James G.D. Peale (Maul Foster & Alongi, Inc./USA)

Chemical Reduction of TCE with EHC™ and Calcium Polysulfide. *B. Svendsen, R.A. Brown, and E. Dmitrivic*
Blake G. Svendsen (ERM/USA)

Developments in In Situ Chemical Reduction (ISCR) Technology. *R.A. Brown*
Richard A. Brown (ERM/USA)

Full-Scale In Situ Vitamin B₁₂-Catalyzed Reductive Dechlorination. *E. Williams Carter, T. Llewellyn, J. Cherry, C. Mowder, R. Loder, S. Lesage, S. Brown, and R. Karp*
Erika L. Williams Carter (ARCADIS U.S., Inc./USA)

* **In Situ Chemical Reduction of Commingled Hexavalent Chromium and TCE Contamination.** *E. Marhofer, G.A. Hayman, J. Molin, and M.S. Resh*
Eric Marhofer (Aspect Consulting/USA)

* **In Situ Chemical Reduction of Hexavalent Chromium Using Calcium Polysulfide.** *J. Dablow and K. Puentes*
Jay Dablow (ERM/USA)

Iron(II)-Organic Complexes as Potential Reactive Amendments for In Situ Chemical Reduction Processes. *T.J. Strathmann and D. Kim*
Timothy J. Strathmann (University of Illinois at Urbana-Champaign/USA)

* **Practical Truths of In Situ Chemical Reduction Technology.** *B. Mork and B. Kelley*
Benjamin Mork (Regenesis/USA)

Reductive Treatment of Volatile Organic Compounds, Organochlorine Pesticides, and Metals in Groundwater. *T. Slater, E. Dmitrovic, and A. Seech*
Eva Dmitrovic (The Adventus Group/CANADA)

Successful In Situ Chemical Reduction of High Explosives in Groundwater. *W.S. Clayton, S. Seitz, M. Meyer, B. Marvin, T. Biggs, and T. Lawler*
Wilson S. Clayton (Aquifer Solutions, Inc./USA)



Photo: Monterey County CVB

Using Chemical Reduction to Treat Chlorinated Solvent-Contaminated Groundwater in Brazil.

S. Loebmann, S. Eskes, A. Cunha, D. Brown, G.J. Skladany, and A. Zabin
Susanne Loebmann (ERM/BRAZIL)

D7. Injectable Substrate Applications for Remediation

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: Rick D. Gillespie (Regenesis)
Arun R. Gavaskar (Battelle)

* Chlorinated Contaminant Partitioning and Biological Reduction through the Use of Innovative Electron Donor.

J. Wilson and S. Dobyms
Jessica Wilson (MSA, P.C./USA)

* Contaminant Degradation Studies with Alkaline, In Situ Chemical Oxidation Agents.

B. Mork and B. Kelley
Benjamin Mork (Regenesis/USA)

* Delivery of Organic Substrates for In Situ Bioremediation Using Jet Nebulizers.

N.D. Glew, M.R. Dyer, and E.C.L. Marnette
Mark R. Dyer (University of Strathclyde/UNITED KINGDOM)

* Enhanced Reductive Dechlorination and Bioaugmentation Establish Effective Biodegradation Environment.

D. Schwendeman and D. Baird
Dwight Schwendeman (REP Associates/USA)

* Enhanced Reductive Dechlorination Results from Successful Pilot- and Full-Scale HRC® Application.

B. Smith and D.M. Rau
Brick Smith (Paragon Consulting Group/USA)

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
Suzanne O'Hara (Geosyntec Consultants/CANADA)

Field Implementation of Two Reductive Dechlorination Technologies to Replace a Groundwater Extraction System.

D.R. Peacock, D.X. Li, and A. Kunkel
Derek R. Peacock (URS Corporation/USA)

Field-Scale Comparison of Edible Oil Substrate (EOS®) and Sodium Lactate for Bioremediation of Trichloroethene in Groundwater.

K. McKenna, P.D. Rohde, J.I. Keiser, D. Williamson, and K. Adler
Keli McKenna (CH2M HILL, Inc./USA)

* Fresh Cheese Whey Application for Enhanced Anaerobic Bioremediation of Low Levels of Chlorinated Ethenes.

V. Mankad, C. Moore, P. Sharma, and K. Sorenson
Vibhav S. Mankad (CDM/USA)

* Full-Scale Remediation of Chlorinated Ethenes Using High-Fructose Corn Syrup.

M. Zenker, N. Shetty, P. Thibodeau, and B. Burgess
Matthew Zenker (ENSR Corporation/USA)

High-Pressure Lance Injection of HRC-A.

D. Markley and S. Mullin
Dale E. Markley (Philip Environmental Services Corporation/USA)

* Innovative, Cost-Effective, Controlled-Release Electron Donor for Enhanced Reductive Dechlorination: Laboratory Development to Field Verification.

S. Wilson and B. Kelley
Scott Wilson (Regenesis/USA)

* Maintaining Neutral pH in Deep Soils and Groundwater Utilizing Insoluble Colloidal Buffers.

W.A. Newman, J. Piegat, D. Griffiths, M. Mejac, and M. Faith
William A. Newman (RNAS, Inc./USA)

* Performance of an Injected Cosolvent Enhanced with Zero-Valent Iron to Remediate a NAPL and High-Concentration TCE Source Area.

S.G. Watkins and M.C. Allen
S. Grant Watkins (ENSR/USA)

Pilot Study of Cheese Whey and HRC® Advanced as Substrates for TCE and 1,2-DCA Degradation.

N.Y. Sherif, P.T. Zawislanski, and A.M. Romolo
Nader Y. Sherif (LFR, Inc./USA)

* Pilot Study Using Hydrogen Release Compound (HRC®) in Fractured Granitic Bedrock.

H. Holbrook, R.H. Mora, S. Grossi, and P. Hallman
Holly Holbrook (Earth Tech/USA)

* Reductive Dechlorination of Chlorinated Ethenes, Ethanes, and Methanes in Saprolite Soils.

N.V. Shetty, M. Zenker, J. Bennett, J. McKeon, M. Torgerson, and J. Moreno
Nanjun V. Shetty (ENSR Corporation/USA)

* Results of Field Testing Hydrogen Gas Infusion for PCE Bioremediation.

J. Sheldon, S. Fogel, and J.F. Begley
James F. Begley (inVentures Technologies, Inc./USA)

* Side-by-Side Comparison of Whey and Ethyl Lactate Substrates for Reductive Dechlorination.

M.R. Sieczkowski, D. Smith, P. Guerra, and J. Sheldon
Michael R. Sieczkowski (JRW Bioremediation, LLC/USA)

*** Significant Improvement of In Situ Gas Mass Transfer Performance for Groundwater Remediation Projects.**

J.A. Jacobs, J. Begley, and N. Murphy
James A. Jacobs (Environmental Bio Systems/USA)

*** Strategies for Pilot-Testing Enhanced Reductive Dechlorination in a Relict TCE Plume.**

J.M. Haynes, M.R. Sieczkowski, and J.D. McDermott
Michael R. Sieczkowski (JRW Bioremediation, LLC/USA)

*** Surfactant-Enhanced In Situ Chemical Oxidation (S-ISCO®) Treatment of NAPLs.**

J.B. Collins and G.E. Hoag
John B. Collins (VeruTek Technologies, Inc./USA)

Treating TCE in Clay by Pneumatic Fracturing and Reagent Injections.

A. Miller, C. Wright, and A. Ayyaswami
Anthony W. Miller (Gannett Fleming, Inc./USA)

Trench Applications of ORC Advanced® Result in Treatment of TPHd- and TPHg-Contaminated Soils.

H. Takemoto, D. Yasaka, and L. Higa
Helene Y. Takemoto (U.S. Army Corps of Engineers/USA)

Panel Discussion: Technical Considerations of Climate Change and Hydrologic Variability When Planning and Managing Remediation Programs

Monday/Track E

Moderator: Scott D. Warner
(Geomatrix Consultants, Inc.)

Panelists:

- Tim Buscheck (ChevronTexaco/USA)
- Andrew Dessler, Ph.D. (Texas A&M University)
- Phil Jagucki (Battelle)
- Tom Mohr (Santa Clara Valley Water District/USA)
- Carlos Panchon (U.S. EPA Office of Superfund Remediation and Technology/USA)
- Edward Parson, Ph.D. (University of Michigan)
- Kate Scow, Ph.D. (University of California-Davis)

Climate change is one of the most important environmental challenges we face. Climate and the long-term trends of climate strongly influence water resources, hydraulic cycles, and surface water management issues. With respect to environmental remediation programs, including innovative in situ methods, we must be cognizant of how trends in hydrologic cycles can affect our design and long-term management of remediation systems. In situ methods, such as bioremediation and permeable reactive barriers, rely on understanding long-term hydraulic conditions to best manage the remedy to successful completion. Changes in such factors as gradient

direction, water levels, and recharge conditions could strongly influence the long-term performance of the system. This discussion will consider the potential for climate change to affect remediation programs and develop ideas for promoting the design and management of sustainable innovative solutions well into the future.

Poster presentations on “Control of Greenhouse Gases” will be given on Monday evening.

*** Application of No-Migration Demonstration Concepts for Characterization of Deep Reservoirs for CO₂ Storage.**

P.L. Ernst, C. Calabrese, D.L. Whitley, and R.C. Bost
Richard C. Bost (ERM/USA)

*** Comparison of GHG Emissions from Alternate Remedial Technologies at a VOC-Contaminated Groundwater Site.**

D.F. Williamson
Dean F. Williamson (CH2M HILL, Inc./USA)

*** Environmental Permitting for the Midwest Regional Carbon Sequestration Partnership Geologic Test Sites.**

J. Sminchak, R. Janosy, P. Jagucki, and N. Gupta
Joel R. Sminchak (Battelle/USA)

*** Evaluation of Regionally Extensive Saline Aquifers for Carbon Storage with Reservoir Testing Conducted at OGS #1 and AEP #1 Wells.**

D. Meggyesy, R. Janosy, P. Jagucki, and F. Spane
Danielle Meggyesy (Battelle/USA)

*** Hydrogen from Recalcitrant Leachates by Photoheterotrophic Fermentation.**

J.A. Acevedo-Benitez and H.M. Poggi-Varaldo
Jorge A. Acevedo-Benitez (CINVESTAV del IPN/MEXICO)

*** Lessons Learned from Well Installations along the Ohio River: Drilling, Data Collection, and Field Operations.**

R. Janosy, D. Meggyesy, N. Gupta, and P. Jagucki
Robert J. Janosy (Battelle/USA)

*** Monitoring of a CO₂ Injection Test in Michigan’s Bass Island Formation.**

D. Meggyesy, J. Gerst, P. Jagucki, and N. Gupta
Jackie Gerst (Battelle/USA)

*** Multiphase Flow Modeling for CO₂ Sequestration.**

J. Sminchak, D. Bacon, and N. Gupta
Joel R. Sminchak (Battelle/USA)

E1. Targeted Delivery of Substrates in Complex Settings

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Erica S.K. Becvar (U.S. Air Force)
Bruce C. Alleman (Brown and Caldwell)

Enhanced In Situ Biodegradation of Tetrachloroethene Using Recirculation. *C.E. Hudson, S. Naik, M.A. Singletary, and B. Nwokike*
Casey E. Hudson (CH2M HILL/USA)

* **A Field Demonstration of Substrate Distribution for Accelerated Anaerobic Biodegradation at Dover AFB, Delaware.** *A. Bloom, G. DeLong, R. Lyon, L. Stenberg, A. Buell, E. Fahnlne, and D. Fox*
Albert C. Buell (URS Corporation/USA)

Full-Scale Implementation: Bioremediation Using Hydraulic Fracturing for HRC® Emplacement and KB-1™ Injection. *B. Butler-Veytia, N. Cochran, B. Powers, S. Hrabovsky, and J. Wright*
Belinda Butler-Veytia (URS Corporation/USA)

* **Full-Scale Implementation: ISCO Using Hydraulic Fracturing for Potassium Permanganate Emplacement.** *B. Butler-Veytia, R. Coringrato, B. Powers, S. Hrabovsky, and J. Wright*
Belinda Butler-Veytia (URS Corporation/USA)

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

Innovative Monitoring Techniques for Fracturing and Injection Activities. *D.L. Schnell*
Deborah L. Schnell (Pneumatic Fracturing, Inc./USA)

* **Recirculation of Organic Substrate in Groundwater to Establish an In Situ Bioreactor.** *J. Perdicaris, L. Davies, M. Martin, E. Meyers, N. Scroggins, and M. Heaston*
Jason Perdicaris (Earth Tech, Inc./USA)

Remediation of TCE and PCE in Groundwater Using Recirculating Wells Coupled with Permanganate Injection. *J. Spadaro, J. Kuiper, J. Feild, and P. Stull*
Jack T. Spadaro (AMEC Earth & Environmental, Inc./USA)

* **Successful Treatment of 1,1,1-TCA in Bedrock by Pneumatic Fracturing and Zero-Valent Iron Injection.** *S. Chen, D. Sarr, and K. Powell*
Steve Chen (ARS Technologies, Inc./USA)

E2. Innovative Delivery Technologies

Platform Papers Tuesday/Posters (*) Monday Evening

Chair: Dawn S. Kaback (Geomatrix Consultants, Inc.)

Achieving Delivery Goals with Engineered Screens. *G. Lososky and M.J. Sequino*
George Lososky (Lososky & Associates, Inc./USA)

* **Amendment Distribution in the Subsurface: Myths and Realities.** *M. Harkness, B. Kueper, and A. Wemp*
Mark R. Harkness (GE Global Research/USA)

Comparison of Fractured and Unfractured Horizontal Soil Vapor Extraction Wells. *J.M. Doesburg*
James M. Doesburg (Directed Technologies Drilling/USA)

A Comparison of Substrate Delivery Methods for Accelerated Anaerobic Biodegradation of Chlorinated Solvents at Dover AFB, Delaware. *A. Bloom, G. DeLong, R. Lyon, A. Buell, D. Fox, E. Fahnlne, and A. Beltran*
David Fox (URS/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 (Earth Tech, Inc./USA)

Enhanced Delivery of Potassium Permanganate Using Horizontal Wells. *W.M. Moran, S.H. Abrams, and G. Lososky*
William M. Moran (Shaw Environmental, Inc./USA)

Field Evaluation of Two Injection Technologies for Use with Emulsified Zero-Valent Iron. *J. Quinn, S. O'Hara, T. Krug, M. Watling, N. Ruiz, C. Su, and R. Puls*
Jacqueline W. Quinn (NASA/USA)

* **Full-Scale Sodium Permanganate Treatment of Chlorinated Solvents in a Fractured-Bedrock Aquifer.** *P. Farrington, J.D. Moody, and J.W. Smith*
Paul Farrington (Shaw Environmental & Infrastructure, Inc./USA)

Improved Delivery for In Situ Remediation of Groundwater Contaminated with Chlorinated Solvents or Recalcitrant Compounds. *D. Kaback*
Dawn S. Kaback (Geomatrix Consultants, Inc./USA)

In Situ Chlorinated Solvents Bioremediation Utilizing a Horizontal Well Recirculation System. *J.G. Johnson, R.J. Kurth, L.M. Combass, and D. Ombalski*
Jeffrey G. Johnson (Shaw Environmental, Inc./USA)

* **Installation of a 1,100-ft Horizontal Well for In Situ Chemical Oxidation.** *D. Ombalski*
Dan Ombalski (Directed Technologies Drilling, Inc./USA)

* **Mobilizing Residual Nonaqueous-Phase Contamination Using Pressure-Pulse Technology.** *J. Weidhaas, T.W. Macbeth, T. Garvey, and E. Mutkowska*
S.E. Panter
Steven E. Panter (Fleming Lee-shue/USA)

* **Passive Infusion of Hydrogen Gas for Enhanced Attenuation of TCE in Groundwater.** *D. Hatfield, J.F. Begley, and S. Fogel*
Daniel Hatfield (URS Corporation/USA)

* **Pilot Test Update: Bioremediation Using Hydraulic Fracturing for HRC® Emplacement and KB-1™ Injection.** *B. Butler-Veytia, N. Cochran, B. Powers, S. Hrabovsky, and J. Wright*
Belinda Butler-Veytia (URS Corporation/USA)

Polymer-Enhanced Delivery of Chemical Oxidants and Bioamendments to DNAPL Zones. *J.E. McCray, J.A.K. Silva, M. Smith, and J. Marr*
John E. McCray (Colorado School of Mines/USA)

* **Remediation of PCE-Contaminated Site Using Water-Jet Technology.** *A. Hamamura, K. Ito, and J. Kawabata*
Akira Hamamura (Kajima Corporation/JAPAN)

* **Semipassive Enhanced In Situ Bioremediation of a Deep Perchlorate and TCE Source Area.** *T. Krug, R. Borch, C. Repta, E.E. Cox, and S. Neville*
Thomas A. Krug (Geosyntec Consultants/CANADA)

E3. Vegetable Oil Applications in Remediation

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: Ryan A. Wymore (CDM)
Douglas E. Jerger (Shaw Environmental, Inc.)

* **Accelerated Anaerobic Biodegradation of a PCE Source Area Two Years Later at Site SS07, Dover AFB, Delaware.** *A. Bloom, G. DeLong, L. Stenberg, R. Lyon, and A. Buell*
Laurie Stenberg (URS Group, Inc./USA)

Assessment of Vegetable Oil, Whey, and Ethyl Lactate as Bioamendments in a Tetrachloroethene-Contaminated Aquifer. *P. Guerra, J. Sheldon, S. Jetter, and R. Reiss*
Peter Guerra (AMEC Earth & Environmental, Inc./USA)

* **Atrazine Remediation with Soybean Oil-Based Biobarriers: Laboratory Studies.** *W.J. Hunter and D.L. Shaner*
William J. Hunter (U.S. Dept. of Agriculture/USA)

Chlorinated Solvent Source Treatment Using Emulsified Vegetable Oil. *J.S. Brauner, B.M. Henry, J.W. Ratz, W.E. Grannis, and E.S.K. Becvar*
J. Steven Brauner (Parsons/USA)

Comparing Biobarrier and Soluble Injection Bioremediation during Thermal Treatment. *J. Weidhaas, T.W. Macbeth, T. Garvey, and E. Mutkowska*
Jennifer Weidhaas (North Wind, Inc./USA)

Emulsified Oil Distribution in Heterogeneous Aquifers: Designing Efficient Injection Systems. *M. Clayton, A. Weispfenning, R.C. Borden, and G. Mahinthakumar*
Robert C. Borden (North Carolina State University/USA)

Enhanced Bioremediation of Carbon Tetrachloride and TCE Using Emulsified Oil. *C. Zawtocki and M. Bramblett*
Christie Zawtocki (Hart & Hickman, PC/USA)

* **Enhanced Bioremediation of Chlorinated Solvents at Waterfront Site.** *H. Clough, M. Stevens, and A. Spencer*
Herb Clough (Ash Creek Associates/USA)

* **Experience in Taiwan Using Emulsified Oil for Bioremediation.** *V. Chen, S. Chang, J. Leu, and M.C. Leahy*
Vincent Chen (ERM/TAIWAN)

Full-Scale RD/RA for Source Area and Plume-Wide Bioaugmentation. *U. Tulsiani, K.S. Sorenson, R.A. Wymore, T. Bragdon, N. Smith, M. Chapman, T.W. Macbeth, M. Robles, and H. Dawson*
Urvi Tulsiani (CDM/USA)

* **Impact of pH Adjustment and Bioaugmentation on Enhanced Reductive Dechlorination of Trichloroethene.** *R.C. Borden, J. Tillotson, and M.T. Lieberman*
Robert C. Borden (North Carolina State University/USA)

* **In Situ Bioremediation and Bioaugmentation in a TCE-Contaminated Site in Mountain View, California.** *A. Verce and M. Stallard*
Anja Verce (Weiss Associates/USA)

In Situ Injection Strategies Using Emulsified Vegetable Oil and Bioaugmentation for the Reduction of Chlorinated Ethenes. *R.E. Mayer, T.I. Ladaa, J.G. Johnson, and L. Combass*
Robert E. Mayer (Shaw Environmental, Inc./USA)

* **A Nonemulsified Vegetable Oil Biobarrier for Chlorinated Ethene Remediation.** *C. Glenn, R. Banks, P. Smith, D. Shipman, and S. Irvin*
Christopher Glenn (Treadwell and Rollo/USA)

* **Sequestration and Treatment of Vadose Zone Solvents Using Edible Oils.** *B.D. Riha, B.B. Looney, and R.J. Hall*
Brian D. Riha (Savannah River National Laboratory/USA)

* **Sequestration of a DNAPL TCE Source with Vegetable Oil.** *A. Gavaskar, S. Williams, J. Hicks, J. Sminchak, S. Lowe, and R. Hinchee*
Arun R. Gavaskar (Battelle/USA)

Use of Emulsified Oil as a Tracer and Biobarrier to Treat TCE in Fractured Bedrock. *J.E. Vidumsky, B. Nave, C.R. Elder, and D.G. Larson*
John E. Vidumsky (DuPont Corporation/USA)

E4. Pesticides/Herbicides

Platform Papers Wednesday/
Posters (*) Tuesday Evening

Chair: Peter Kjeldsen (Technical University of Denmark)

* **Aerobic and Sulfate-Reducing Slurry Bioreactors for Remediation of a Heavy Soil Contaminated with Lindane.** *I.V. Robles-Gonzalez, N. Rinderknecht-Seijas, and H.M. Poggi-Varaldo*
Ileri Robles-Gonzalez (CINVESTAV/MEXICO)

* **Assessment and Remediation of Organochlorine-Contaminated Site in India.** *K. Kumar, D. Saravana, P. Girish, and T. Chakrabarti*
Tapan Chakrabarti (National Environmental Engineering Research Institute/INDIA)

Assessment of Zero-Valent Iron Technologies for Source Remediation of Organophosphorous Insecticides. *A.S. Fjordboge and P. Kjeldsen*
Annika S. Fjordboge (Technical University of Denmark/DENMARK)

* **Binding of Organochlorine Pesticides in Soil and a Phytoavailability Assessment.** *I. Hilber, G.S. Wyss, P. Maeder, L. Vogt, and R. Schulin*
Isabel Hilber (Research Institute of Organic Agriculture/SWITZERLAND)

* **Biodegradation of Organochlorine Pesticides (Endosulfan and Endosulfan Sulfate) by Soil Bacteria.** *S. Hasnain and F. Jabeen*
Shahida Hasnain (University of the Punjab/PAKISTAN)

* **Bioremediation of an Agricultural Heavy Soil Polluted with Lindane: Comparison of Anaerobic and Aerobic Slurry Bioreactors.** *I.V. Robles-Gonzalez, N. Rinderknecht-Seijas, and H.M. Poggi-Varaldo*
Ileri Robles-Gonzalez (CINVESTAV/MEXICO)

Biotransformation of Chlorinated and Recalcitrant Substances by Cyanobacteria. *T. Kuritz*
Tanya Kuritz (Oak Ridge National Laboratory/USA)

* **Chlorinated Pesticide Remediation in Soil and Groundwater at Oatland Island, Georgia.** *J. Caparoso*
Jennifer Caparoso (Centers for Disease Control & Prevention/USA)

* **Degradation of DDT by *Fomitopsi pinicola*: Possible Involvement of Enzymatic Reaction.** *A.S. Purnomo, I. Kamei, and R. Kondo*
Adi S. Purnomo (Kyushu University/JAPAN)

* = poster presentation

* **Enrichment and Isolation of Endosulfan-Degrading Bacteria from Agricultural Soils.** *F. Jabeen and S. Hasnain*
Farkhanda Jabeen (University of the Punjab/PAKISTAN)

* **Extracting Value from Historical Data: Chlorophenol Natural Attenuation Promotes Site Reuse.** *K. Shump*
Ken Shump (CH2M HILL/USA)

* **Large-Scale Bioremediation of Organochlorine Pesticides via In Situ Chemical Reduction.** *D. Hill, G. Jorey, J. Bolanos-Shaw, N. Jackson, and K. Bolanos-Shaw*
Kerry Bolanos-Shaw (The Adventus Group/CANADA)

Large-Scale Field Demonstration of Biotreatment and Zero-Valent Iron-Enhanced Biotreatment for Chlorobenzenes and Hexachlorocyclohexanes in Soil. *T. Balba, S. Dore, D. Pope, J. Smith, and A. Weston*
Alan F. Weston (Conestoga-Rovers & Associates/USA)

Photocatalytic Degradation of Chlorophenol over Ordered Titanium Dioxide Mesoporous Materials. *B. Alberts, K. Freeman, J. Russell, M.D. Koppang, and R.T. Koodali*
Blake Alberts (The University of South Dakota/USA)

* **Remediation Technologies for a Large Pesticide-Contaminated Site: Enclosure and Pilot Tests.** *B. Hvidberg, O. Kiilerich, and L. Ramsay*
Borge Hvidberg (Region Midtjylland/DENMARK)

* **Using Chemical Reduction and Biostimulation to Treat Pentachlorophenol Contamination in Brazil.** *M. Naves, S. Sussumu, S. Eskes, A. Marchi, G.J. Skladany, J. Molin, D. Raymond, and M.D. Lee*
Matheus Naves (ERM/BRAZIL)

E5. PCBs/Dioxins/Furans

Platform Papers Wednesday/
Posters (*) Tuesday Evening

Chairs: Alan F. Weston (Conestoga-Rovers & Associates)
Dan W. Waddill (U.S. Navy)

* **Anaerobic Dechlorination of Polychlorinated Biphenyls by the Cultures Enriched from Paddy Fields.** *A. Katayama, N. Yoshida, and D. Baba*
Arata Katayama (Nagoya University/JAPAN)

Biokinetic Analysis of PCDD/F Dechlorination by *Dehalococcoides*. *D.E. Fennell, F. Liu, E.-K. Son, and V. Krumins*
Donna E. Fennell (Rutgers University/USA)

* **Changes in PFOA and PFOS Adsorption to Groundwater Sediment.** *M. Ferrey, C. Adair, and J.T. Wilson*
Mark L. Ferrey (Minnesota Pollution Control Agency/USA)

* **Characterization and Delineation of a Highly Viscous PCB DNAPL.** *B.N. Aragona, J.J. Johnson, and W.C. Hardison*
Ban N. Aragona (Haley & Aldrich, Inc./USA)

* **Degradation of Individual Polychlorinated Biphenyl Congeners Using Mechanically Alloyed Palladized Magnesium.** *R. DeVor, B. Aitken, P. Maloney, E. Holland, C.L. Geiger, C.A. Clausen, L. Talalaj, K. Carvalho-Knighton, and J. Quinn*
Robert W. DeVor (University of Central Florida/USA)

Developments in Anaerobic In Situ Treatment of Polychlorinated Biphenyls (PCBs). *K.R. Sowers, B. Kjellerup, M. Wright, and H.D. May*
Kevin R. Sowers (University of Maryland Biotechnology Institute/USA)

* **Enhanced Reductive Dechlorination of PCBs in Contaminated Sediments Using Pure and Industrial Iron.** *A. Khodadoust, S. Ramamurthy, and R. Brenner*
Amid P. Khodadoust (University of Illinois at Chicago/USA)

Field-Scale Application of a Bimetallic Treatment System to Degrade PCBs Found in Paint. *J. Quinn, C. Clausen, C. Geiger, J. Captain, S. O'Hara, and N. Ruiz*
Jacqueline W. Quinn (NASA/USA)

* **In Situ Remediation of PCB without Toxic By-Products.** *M. Van Dyke and D.M. Tanner*
Mark Van Dyke (Amstar Envirochem Inc./USA)

* **In Situ Thermal Remediation of Dioxin- and PAH-Contaminated Soil at a Former Creosote Site.** *R.S. Baker, J.M. Bierschenk, and D. Tarmasiewicz*
Ralph S. Baker (TerraTherm, Inc./USA)

* **Investigation of Microbial Community Structures and Dechlorination Pathways in a PCB-Contaminated Sediment Core.** *Y. Yu, J.M. VanBriesen, E.G. Minkley, W.E. Brown, and G. Lowry*
Gregory V. Lowry (Carnegie Mellon University/USA)

* **Investigation of PCB Pollution in Turkey.** *I. Imamoglu, K. Gedik, and N. Akduman*
Ipek Imamoglu (Middle East Technical University/TURKEY)

Mass Balance Evaluation of Mechanochemical Destruction of PCBs. *D.C. Jensen, D.A. Cacciatore, D.P. Leigh, S.E. Shealy, B. Black, M. Bulley, and T. Bellingham*
David A. Cacciatore (Shaw Environmental, Inc./USA)

* **Microcosms as a Screening Tool for PCB Bioremediation.** *V. Krumins, J.-W. Park, L. Kerhokof, L. Totten, M. Haggblom, and D. Fennell*
Valdis Krumins (Rutgers University/USA)

* **Ozone Treatability Study of PCB-Contaminated Soil and Groundwater.** *U. Desery, O. Filzinger, and G. Skladany*
Ulrich Desery (ERM/GERMANY)

* **PCB Degradation under Nitrate-Reducing Conditions: A Laboratory and Field Study.** *M.M. Francis and R. Phernambucq*
Mike McD. Francis (NOVA Chemicals/CANADA)

Stabilization and Solidification of PCB-Contaminated Sediments of the Sydney Tar Ponds—A Leachate Study. *A. Britten, K. Naikwadi, and F. Potter*
Allen J. Britten (Cape Breton University/CANADA)

E6. Determining Sources of Perchlorate Contamination in Groundwater

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: Keith A. Fields (Battelle)
Paul B. Hatzinger (Shaw Environmental, Inc.)

Background Concentrations of Perchlorate in Arid and Semiarid Regions of North America and Its Impact on Site Assessment. *W.A. Jackson, B. Rao, T.A. Anderson, G.J. Orris, K.A. Rainwater, S. Rajagopalan, B.R. Scanlon, D.A. Stonestrom, M.A. Walvoord, G. Harvey, L. Fahlquist, and B. Andraski*
W. Andrew Jackson (Texas Tech University/USA)

Evaluation of Nonmilitary Sources of Perchlorate in the Environment. *C.E. Aziz, M. Bogaart, D. Kuntz, E. Cox, M. Quigley, R. Fitsik, A. Braga, J. Oxley, K. Griffith, J. Johnson, and K. Richman*
Carol E. Aziz (Geosyntec Consultants/CANADA)

Fate and Transport of a Large Perchlorate Plume at the Stringfellow (California) Superfund Site. *G. Kenoyer, J. Aldern, and R. Paulson*
Galen Kenoyer (Kleinfelder/USA)

Isotopic Evidence for Agricultural Perchlorate in Groundwater of the Western Chino Basin, California. *N.C. Sturchio, A.D. Beloso, L.J. Heraty, J.P. LeClaire, T. Rolfe, and K.R. Manning*
Neil C. Sturchio (University of Illinois at Chicago/USA)

Perchlorate Fate and Transport Evaluation at the Jet Propulsion Laboratory Site Using Isotope Analysis. *S.W. Slaten, K.A. Fields, B. Sass, and M. Bhargava*
Steven Slaten (NASA/USA)

Perchlorate Source Identification Using Stable Isotope Analysis. *P.B. Hatzinger, N.C. Sturchio, J.K. Bohlke, W.A. Jackson, and B. Gu*
Paul B. Hatzinger (Shaw Environmental, Inc./USA)

E7. Treatment of Perchlorate-Contaminated Soil and Groundwater

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: Andrea Leeson (SERDP/ESTCP)
Neil C. Sturchio (University of Illinois at Chicago)

Bench-Scale to Field-Scale: Bioremediation of Perchlorate-Contaminated Soil. *L. LaPat-Polasko, A. MacHugh, and S. Koehne*
Laurie T. LaPat-Polasko (Geomatrix Consultants, Inc./USA)

* **Biological Treatment of Potable Water in the United States to Remove Perchlorate and Other Emerging Contaminants.** *P.J. Evans, D. Dodrill, C. Schulz, E. Opitz, F. Blaha, and J. Albert*
Patrick J. Evans (CDM/USA)

Development of Metal Catalysts for Reducing Perchlorate and NDMA at Ambient Temperature and Pressure. *T.J. Strathmann, C.J. Werth, J.R. Shapley, K.D. Hurley, C.E. Joseph, and A.J. Friedrich*
Timothy J. Strathmann (University of Illinois at Urbana-Champaign/USA)

* **Field Demonstration of a Novel Ion Exchange Approach to Removal of Perchlorate from Groundwater.** *W.H. Carlin, S. Boyce, and J. Miers*
Jay Miers (Rohm & Haas Company/USA)

* **Field-Scale Demonstration: Integrated Ion Exchange Regeneration Process for Perchlorate Removal.** *C.C. Lutes, T. Henderson, M. Doorn, C.C. Chiang, and B. Gu*
Christopher C. Lutes (ARCADIS/USA)

Fixed-Bed Biological Perchlorate Destruction. *J. Brown, C. Lauderdale, E. Morgenroth, and L. Raskin*
Jess C. Brown (Carollo Engineers/USA)

Fluidized-Bed Bioreactor System Treatment of Perchlorate in Groundwater to Potable Standards. *T.S. Webster, A.P. Togna, S. Wong, W.J. Guarini, and W. Hunt*
Todd S. Webster (Shaw Environmental, Inc./USA)

Lines of Evidence for Monitored Natural Attenuation of Perchlorate. *S.L. Knox, M.T. Lieberman, R.C. Borden, S. Jorgensen, and W. Lucas*
Sheri L. Knox (Solutions-IES, Inc./USA)

Novel Electrochemical Process for Treatment of Perchlorate in Waste Water. *Y. Lin, D. Choi, J. Wang, and J. Bontha*
Yuehe Lin (Pacific Northwest National Laboratory/USA)

Perchlorate Destruction Using Hydrogen and the Membrane Biofilm Reactor. *B.E. Rittmann, P.J. Evans, T. Appleberry, and R. Buchwald*
Bruce E. Rittmann (Arizona State University/USA)

Perchlorate Remediation in Vadose Zone Soil by Gaseous Electron Donor Injection Technology (GEDIT). *P.J. Evans, T. Titus, R.A. Brennan, H. Cai, and R. Fricke*
Patrick J. Evans (CDM/USA)

* **Perchlorate, TCE, and 1,4-Dioxane Investigation and Remediation at a Rocket Propellant Facility in a Semiarid Environment.** *E. Tyler and D. Neidigh*
Edward Tyler (Kleinfelder West Inc./USA)

* **Rapid, Full-Scale Bioremediation of Perchlorate-Contaminated Soil to Support Site Redevelopment.** *P. Evans, W. Weaver, J. Weiser, W. Grove, and H. Amini*
Patrick J. Evans (CDM/USA)

* **Simultaneous Removal of Perchlorate and Energetic Compounds by Zero-Valent Iron and Perchlorate-Respiring Bacteria.** *S.C. Ahn, D.K. Cha, and B.J. Kim*
Se Chang Ahn (University of Delaware/USA)

Tailored Granular Activated Carbon for Well-Head Perchlorate Treatment. *T. Henderson, C.C. Lutes, D.S. Liles, T. Peschman, J. Graham, S. Marshall, F. Cannon, J. Patterson, R. Parette, M. Goltz, D. Craig, and D. Felker*
Christopher C. Lutes (ARCADIS/USA)

F1. Remediation Cost and Technology Selection

Platform Papers Monday/Posters (*) Monday Evening
Chairs: Paul R. Lear (Shaw Environmental & Infrastructure, Inc.)
Joseph S. Rothermel (North Wind, Inc.)

Application of Planning-Level Predictive Tools to Assess DNAPL Source Depletion Benefits. *G.M. Brown, T. Gaffney, and S. Melkote*
Gregory M. Brown (LFR Inc./USA)

Balancing Technology Selection with Overall Project Economy and Life-Cycle Value. *D. Graves and P. de Haven*
Duane Graves (Geosyntec Consultants/USA)

* **Comparison of Biostimulation and Ozone Sparging for In Situ Treatment of PCE-Contaminated Groundwater in Low-Permeability Strata.** *J.K. Nguyen and S. Figgins*
James K. Nguyen (Brown and Caldwell/USA)

* **Cost/Performance Analysis of EAD at Four Dry Cleaner Sites.** *D. Hanson and B. Timmins*
Donald Hanson (Oregon Department of Environmental Quality/USA)

Development of a Rehabilitation Strategy for Chlorinated Solvent Wastes at Umbogintwini, South Africa. *I. Cameron-Clarke and D. Duthie*
Ian Cameron-Clarke (SRK Consulting/SOUTH AFRICA)

Development of a Screening Tool for DNAPL Remediation Technologies. *C. LeBron, J. Konzuk, D. Major, M. Duhamel, G. Grant, C. Aziz, M. West, B. Kueper, T. Pang, and J. Gerhard*
Carmen A. Lebron (U.S. Navy/USA)

* **Effective Decision Heuristics: Forecasting Desired Outcomes for Complex Remediation Sites.** *R. McKeeman, P. Stefan, and R.W. Lee*
Ryan McKeeman (ERM/USA)

* **Feasibility Evaluation of DNAPL Source Zone Reduction in Silty-Clay Beneath an Occupied Residential and Commercial Structure.** *W.J. Prall and N. Posavatz*
William J. Prall (Global Remediation Technologies, Inc./USA)

* **Feasibility Study for 1,4-Dioxane in Groundwater.** *J.L. Pintenich*
Jeffrey L. Pintenich (Brown and Caldwell/USA)

* **Field Comparison of Four Technologies to Treat TCE in Groundwater.** *J. Skeeane, C. Bozzini, M. Tiburzi, D. Hood, and B. Lowder*
Jessica Skeeane (CH2M HILL/USA)

* **Multiphased Assessment and Remediation Approach for CVOC-Affected Soil and Groundwater at a Manufacturing Facility in Japan.** *K. Tachibana, K. Yoshida, and J. Meier*
Kaori Tachibana (ERM/JAPAN)

Parametric Estimating of Capital and O&M Costs for In Situ Bioremediation. *N. Hasan and J.E. Claypool*
John E. Claypool (Earth Tech, Inc./USA)

Remediation Costing and Technology Selection for NASA's Launch Complex 34. *M.J. Deliz, J. Langenbach, and T.A. Peel*
Michael J. Deliz (NASA/USA)

* **Risk Analytical Cost-Benefit Evaluation of Site Remediation Options.** *G. Lemming, P. Friis-Hansen, and P.L. Bjerg*
Gitte Lemming (Technical University of Denmark/DENMARK)

* **A Screening Model for Design and Costing of an Innovative Technology to Treat Perchlorate-Contaminated Groundwater.** *W. Powell, D. Craig, A. Thal, D. Felker, M. Goltz, J. Patterson, R. Parette, F. Cannon, T. Peschman, D. Gillen, and C. Lutes*
Mark N. Goltz (Air Force Institute of Technology/USA)

Sensitivity of Subsurface Conditions and the Affect on Selection of In Situ Remediation Technologies and Life Cycle Costs. *R.W. Tossell, B. Greenly, B. Whiffin, B. Shearer, M. Barackman, G. Vogt, M. O'Brien, and B. Michaud*
Robert W. Tossell (CH2M HILL/CANADA)

Test Program for Selecting Technologies for Groundwater Treatment at a Hazardous Waste Site. *A. Wolfenden and L. Saska*
Laszlo Saska (California Department of Toxic Substances Control/USA)

Using Monte Carlo Analyses to Evaluate Financial Reserves for Environmental Obligations. *M.C. Leahy and J. Perazzo*
Maureen C. Leahy (ERM/USA)

* **Why In Situ Thermal Desorption is the Most Cost-Effective In Situ Remediation Method for Many Sites.** *R.S. Baker, J.M. Bierschenk, J. LaChance, D. Tarmasiewicz, G. Heron, and W.R. Leach*
Ralph S. Baker (TerraTherm, Inc./USA)

F2. Site Assessment, Risk Assessment, and Decision-Making: Closing the Gaps

Platform Papers Tuesday/Posters (*) Tuesday Evening
Chairs: Paul W. Hadley (California Dept of Toxic Substances Control)
Keith Tolson (Geosyntec Consultants)

* **Air Force-Wide Trends in TCE and Other Constituents in Groundwater.** *P.M. Hunter, J.L. Gillespie, and M.W. Sembera*
Philip M. Hunter (U.S. Air Force/USA)

Case Studies of the Use of Risk Assessment in Remedial Decision-Making. *P.W. Hadley, A.K. Meyer, and S. Siddhanti*
Paul W. Hadley (California Dept of Toxic Substances Control/USA)

* **Chlorinated Solvents: Liabilities Posed by Some 1940s and 1960s Cases.** *M. Rivett*
Michael O. Rivett (University of Birmingham/UNITED KINGDOM)

Contaminated Soil Cleanup Objective Assessment through Statistical Analysis: Selected Case Studies.

G. Misra and H. Sartain
Girish Misra (ERM/USA)

The Elephant in the Room: The Industry-Wide Blind Spot on Nonrepresentative Data from Heterogeneous Environments.

N. Clite, R. Baldino, J. Fleissner, and D. Eskew
Nova Clite (T N & Associates, Inc./USA)

*** Factors Influencing Chlorinated Solvent Distribution at Waterfront Site.**

A. Spencer and A. Schmidt
Amanda Spencer (Ash Creek Associates/USA)

*** Feasibility Study of Species Distribution for Dioxin-Contaminated Sediments after Fered-Fenton Process.**

H.-T. Chen, J.M. Chen, Y.-H. Huang, J.-E. Chang, L.-C. Wang, and G.-P. Chang-Chien
Hung-Ta Chen (National Cheng Kung University/TAIWAN)

Geospatial and Bayesian Statistical Analysis to Enhance Risk-Based Environmental Assessment and Decision-Making.

P.J. de Haven, R.A. Siebenmann, and J.K. Tolson
Peter J. de Haven (GeoSyntec Consultants/USA)

*** Impacts to Remedy Selection in the Identification of Dense Nonaqueous-Phase Liquids.**

G.K. Shkuda and E. Rossano
Gregory K. Shkuda (ERM/USA)

Improving Transparency in the Environmental Restoration Process.

B. Call, S. DiZio, P. Hadley, and K. Lynch
Bradley Call (U.S. Army Corps of Engineers/USA)

*** Is the Migration of Contaminated Soil Vapor a Larger Problem Than Anticipated?**

G.K. Shkuda, J. Mohlin, M. Mattern, and P. Gravier
Gregory K. Shkuda (ERM/USA)

*** ITRC's Technical and Regulatory Guidance for Bioremediation of Chlorinated Ethene DNAPLs.**

R. Wymore, N. Akladiss, M. DeFlaun, D. Goswami, P. Hadley, E. Hausamann, S. Hill, J. Lisiecki, T. Macbeth, B. Morris, M.J. Ondrechen, F. Payne, M. Sieczkowski, D. Smith, M. Smith, and H. Stroo
Ryan A. Wymore (CDM/USA)

*** Lessons Learned from Conducting Performance-Based Management Remedial Process Optimization at Department of Defense Sites.**

J.T. Gibbs and J. Santillan
James T. Gibbs (Brown and Caldwell/USA)

*** Pile Foundation Construction: Modeling the Effect on Chlorinated Solvent Plumes.**

M.A. Orcino
Michael A. Orcino (Geotechnical and Environmental Consultants, Inc./USA)

*** The Realities of Direct-Push Injection into Difficult Lithologies.**

E. Cooper, A. Livadas, and T. Hanna
Eliot D. Cooper (Vironex, Inc./USA)

*** Results and Lessons Learned from Full-Scale Remediation Systems.**

P. Mihopoulos and U. Lindmark
Philip G. Mihopoulos (Lindmark Engineering/USA)

*** A Tale of Three Systems: Materials of Construction in Remediation Systems.**

J.L. Pintenich
Jeffrey L. Pintenich (Brown and Caldwell/USA)

*** Thermal Remediation Around the World—Lessons Learned.**

G. Heron, R. Baker, J. LaChance, J. Galligan, J. Bierschenk, T. Heron, and S.G. Nielsen
Gorm Heron (TerraTherm, Inc./USA)

*** Three Sites, Three Solutions, and One Approach.**

R.A. Paschke, J. Kesari, M. Corbin, and A. Thomas
Robert A. Paschke (3M/USA)

Uncertainty-Based Risk Classification and Scaling for Sediment Remedial Decision-Making.

P. Adriaens, M.-Y. Li, A. Michalak, J. Wolfe, and N. Barabas
Peter Adriaens (University of Michigan/USA)

*** The Unmet Challenges of Performance-Based Contracting—Are Hybrid Contracts the Answer?**

R. Tabachow, G.G. Back, F.X. Markert, and E. Roberts
Ross Tabachow (Excalibur Group, LLC/USA)

Use and Misuse of Environmental Monitoring and Screening Criteria.

S.M. DiZio, P.W. Hadley, A.K. Meyer, and S. Siddhanti
Stephen DiZio (California Environmental Protection Agency/USA)

*** Variability in Risk-Screening Evaluations.**

C. Koger, B. Call, P. Hadley, and K. Lynch
Cory Koger (U.S. Army Corps of Engineers/USA)

F3. Community Involvement and Risk Communication

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Merrilee Fellows (NASA)

Susan L. Santos (FOCUS Group Consulting)

*** Is It Working? How Can We Tell?**

J.W. Sheahan, J.W. Parker, M.J. Dybas, M.J. Barcelona, and R.F. Hickey
Joseph W. Sheahan (Ground Water Solutions, Inc./USA)

Risk Communication: What is Safe? Expect the Unexpected.

A. Chun
Alvin Chun (The Chun Group/USA)

* = poster presentation

Risk Communications Issues for Emerging**Contaminants.** *P.J. Yaroschak*

Paul J. Yaroschak (Office of the Deputy Under Secretary of Defense/USA)

The Importance of Risk Communication and Community Involvement at Complex Hazardous Waste Sites—A NASA Perspective. *M. Fellows and S.L. Santos*
Merrilee Fellows (NASA/USA)

Why “Trust Us, We Are Experts” Doesn’t Work in Conveying Health and Risk Information to the Public.

M.F. McDaniel

Mary F. McDaniel (McDaniel Lambert, Inc./USA)

F4. Long-Term Monitoring Strategies and Remedial Action Optimization

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Mark King (Groundwater Insight, Inc.)

Keith W. Henn (Tetra Tech NUS, Inc.)

Adaptive Long-Term Monitoring at Environmental Restoration Sites. *K. Harre, Y. Zhang, T. Chaudhry, B.S. Minsker, R. Greenwald, and C.B. Davis*
Tanwir Chaudhry (Consultant - Naval Facilities Engineering Service Center/USA)

* **Effects of Catalyzed Persulfate ISCO Solvent Treatment on Subsurface Ecology and Implications for Long-Term MNA: A Case Study.** *S. Zachary, P. Sones, A. Peacock, J.E. Studer, J. Scott, and Y.N. Garson*
Scott Zachary (Haley & Aldrich, Inc./USA)

* **Energy Optimization for Groundwater Treatment—Wind Turbine Visibility Analysis.** *S. DeHainaut and R. Forbes*
Scott DeHainaut (CH2M HILL/USA)

* **Field Management Decisions Based on Real-Time Data During Steam and Hot-Air Injection.** *S.E. Downes, P. Juriasingani, M. Higgins, and M. Kershner*
Stephen E. Downes (Tetra Tech, Inc./USA)

Incorporating State Risk-Base Corrective Action (RBCA) Guidance into Optimization Strategies for Navy Cleanup Projects. *M.A. Singletary, M.J. Maughon, D.W. Waddill, K. Henn, and C. Pike*
Michael A. Singletary (U.S. Navy/USA)

* **Integrated Maintenance Approach to Improving Long-Term Remedial Well Operation.** *J. Bailey and A. Wicklein*
Jim Bailey (Kleinfelder/USA)

* **Long-Term Monitoring at the Sydney Tar Ponds—Canada’s Largest Remediation Project.** *M. Janes, J. Green, and F. Potter*
Janice Green (Earth Tech Canada/CANADA)

Long-Term Monitoring Optimization at Camp Lejeune. *D. Laudermilch, C. Bozzini, D. Hood, and B. Lowder*
Donna Laudermilch (CH2M HILL, Inc./USA)

Monitoring Network Design and Optimization Using Two Genetic Algorithm-Based Approaches. *S. Morgan and M.M. Thomson*
Scott A. Morgan (URS-Diamond/USA)

Optimization of Active Remediation vs. LTM at Navy DNAPL Sites. *D. Waddill, M. Singletary, K. Henn, and C. Pike*
Dan W. Waddill (U.S. Navy/USA)

* **Optimization of Groundwater Remediation via Conversion of Active Interception Trenches into Passive PRBs.** *J. Mueller, J. Molin, and J. Smith*
James G. Mueller (Adventus Americas Inc./USA)

* **Reductive Dechlorination in a Landfill Plume and Implications for Remedial System Performance and Optimization.** *J.G. Blount, J. Glass, P. Clement, and R. Forbes*
Jonathan G. Blount (CH2M HILL/USA)

* **Remedial Optimization at Solvent DNAPL Site Using a Passive In Situ Hydraulic Treatment Conduit.** *C.R. Donnerberg, P. Rohde, J.P. Cleary, and J.W. Smith*
John P. Cleary (Project Realty, L.L.C./USA)

Using GTS as a Tool for LTM Optimization at Government and Military Sites. *P.M. Hunter, K. Cameron, and R. Stewart*
Philip M. Hunter (U.S. Air Force/USA)

Photo: Monterey County CVB



Panel Discussion: Sustainable Remediation—Issues and Opportunities

Wednesday/Track F

Moderators: Dave Ellis (Dupont)
Paul Hadley (California Department of Toxic Substances Control)

The Sustainable Remediation Forum (SURF) is working to define sustainability within the context of a cleanup, create a framework to quantify sustainability, and develop a communication strategy to facilitate regulatory and public acceptance. SURF's general view on sustainable remediation is to minimize or eliminate energy consumption and ancillary environmental impacts from cleanups (e.g., CO₂ emissions to the air); preserve natural resources; maximize the reuse of land and the recycling of materials; and promote technologies that permanently eliminate contamination. SURF suggests that sustainability can be integrated with other selection criteria, recognizing that remedial actions have unintended environmental impacts and can be prioritized based on sustainability. The aim is to establish organizational metrics to evaluate remedial options for sustainability, in addition to the traditional criteria of protectiveness, regulatory compliance, community acceptance, cost, and technical aspects.

Discussions on the topic of sustainable, or "green," remediation can range from constructive dialogue to heated debate and can generate anything from glowing optimism to significant pessimism. A diverse panel of experienced remediation professionals will discuss principles, practices, and definitions of sustainable remediation and will engage the audience over the current state of the art as well as prospects for shaping the future of this new development in remediation.

F5. Sustainable Remediation

Platform Papers Wednesday/
Posters (*) Wednesday Afternoon

Chairs: Peter J. Zeeb (Geosyntec Consultants, Inc.)
David E. Ellis (Dupont Company)

Aligning Remediation Choices with Sustainability Indicators. *D.J. Watts, H. Dhaliwal, and D.E. Ellis*
Daniel J. Watts (New Jersey Institute of Technology/USA)

* **Balancing Cleanup and Sustainability at a CERCLA Superfund Site.** *L.M. Smith, A. Rieke, and E. Nixon*
L. Maile Smith (Northgate Environmental Management, Inc./USA)

* **Case Study: Sustainable Off-Gas Treatment Remediation at a Site with "High Concentration" Recalcitrant Compounds.** *M. Reardon, L. Kessel, and C. Winell*
Lowell G. Kessel (G.E.O., Inc./USA)

* **Combining NEBA with Economics to Maximize Remediation Sustainability and Value.** *P. Favara, J. Nicolette, and M. Rockel*
Paul J. Favara (CH2M HILL/USA)

Decision Analysis Tools to Maximize Value and Sustainability in Remedial Planning and Implementation. *P.J. Favara*
Paul J. Favara (CH2M HILL/USA)

* **Greening Remediation: Using Value Engineering to Make Remedial Actions Sustainable.** *G.M. Brown and J. Armstrong*
Gregory M. Brown (LFR Inc./USA)

Integrating Green Technologies and Strategies into Remediation. *P.W. Hadley and T. Mahmoud*
Paul W. Hadley (California Dept of Toxic Substances Control/USA)

Soil and Groundwater Risk Management, Sustainability and Net Environmental Value. *D. Reinke, P. Scott, and N. Harries*
David Reinke (Shell Global Solutions/UNITED KINGDOM)

Sustainability Analysis for Improving Remedial Action Decisions. *D.E. Ellis, T.A. Ei, and P.B. Butler*
David E. Ellis (Dupont Company/USA)

* **Sustainable Alternatives for Remediating Chlorinated Solvent Sites.** *P. Bennett, J. Bussey, D. Gandhi, L. Feldman, and S. Warner*
Peter Bennett (Geomatrix Consultants, Inc./USA)

* **Sustainable Remediation—Another Tick Box or a New Paradigm for Technology Selection?** *A. Thomas, J. Baldock, and C. Kingston*
Alan O. Thomas (ERM UK Ltd./UNITED KINGDOM)

* **A Template for the Integration of Sustainable Design Concepts into Remediation Projects.** *J.A. Gove, K.M. Lemaster, and M.E. Miller*
Justin A. Gove (CDM/USA)

* **Utilizing a Sustainability Management System to Improve Sustainability Performance of Organizations and Projects.** *J.C. Jobin, K.M. Lemaster, and T.A. Pedersen*
Kristin Lemaster (CDM/USA)

F6. Risk Assessment Methods and Risk-Based Cleanup Actions

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: Pamela Rodgers (Battelle)
Ruth Owens (U.S. Navy)

* **Assessing Human Health Risks from Pharmaceuticals and Personal Care Products.** *L. Kennedy, J. Debroux, T. Fuji, C. Ryals, T. Pinit, and H. Brunelle*
Laura Kennedy (Kennedy/Jenks Consultants/USA)

* **Assessing the Risk of Chemical Oxidation of Chlorinated Compounds via Mechanical-Auger Mixing.** *R.C. Bost, M.A. Boone, and S.F. Li*
Marjorie A. Boone (ERM/USA)

* **Challenges Associated with Vapor-Phase Investigation Activities in an Urban Area.** *J.T. Kelley, B. Frez, and J. Underwood*
Justin T. Kelley (Earth Tech, Inc./USA)

* **Does Garden Vegetable PAH Uptake Create a Significant Exposure Pathway?** *B. Beuthe, H. Halen, M. Le Bel, M. Moutier, E. Delcarte, and P. Maesen*
Birgitta Beuthe (SPAQuE/BELGIUM)

* **EVS Modeling, Risk Assessment, and Remediation of Chlorinated Solvents Using ISVE at an Industrial Facility, Los Angeles, California.** *A. Lizzi and G. Smith*
Anthony Lizzi (Earth Tech, Inc./USA)

Influence of Site-Specific Measurement of Perchloroethylene (PCE) Sorption on Remedial Decision-Making. *R. Watson, R.M. Allen-King, S. Choung, G. Wang, M. Kominek, and S. Feenstra*
Robert Watson (Groundwater Sciences Corporation, Inc./USA)

Optimum Exposure Area Grid Placement for Human Health Risk Assessment Using ArcGIS Spatial Analyst. *J. Stovall and M. Bolwahn*
Michelle Bolwahn (BWXT Pantex LLC/USA)

* **Remedial Action Optimization at a Pesticide-Contaminated Site Using Risk-Based Corrective Action Evaluations.** *C.E. Hudson, M.D. Halil, M.A. Singletary, and A. Robinson*
Casey E. Hudson (CH2M HILL/USA)

A Remediation Decision Tool for Groundwater Contaminated with Chlorinated Solvents. *D. Kaback, K. Jenni, J. Ross, K. Vangelas, and B. Looney*
Dawn S. Kaback (Geomatrix Consultants, Inc./USA)

Risk Assessment and Modeling to Target Remediation of Industrial Impacts. *W. Benni, M.A. Parcher, J.P. Waddell, E. Nugent, and M. Bennett*
William Benni (Environmental Science & Technology/USA)

* **The Risk-Based Remediation of an Australian Site Contaminated with Agent Orange Derivatives.** *J. Clay, W. Ellis, and P. Lavelle*
Jason Clay (ERM/AUSTRALIA)

* **Use of Interactive GIS for Risk Management Decision-Making.** *S. Cardinale, L. Lundgren, and D. Jenson*
Simon Cardinale (Tetra Tech/USA)

F7. Post-Remediation Management and Brownfield Redevelopment

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: Rula Anselmo Deeb (Malcolm Pirnie, Inc.)
Laurie Haines (U.S. Army Environmental Command)

Developing Cleanup Criteria for LNAPL-Impacted Sites. *K. Dovantzis, M. Bedan, J. Gentry, and T. Petranoff*
Kostas Dovantzis (CH2M HILL/USA)

* **Drivers, Approaches, and Technology Improvements in UK Site Remediation.** *J. Baldock, P. Dowson, A. Thomas, and J. Waters*
James Baldock (ERM UK Ltd./UNITED KINGDOM)

* **Enhanced Bioremediation Pilot Test Results at a Site in Northwestern Georgia.** *W.A. Butler, D. Ross, S. Walsh, M. Leahy, and B. Jeffers*
William A. Butler (Environmental Resources Management/USA)

In Situ Remediation of TCE at an Abandoned Industrial Site—In Clay and under a River. *C.J. Athmer, J. Easterly, and R. Strohm*
Christopher J. Athmer (Terran Corporation/USA)

* **In Situ Stabilization of Lithium and Bromate Tailings at a Former Ore Processing Facility.** *R.G. Schaar and T. Uher*
Ralph G. Schaar (Compass Environmental, Inc./USA)

* **In Situ Stabilization of MGP-Impacted Soils During Brownfield Redevelopment.** *R.G. Schaar, L. DePersia, and K.A. Kester*
Ralph G. Schaar (Compass Environmental, Inc./USA)

Integrating Environmental Cleanup with Site Development Activities. *R.C. Brandt and D. Roth*
Randolph C. Brandt (LFR Inc./USA)

Obtaining Approval of a Technical Impracticability Waiver for a Chlorinated Superfund Site: A Case Study. *R.C. Bost and R.G. Perry*
Richard C. Bost (ERM/USA)

Performance Assessment Error Due to Remediation-Induced Changes in Subsurface Properties and DNAPL Partitioning Behavior. *L.M. Woods, R.L. Siegrist, B.G. Petri, and M.L. Crimi*
Leanna M. Woods (Colorado School of Mines/USA)

* **Residential Redevelopment at an Industrial Brownfield Site Supported by a Vapor Intrusion Assessment.** *S.L. Sager, E. Rhine, and S. Young*
Shawn L. Sager (ARCADIS/USA)

* **Sustainable Remediation at the Denver Federal Center.** *J. Kleinschmidt, E. Petrovskis, R. Melvin, and M. Gasser*
John Kleinschmidt (GSA Public Building Services/USA)

F8. Exit Strategies and Closure for Remediation Sites

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: Richard B. Wice (Shaw Environmental, Inc.)
Dawn M. Hayes (U.S. Navy)

* **Countdown to Cleanup at Cape Canaveral—A Base Perspective.** *M.A. Kershner and R.D. Butler*
Mark A. Kershner (U.S. Air Force/USA)

Exit Strategies for a Performance-Based Cleanup of MTBE in Groundwater. *A.N. Amini, C.T. Coonfare, K.A. Fields, and M.P. Smits*
A. Nick Amini (Battelle/USA)

* **Facility-Wide Groundwater Remediation and Exit Strategy: Source Mass Reduction, Containment, Natural Attenuation, and Risk Management.** *S. Zachary, P. Sones, J.E. Studer, M. Mehran, J. Scott, and Y.N. Garson*
Scott Zachary (Haley & Aldrich, Inc./USA)

The Goal is Site Closure—Mistakes Are Costly. *R. Lewis and K.O. Gill*
Richard L. Lewis (ERM/USA)

* **Incorporating Abiotic Degradation of TCE into the Treatment Train Approach at a Site in Indiana.** *R. Brown and M. Ryan*
Martin Ryan (ERM, Inc./USA)

* **An Integrated Approach to Mitigate PCE Risks.** *L. Alm, C. Weber, and T. O'Connell*
Lyndsey J. Alm (Environmental Resources Management (ERM)/USA)

The Long Road to NPL Site Deletion for an Intel South Bay VOC Site. *R.S. Makdisi and T. Cooper*
Richard S. Makdisi (Stellar Environmental Solutions, Inc./USA)

* **Post-ERH Exit Strategy at Air Force Plant No. 4.** *R.B. Wice, R. McDaniel, J. Triplett Kingston, G. Walters, and R. Barringer*
Richard B. Wice (Shaw Environmental, Inc./USA)

Remediating Metal Plating-Impacted Soils with Bankrupt Owners. *S. Figgins, R. Roseman, and A. LaPostal*
Steve Figgins (Brown and Caldwell/USA)

* **Revisiting Past Decisions, Defining New Exit Strategies.** *V. King, S. Bowen, N. Voorhies, R. Porges, T. Fox, and T. Battenhouse*
Tad C. Fox (SAIC/USA)

Risk-Based Exit Strategy for an RDX/TCE Plume in a Complex Fractured Rock Aquifer. *M.A. Singletary, W. Gates, R. Basinski, K. Henn, H. Hickey, and T. Brent*
Michael A. Singletary (U.S. Navy/USA)

Site Closure Strategy Model for Creosote Site. *F.R. Coll, D.R. Gray, M. King, K. Paschl, and M. Brouman*
Frederic R. Coll (URS Corporation/USA)

* **A Systematic Approach to Site Closure: Step 1—Effective Characterization.** *M. Ravella, L. Burkhardt, R.J. Fiacco, C. Coladonato, M. Duquoc, E. Moore, and J. Mark*
Louis Burkhardt (Raytheon Company/USA)

* **Use of Risk Management for the Remediation and Closure of a Former Manufactured Gas Plant.** *D. Gabardi and E. Buc*
Dawn Gabardi (ARCADIS/USA)

G1. Improvements in Verification of Natural Attenuation

Platform Papers Monday/Posters (*) Monday Evening
Chairs: Beth Walden (U.S. EPA)
Skip Chamberlain (U.S. Department of Energy)

* **Abiotic, Aerobic Degradation of Chlorinated Ethenes in Groundwater.** *M. Ferrey, C. Adair, and J.T. Wilson*
Mark L. Ferrey (Minnesota Pollution Control Agency/USA)

* **Application of Molecular Biological Tools for Benzene Biodegradation in Southeast Asia.** *T.E. Buscheck, K.C. Harding T.P. Hoelen, D. Mackay, and K. Sublette*
Timothy E. Buscheck (Chevron Energy Technology Company/USA)

* **Closing the Mass Balance on Sources, Donors, Competing Reactions, and Attenuation Processes at Chlorinated Solvent Sites.** *R. Kamath, C. Newell, D. Adamson, B. Looney, and K. Vangelas*
Roopa Kamath (GSI Environmental, Inc./USA)

* **Combined Stable Carbon and Chlorine Isotope Analysis as Evidence for Natural Attenuation of Chlorinated Hydrocarbons.** *F. Volkering, B. van Breukelen, J. Gemoets, K. Sakaguchi-Soder, J. Jager, H. Veld, and M. Elsner*
Frank Volkering (TAUW bv/THE NETHERLANDS)

Conceptual Method for Assessing Long-Term Natural Attenuation for Co-Mingled Plumes. *A. Wani and R. Bost*
Altat H. Wani (Environmental Resources Management, Inc./USA)

Decision Flowchart for the Use of Enhanced Attenuation and Monitored Natural Attenuation—Chlorinated Organics. *J. Kean and K. Wilson*
Judie A. Kean (ITRC/Florida Dept of Environmental Protection/USA)

Demonstration of Monitored Natural Attenuation of a Mixed Plume to Assist Remedial Design. *L. Zeng, K. Everett, and P. Srivastav*
Lingke Zeng (Shaw Environmental, Inc./USA)

* **Determining a TCE Degradation Rate for a Complex, Mixed Contaminant Plume Using Enzyme Probes.** *D.L. Dettmers, M.H. Lee, A. O'Hagan, and S. Wakelam-Sayler*
Dana L. Dettmers (North Wind, Inc./USA)

Determining In Situ Degradation Rates for Petroleum Compounds via Push Pull Tests under Natural and Biostimulated Conditions. *E.J. Raes, J. Istok, K.L. Sublette, J. Busch-Harris, E. Jennings, A. Peacock, and G. Davis*
Eric J. Raes (Engineering & Land Planning Associates, Inc./USA)

* **Evaluation of Enhanced Attenuation Downgradient of a TCE Source Area.** *M.H. Lee, D.L. Dettmers, J. Rothermel, and L.O. Nelson*
M. Hope Lee (North Wind, Inc./USA)

* **Evaluation of Intrinsic Biodegradation of TCE to Support Monitored Natural Attenuation at Hill AFB.** *M.H. Lee, D. Rodgers, D. Dettmers, K.A. Gorder, and S.C. Smith*
M. Hope Lee (North Wind, Inc./USA)

* **Field Applications of Stable Isotope Analysis for Biodegradation of Benzene and MTBE.** *T.E. Buscheck, T.P. Hoelen, and K.C. Harding*
Timothy E. Buscheck (Chevron Energy Technology Company/USA)

Moving beyond Pump-and-Treat toward Enhanced Attenuation and Combined Remedies: T-Area, Savannah River Site. *B.D. Riha, B.B. Looney, J.V. Noonkester, and G.C. Blount*
Brian B. Looney (Savannah River National Laboratory/USA)

Natural Attenuation—Do We Know Enough to Address the Question of Sustainability? *E. Kalve, E.M. Nichols, C.L. McIlvaine, P.T. Zawislanski, and P. McLoughlin*
Erica Kalve (LFR Inc./USA)

* **Natural Attenuation of Chlorinated Solvents: A Case Study from Naval Air Station North Island.** *T.H. Wiedemeier, J.L. Yux, R.L. Wong, B.C. White, and M.J. Pound*
Todd H. Wiedemeier (T.H. Wiedemeier & Associates, LLC/USA)

Natural Attenuation Rates as Part of Conceptual Model-Based Performance Monitoring for TCE and 1,2-DCA Plumes. *B.L. Hall, K.A. Gorder, P.A. EerNisse, and D.S. Oliver*
Barbara L. Hall (U.S. Air Force/USA)

* **Quantification and Significance of Error in the Domenico Solution to the Three-Dimensional ADR Equation.** *P.C. de Blanc, C.J. Newell, and C.E. Aziz*
Phillip C. de Blanc (GSI Environmental Inc./USA)

* **A Spreadsheet Model to Estimate Sequential Daughter Product Rate Constants.** *D.K. Burnell, J.W. Mercer, and L.S. Sims*
Daniel K. Burnell (GeoTrans, Inc./USA)

Sustainability of Natural Attenuation for Chlorinated Solvents. *T.H. Wiedemeier, J.L. Yux, and M.J. Pound*
Todd H. Wiedemeier (T.H. Wiedemeier & Associates, LLC/USA)

* **Use of Microbial Tools During Source Delineation and Natural Attenuation Evaluation.** *D.L. Dettmers, J.E. Gallegos, M.H. Lee, T.W. Macbeth, J.L. Weidhaas, and J. Skog*
Dana L. Dettmers (North Wind, Inc./USA)

Using an Integrated Approach to Investigate Natural Biodegradation of Coal-Tar Compounds in a Deep Groundwater Aquifer under Anaerobic Conditions. *M. Christophersen, M.M. Broholm, D. Hunkeler, D.L. Baun, L. Andersen, C. Westergard, H.C.L. Hansen, H. Skou, and P.L. Bjerg*
Mette Christophersen (Region of Southern Denmark/DENMARK)

G2. Innovative Site Assessment Tools and Strategies

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: Kent S. Sorenson (CDM)
Robert L. Kelley (Regenesis)

* **Assessment and Remediation of Vapor Intrusion to Indoor Air at South Mesa State Superfund Site, Gilbert, Arizona.** *J.N. Clarke*

James N. Clarke (MACTEC Engineering & Consulting, Inc./USA)

* **Attenuation and Isotopic Effects from Molecular Diffusion in Fractured Aquifers.** *H. Aktor and K.A. Nielsen*
Henrik Aktor (AKTOR Innovation ApS/DENMARK)

Comparative Assessment at Four DNAPL Sites: Source/Plume Remedial Options. *N. Basu, P.S.C. Rao, M.D. Annable, K. Hatfield, R.W. Falta, S. Nandy, M. Mallavarapu, and R. Naidu*
Nandita Basu (Purdue University/USA)

Compound-Specific Isotope Analysis in Vapor Intrusion Investigations: Case Study Reviews. *P.W. McLoughlin and R.J. Pirkle*

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

* **Creosote Delineation by Rapid Optical Screening Tool (ROST™) Laser-Induced Fluorescence System.**

S. Maxwell and S. Ross

Stephen Maxwell (ENSR Corporation/USA)

* **Design and Performance of an Innovative Vapor-Sampling Apparatus.** *C. Domaradzki, M. Frak, G.K. Shkuda, and A. Coenen*

Gregory K. Shkuda (ERM/USA)

Economical Site Characterization Using High-Resolution Passive Soil Gas Sampling. *J.W. Hodny, G. Schaefer, and D. Timmons*

Jay W. Hodny (W.L. Gore & Associates, Inc./USA)

* **Empowering Field Analysis with Real-Time Data Management Support.** *J. Sohl and N. Tillman*

John Sohl (Columbia Technologies/USA)

* **Fluorescent Dye-Tracing Used to Investigate Preferential Flow Paths in a DNAPL-Contaminated Aquifer.** *R.C. Sents, M.H. Otz, and J.S. Fox*

Robert C. Sents (ERM/USA)

Lifecycle Remedial Design for a 60-Acre CAH Plume Supported by Innovative Site Characterization. *T. King, B. Bond, and A. Hackenberg*

Trevor King (Langan Engineering & Environmental Services/USA)

Mass Flux Distribution Using the High-Resolution Piezocone and GMS. *M. Kram, N. Jones, J. Chau, G. Robbins, and A. Bagtzoglou*
Mark Kram (U.S. Navy/USA)

* **Passive Flux Meter (PFM) Monitoring of Hydraulic and Contaminant Flux During NZVI Treatment of cVOCs.** *K.J. Baltz, R.S. Keenan, and N. Conrey*
Kelly J. Baltz (Golder Associates Inc./USA)

* **The Power of Combining Rapid Screening Technologies with Environmental Visualization Software.** *L.M. Rebele and S. Liu*
Leo Rebele (Brown and Caldwell/USA)

* **Preliminary Investigation of a Perchloroethylene (PCE) Groundwater Plume Using a Passive Soil Gas Survey.** *J.N. Clarke, D.F. Goodwin, and H. O'Neill*
James N. Clarke (MACTEC Engineering & Consulting, Inc./USA)

* **Rapid Site Delineation Using Surface Geophysics and Soil Conductivity/Membrane Interface Probe.** *I. Utne, R. Lamb, and M. Eversman*
Isaiah Utne (ERM/USA)

* **Relevance of Mass Flux in the Site Characterisation Framework.** *D. Thomas, K. Mundle, G. Patrick, M.D. Annable, and P.S.C. Rao*
David G. Thomas (Golder Associates Pty. Ltd./AUSTRALIA)

* **A Sensor System for Real-Time Environmental Detection and Monitoring.** *D.P. Campbell, D. Gottfried, and K.C. Caravati*
Daniel P. Campbell (Georgia Institute of Technology/USA)

* **Two Rapid Site Characterization Strategies—Intensive DPT Groundwater Characterization and the MIP.** *D.R. Peacock, D. Li, and A. Kunkel*
Derek R. Peacock (URS Corporation/USA)

Using EPA's Visual Sampling Plan for Site Characterization and Remedy Performance Evaluation. *P.L. Ernst, R.G. Perry, S.F. Li, and R.C. Bost*
Patricia L. Ernst (ERM/USA)

* **Using Perchlorate to Estimate Site-Specific Recharge for Groundwater Pathway Evaluation.** *S. Regmi, J. Stovall, T. Battenhouse, L. Deschaine, and T. Fox*
Tad C. Fox (SAIC/USA)

* **Using Specific Conductance Data to Support Characterization of DNAPL Sites.** *R.J. Fiacco, M. Duquoc, and M.C. Leahy*
R. Joseph Fiacco (ERM/USA)

G3. Verification of Site Restoration Goals Using Performance-Monitoring Tools

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: Russell R. Sirabian (Battelle)

Chuck N. Elmendorf (Panther Technologies, Inc.)

* **Assessment of Biodegradation at a Site Contaminated with Chlorinated Ethenes and Ethanes Using Stable Isotope Analysis.** *T.P. Hoelen,*

T.E. Buscheck, and K.C. Harding

Thomas P. Hoelen (Chevron Energy Technology Company/USA)

* **Field-Derived Microcosm Study of Stable Carbon Isotope Fractionation during Degradation of 1,2,4-Trichlorobenzene.** *H. Howlett, S. Hirschorn, G. Lacrampe-Couloume, E. Edwards, B. Sherwood Lollar, G. Grant, and S. Dworatzek*

Michael R. Howlett (University of Toronto/CANADA)

Geophysical Monitoring of Hydrological and Biogeochemical Transformations Associated with Bioremediation. *S.S. Hubbard, K. Williams, M. Conrad, J.E. Peterson, B. Faybishenko, J. Ajo-Franklin, T.C. Hazen, and P. Long*

Susan S. Hubbard (Lawrence Berkeley National Laboratory/USA)

An Innovative Approach to Move from Active to Passive LNAPL Management. *M. Dexter, T. Palaia, A. Pennino, W. Grannis, and T. Lanning*

Marc Dexter (CH2M HILL/USA)

* **Long-Term Monitoring Program Optimization Fresno Sanitary Landfill Superfund Site.** *Y.J. Nyznyk, G. McCurry, R. TerBerg, and G. Slater*

Yash Nyznyk (CDM/USA)

Modeling Natural Attenuation of TCE in Aerobic Groundwater. *R.C. Starr, M.H. Lee, D.L. Dettmers, M. Delwiche, D. Newby, C. Radtke, A. Paszczynski, R. Paidisetti, M. Conrad, E. Brodie, F. Colwell, and L.O. Nelson*

Robert C. Starr (North Wind, Inc./USA)

Monitoring Site Microbial Ecology after an In Situ Chemical Oxidation Treatment. *G. Davis, B. Balwin, D. Ogles, S. Koenigsberg, and G. Cronk*

Greg Davis (Microbial Insights Inc./USA)

* **A Novel Method for In Situ Measurement of Oxidation Reduction Potential.** *W.A. Farone and T. Palmer*

William A. Farone (Applied Power Concepts, Inc./USA)

* **Sensors: Are They a New Way to Collect Environmental Data for Regulatory Decision-Making?**

S.J. Nagourney

Stuart Nagourney (New Jersey Department of Environmental Protection/USA)

A Study of Quenching Procedures for VOC Sampling at ISCO Sites. *R.A. Brown, T. Pac, R.L. Lewis, M. Lee, and C. Armbruster*

Timothy Pac (ERM/USA)

* **Use of Natural Gamma Logging to Evaluate Well Construction.** *J. Raphael, D. Boehnker, O. Ogbekor, B. Fishwild, and B. Kanzler*

Jessica Raphael (CH2M HILL/USA)

G4. In Situ Soil-Mixing Technologies

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Thomas J. Simpkin (CH2M HILL)

Tom Sale (Colorado State University)

Delivery of ISCO Reagents Using Soil Blending.

J. Haselow, J. Rossabi, E. Escochea, and J. Vanek

John S. Haselow (Redox Tech, LLC/USA)

DNAPL Remediation at Camp Lejeune Using ZVI-Clay Soil Mixing. *C. Bozzini, J. Skeeane, M. Tiburzi, D. Hood, and B. Lowder*

Christopher Bozzini (CH2M HILL/USA)

* **Economics of Combined Thermal and ZVI Large-Diameter Auger Soil-Mixing Remediation Technology.**

P. La Mori and E. Kirkland

Phillip N. La Mori (FECC, Inc./USA)

* **Effectiveness of ZVI Injection and Soil Mixing in Remediating a Trichloroethene Source Area.** *K. Dobson, M. Singer, and D. Timmons*

Keith M. Dobson (CH2M HILL/USA)

* **Field Implementation of ZVI and Clay Soil Mixing for a Multicomponent NAPL.** *E. Killenbeck, E. Panhorst, F. Lenzo, A. Faulkner, and F. Payne*

Eric R. Killenbeck (ARCADIS/USA)

* **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 Soil Mixing: Insights from Laboratory-Scale Studies. *M. Olson and T. Sale*

Mitchell Olson (Colorado State University/USA)

* **Multiple Amendment Pilot Testing for Full-Scale CVOC Remedial Design.** *T. Adams and G. Vierkant*

Timothy V. Adams (Roux Associates, Inc./USA)

An Overview of In Situ Soil Mixing Remediation Technologies. *T. Sale and S. Day*
Tom Sale (Colorado State University/USA)

Remediation of Chlorinated Hydrocarbons Utilizing Zero-Valent Iron via Soil Mixing. *S. Ruffing, C. Pike, M. Speranza, and N. Flaherty*
Steven H. Ruffing (Tetra Tech NUS, Inc./USA)

Steam, Hot Air, and Zero-Valent Iron-Enhanced In Situ Soil Mixing with Large-Diameter Auger, Cape Canaveral Air Force Station, Florida. *M. Higgins, P. Juriasingani, S. Downes, R. Rolon, H. Faircloth, R.A. Kline, and M. Kershner*
Purshotam Juriasingani (Tetra Tech, Inc./USA)

G5. Air Sparging and Soil Vapor Extraction

Platform Papers Wednesday/
Posters (*) Tuesday Evening

Chairs: David J. Becker (U.S. Army Corps of Engineers)
Richard L. Johnson (Oregon Health & Science University)

* **Case History and Lessons Learned for TCFM (Freon 11) Plume Remediation Using Air Sparging.** *R.F. Simcik and R. Santos-Ebaugh*
Robert F. Simcik (Tetra Tech NUS, Inc./USA)

Deep-Aquifer Air Sparging Successfully Remediates Dissolved PCE. *L.S. Colella, M. Skeeane, J.L. Bossart, and R. Armstrong*
Linda S. Colella (CH2M HILL/USA)

* **Effectiveness of Ozone Sparging Combined with Horizontal and Vertical Soil Vapor Extraction Remediation Systems.** *S.J. Bhuyan, C.E. Blanchard, W.M. Gill, and M.R. Latin*
Charles E. Blanchard (Groundwater & Environmental Services, Inc./USA)

Engineering Problems and Solutions Related to the Field Implementation of Air and Ozone Sparging. *L. Goldstein, D. Bradshaw, M. Adams, H. Kramer, and T. Dowling*
Lucas Goldstein (LFR Inc./USA)

Evaluation of Air Sparging Trench for the Treatment of VOCs and Arsenic. *M.C. Marley, O.J. Uppal, D. Keane, and D. Peschel*
Michael C. Marley (XDD, LLC/USA)

Oxygen Sparging for Bioremediation of PAHs from a Former Manufactured Gas Plant Site. *D. Falatko, J. Higgins, S.A. Fam, G. Pon, and E. Green*
David Falatko (Innovative Engineering Solutions, Inc./USA)

* **Pneumatic Fracturing for Enhancing High-Vacuum Vapor Liquid Extraction.** *J. Barnes, D. Yaffe, and B. Dean*
Jacob Barnes (Earth Tech, Inc./USA)

* **Remediation of Chlorinated Ethene Impacts within Fractured Crystalline Rock.** *J.P. Waddell, J.R. Field, M. Bennett, and K.S. Novakowski*
Jonathan P. Waddell (Groundwater & Environmental Services, Inc./USA)

* **Soil Vapor Extraction Influence in a Deep Vadose Zone and Multiple-Release Setting.** *S. Winners, M. Trudell, and M. Gard*
Steve Winners (Worley Parsons Komex/USA)

TCE Source Area Remediation by Soil Vapor Extraction and In-Well Stripping. *J.M. Frain and M. Resh*
Jil M. Frain (EA Engineering, Science, and Technology, Inc./USA)

* **Transition from Active to Enhanced Attenuation (EA) Using Passive Soil Vapor Extraction (PSVE).** *B. Riha and T. Whiteside*
Brian D. Riha (Savannah River National Laboratory/USA)

* **Vadose Zone Source Removal and Resulting Effects on Groundwater at Drycleaner Sites.** *M. Lodato and W. Linn*
Michael Lodato (Geosyntec Consultants, Inc./USA)

G6. Improvements in Pump-and-Treat Applications

Platform Papers Wednesday/
Posters (*) Tuesday Evening

Chairs: James T. Gibbs (Brown and Caldwell)
Michael J. Pound (U.S. Navy)

Biological Degradation Enhanced with Groundwater Pump-and-Treat. *R. Larson, J. Applegate, K. Warner, R. Cowdery, W. Burns, and J. Winters*
Joseph Applegate (LFR, Inc./USA)

* **Comprehensive Evaluation of Pump-and-Treat System Performance Fresno Sanitary Landfill.** *G. McCurry, Y. Nyznyk, W. Pickus, and G. Slater*
Gordon N. McCurry (Camp Dresser & McKee, Inc./USA)

* **Conversion of a Pump-and-Treat System to ISCO Recirculation within Fractured Bedrock.** *D.W. Tomlinson, R.T. Wroblewski, and H. He*
Derek W. Tomlinson (ERM/USA)

Criteria for Assessing the Appropriateness of Pump-and-Treat as a Remedial Technology. *R.C. Bost, A. Wani, and R. Lee*
Richard C. Bost (ERM/USA)

Fifth International Conference on Remediation of Contaminated Sediments

Jacksonville, Florida • February 2-5, 2009

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 Fourth Sediments Conference (Savannah, January 2007) was the largest to date in this series. It was attended by 800 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 300 platform and poster presentations and four panel discussions.



The 2009 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 co-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 29, 2008. Abstracts will be due in June 2008. The Conference is sponsored and organized by Battelle.

* **Enhanced In Situ Bioremediation to Supplement Pump-and-Treat Operations.** *D.R. Gray, F.R. Coll, J. Powers, and D. Raymond*
Douglas R. Gray (URS Corporation/USA)

* **Expediting Cleanup of a Pump-and-Treat Site by Use of Chemical Oxidation Technology.** *G. Cronk*
Gary Cronk (JAG Consulting Group, Inc./USA)

* **Full-Scale Groundwater Circulation Well (GCW) Technology to Contain Migration of Chlorinated Solvents.** *F. Lakhwala, J. Mueller, E. Alesi, M. Sick, S. Chang, and J. Huang*
Fayaz Lakhwala (Adventus Americas, Inc./USA)

* **Optimization of a Water Supply Well for Recovery of a Trichloroethene Plume.** *J.C. Roberts, C.B. Stay, R.A. Brown, and S.B. Walsh*
John C. Roberts (ERM, Inc./USA)

* **Trench-Based Groundwater Remediation in a Low-Permeability Soil.** *R.M. Jones, R.J. Kimball, P.A. Karas, and J.J. Eisenbeis*
Robin M. Jones (CDM/USA)

G7. Management of Contaminated Sediments Sites

Platform Papers Thursday/
Posters (*) Wednesday Afternoon
Chairs: Bruce Fidler (Malcolm Pirnie, Inc.)
Bart Chadwick (U.S. Navy)

Active Capping for the Management of Contaminated Sediments. *D. Reible*
Danny Reible (University of Texas/USA)

* **Adsorption of Phthalic Esters onto Sediments at Lanzhou Section of Yellow River.** *H. Chen, H. Guo, M. Zhou, and Y. Yang*
Hui Chen (Northwest Normal University/CHINA)

Challenges for Localized Sediment Remediation Projects within the Portland Harbor Superfund Site. *L. McWilliams*
Laura McWilliams (URS Corporation/USA)

* **Engineering Test Evaluation for Capping of Manufactured Gas Plant and Wood Milling Contaminated Sediments in Ashland Harbor, Wisconsin.** *H. Huls, W. Bosworth, and J. Winslow*
Hubert H. Huls (URS Corporation/USA)

* **Evaluation of Biodegradation Potential in Contaminated Lake Sediment under Aerobic and Anaerobic Conditions.** *A. Smith, D.D. Reible, M.J. Kirisits, K.A. Kinney, G.E. Speitel, and C.E. Kiehl-Simpson*
Anthony Smith (The University of Texas at Austin/USA)

* **Evaluation of Gas Ebullition on the Release of Contaminants from Sediments.** *T.M. Lyons*
Terrence M. Lyons (U.S. EPA/USA)

Evaluation of Groundwater-Saltwater Interaction within the Tidal Influence Zone. *J. Weaver, C. Talbot, M. Bloes, B. Longino, and A. Daus*
Jeffrey Weaver (Geomatrix Consultants, Inc./USA)

Fate of Persistent Chemicals in Tidal Passaic River Sediments. *S. McDonald, A. Accardi-Dey, L. Bossi, S. Thompson, S. Gbondo-Tugbawa, J. Atmadja, E. Garvey, and B. Fidler*
Shane D. McDonald (Malcolm Pirnie, Inc./USA)

* **Geoenvironmental Aspect of Design Criteria for Field Implementation of Sediment Capping.** *H. Choi, Y. Ok, H. Gil, and G. Kim*
Geonha Kim (Hannam University/SOUTH KOREA)

Guidance for Monitored Natural Recovery at Contaminated Sediment Sites. *V. Magar, D.B. Chadwick, J.M. Conder, T. Dekker, J.A. Stevens, M. Mills, and T. Bridges*
Victor S. Magar (ENVIRON International Corporation/USA)

* **Innovative Sediment Cap Design and Habitat Enhancement at a Sensitive Military Site.** *A. Bullard, S. Chattopadhyay, T. Himmer, and A. Gutberlet*
Andrew K. Bullard (Battelle/USA)

* **Laboratory Studies on the Utility of a Sand Layer for Controlling NAPL Migration from Sediment during Ebullition.** *E.L. McLinn and T.R. Stolzenburg*
Eugene L. McLinn (RMT, Inc./USA)

* **Migration Potential of DDT through In-Place Sediment Caps.** *S. Chattopadhyay*
Sandip Chattopadhyay (Tetra Tech EMI/USA)

Multiple-Lines-of-Evidence Assessment to Identify Groundwater Discharge Contribution to Sediment Contamination. *C. Hawley, A. Wood, W. Locke, and T. Martin*
Christine Hawley (Integral Consulting, Inc./USA)

Outcomes-Based Approach to Managing Sediment Sites. *D.F. Hayes*
Donald F. Hayes (University of Louisiana at Lafayette/USA)

* **Reactive Sediment Capping Pilot-Study Phase I: Background and Conceptual Design.** *D. Bessingpas, N. Gensky, A. Coleman, D. Reible, and J. Clock*
David G. Bessingpas (ARCADIS BBL/USA)

Sediment Quality Objectives for Enclosed Bays and Estuaries of California. *C. Beegan and S. Bay*
Chris Beegan (State Water Resources Control Board/USA)

* **Semipermeable-Membrane Devices to Quantify Effectiveness of Sediment Capping Strategies.** *P. Adriaens, M.-Y. Li, A. Michalak, J. Wolfe, and N. Barabas*
Peter Adriaens (University of Michigan/USA)

* **Spatial Distribution of Biogeochemical Processes Following In Situ Capping of Contaminated Sediments.** *D.W. Himmelheber, K.D. Pennell, M. Taillefert, and J.B. Hughes*
David W. Himmelheber (Georgia Institute of Technology/USA)

Sustainability Considerations in Sediment Cleanups—Opportunities and Challenges. *G.W. Peterson*
Gregory W. Peterson (Limno-Tech, Inc./USA)

* **Tennessee Products/Chattanooga Creek Remediation Utilizing AquaBlok® Low-Permeability Thin Capping.** *J.H. Hull, J.A. Collins, and C. Zeller*
John H. Hull (AquaBlok, Ltd./USA)

G8. In Situ and Ex Situ Treatment of Contaminated Sediments

Platform Papers Thursday/
Posters (*) Wednesday Afternoon
Chair: Eric A. Foote (Battelle)

Beneficial Use of Marine Sediments in the Road Foundation: Mechanical and Environmental Behaviours. *N.T. Tran, R. Zentar, and N.E. Abriak*
Ngoc Thanh Tran (Ecole des Mines de Douai/FRANCE)

Biogeochemical Effects on the Performance of Activated Carbon Sediment Caps for In Situ Management of PCB-Contaminated Sediments. *J.L. Fairey, K.M. McDonough, and G.V. Lowry*
Gregory V. Lowry (Carnegie Mellon University/USA)

Dredged Organic Harbor Mud—A Challenging Construction Material Deformation Behavior and Evolution of Shear Strength and Permeability of Soft Dredged Harbor Mud. *B.F. Schlue, S. Kreiter, and T. Moerz*
Benjamin F. Schlue (University of Bremen/GERMANY)

Field Testing of Activated Carbon Mixing and In Situ Stabilization of PCBs in Sediments. *R. Luthy, Y.-M. Cho, A.J. Kennedy, T.S. Bridges, and U. Ghosh*
Richard G. Luthy (Stanford University/USA)

In Situ Stabilization/Solidification of Catalyst and Sediment Containing Petroleum Compounds and Metals. *R. Singh, S. Horne, and K.A. Schroeder*
Rajesh Singh (Langan Engineering & Environmental Services/USA)

* **Simultaneously Extracted Metals and Acid Volatile Sulfides for Sediments in a Florida Water Body.** *P.J. Linton*
P. James Linton (ARCADIS BBL/USA)

Solidification/Stabilization of PCB- and Coal Tar-Impacted Sediment at the Sydney Tar Ponds. *C. Holt, B. Noble, and F. Potter*
Bruce Noble (Earth Tech Canada/USA)

H1. Energetics Residues: Range Characterization and Management

Platform Papers Monday/Posters (*) Monday Evening

Chairs: Les Clarke (Battelle)
Greg Swanson (Tetra Tech EMI)

Energetic Residue Mass Deposition Resulting from Live-Firing of Military Munitions. *M.R. Walsh, M.E. Walsh, C.M. Collins, J.E. Zufelt, and C.A. Ramsey*
Michael R. Walsh (U.S. Army Corps of Engineers/USA)

Energetic Residues Deposition from 66-mm and 84-mm Antitank Munitions. *S. Thiboutot and G. Ampleman*
Sonia Thiboutot (DRDC Valcartier/CANADA)

EPA Method 8330B: Data Quality Impact on the Characterization of Energetic Residues on Military Training Ranges. *A.D. Hewitt, T.F. Jenkins, M.E. Walsh, M.R. Walsh, S.R. Bigl, M.A. Chappell, and C.A. Ramsey*
Alan D. Hewitt (U.S. Army Corps of Engineers/USA)

* **Hydraulic and Biochemical Influence of Surface Vegetation on Fate and Transport of ERCs.** *I. Feliciano, S. Hwang, and I. Padilla*
Sangchul Hwang (University of Puerto Rico/USA)

Investigation and Analysis of Munitions Constituents at a Practice Range Facility. *C.T. Coonfare, M.E. Kelley, S.E. McCall, A. Lind, and G. Buckner*
Christopher T. Coonfare (Battelle/USA)

* **Propellant Residues and Gases Emitted during 105-mm Live Firing at the Muffler Installation in Nicolet, Lac St-Pierre, Canada.** *G. Ampleman, S. Thiboutot, I. Poulin, and B. Quemerais*
Guy Ampleman (DRDC Valcartier/CANADA)

H2. Treatment of Munitions Residues in Soil and Groundwater

Platform Papers Monday/Posters (*) Monday Evening

Chair: Wilson S. Clayton (Aquifer Solutions, Inc.)

* **Accelerated Remediation of RDX Using Enhanced Bioremediation Technology.** *J. Peevler-Boyd, B. Caldwell, R. Britto, and R. Arnseth*
Janna Peevler-Boyd (Tetra Tech, Inc./USA)

* **Aquifer Characterization for an ISCO Treatment of an RDX-Contaminated Aquifer.** *J. Albano, C. Chockjaroenrat, S. Comfort, V. Zlotnik, T. Halihan, and S. Onanong*
Jeffrey A. Albano (University of Nebraska/USA)

MUNITIONS RESPONSE AND OPERATIONAL RANGE SUSTAINABILITY CONFERENCE

Summer 2009

The *Munitions Response and Operational Range Sustainability Conference* will promote the exchange of leading-edge technical information that supports (a) improving and enhancing cleanup processes and techniques used at former munitions sites and (b) practicing the environmental stewardship necessary to sustain the military's ability to conduct realistic air, land, and sea training into the future. Conference participants will be remedial project managers, range managers, regulators, researchers in private industry and universities, and other stakeholders concerned with converting munitions sites to other uses or with maintaining the effectiveness of active sites.

The U.S. Department of Defense (DoD) established the *Military Munitions Response Program* (MMRP) to manage the environmental, health and safety, and operational issues presented by unexploded ordnance (UXO), discarded military munitions (DMM), and munitions constituents (MC) at former munitions sites. DoD's *Sustainable Range Management* initiative is intended to ensure that operational ranges can be maintained at high levels of readiness to support testing and evaluation of weapon systems and training of armed forces personnel while protecting human health and the environment.

The theme for the 2009 Conference is "Raising the Bar." Among topics the program is expected to cover are advances in detection and discrimination on munitions response sites; enhancements in data collection and reporting; wide area assessment; UXO clearance and disposal; underwater UXO and MC; management of material potentially presenting an explosive hazard (MPPEH); operational range clearance; and application of business processes to MMRP and range sustainability.

Information on Conference date and location will be posted at www.battelle.org/rangecon in January 2008. To inquire about opportunities for your organization to co-sponsor the Conference, please call 800-783-6338. Details on abstract preparation and submission, exhibits, and short courses will be posted in May 2008. Abstracts will be due in September 2008. The Conference is sponsored and organized by Battelle and will be chaired by Les Clark and Jim Abbott.

* **Bench-Scale Peroxide and Alkaline Hydrolysis Comparison Studies for DNT.** *R. Britto and M. Patel*
Ronnie Britto (Tetra Tech/USA)

* **Coupled Abiotic/Biotic Degradation of N-Nitrosodimethylamine in Subsurface Sediments.** *J.E. Szecsody, J.P. McKinley, A. Breshears, R.K. Kukkadapu, and C. Burns*
Jim E. Szecsody (Pacific Northwest National Laboratory/USA)

Current and Future Research Perspectives for Energetic Materials in Soil and Groundwater. *A. Leeson*
Andrea Leeson (SERDP/ESTCP/USA)

* **Degradation of Recalcitrant Chemical and Biological Agents in Landfill Leachates.** *W.J. Davis-Hoover, M.M. Wade, M. Gooden, T. Biggs, M. Sheely, J. Cambria, and P.G. Koga*
Wendy J. Davis-Hoover (U.S. EPA/USA)

* **Degradation of TATP, TNT, and RDX Using Mechanically Alloyed Metals.** *R. Fidler, C.L. Geiger, C.A. Clausen, and M.E. Sigman*
Rebecca Fidler (University of Central Florida/USA)

Degradation Routes of RDX: Strategies to Enhance In Situ Remediation. *J. Hawari, J.-S. Zhao, D. Fournier, A. Halasz, and D. Manno*
Jalal Hawari (National Research Council/CANADA)

* **Energetic Residues from Artillery and Mortar Live-Fire: Studies on Alaskan Training Ranges.** *M.E. Walsh, C.M. Collins, S. Taylor, M.R. Walsh, A.D. Hewitt, T.A. Douglas, and C.A. Ramsey*
Marianne E. Walsh (U.S. Army Corps of Engineers/USA)

Evaluating Permanganate Performance during an In Situ Treatment of an RDX-Contaminated Aquifer. *S. Comfort, J. Albano, C. Chokejaroenrat, S. Onanong, and W. Clayton*
Steve Comfort (University of Nebraska/USA)

* **Field-Scale Catalyst Reactor for Treatment NDMA, TCE, and Nitrate.** *C. Schaefer, L. Archibald, and T. Cooper*
Charles Schaefer (Shaw Environmental, Inc./USA)

* **In Situ Bioremediation of Energetic Compounds in Groundwater.** *P.B. Hatzinger, D. Watt, C. Schaefer, K. Gerdes, M. Lobsiger, and P. Sheehan*
Paul B. Hatzinger (Shaw Environmental, Inc./USA)

* **In Situ Ozone Oxidation of High Explosives in the Vadose Zone.** *B.K. Marvin, W.S. Clayton, and S. Seitz*
Bruce K. Marvin (Aquifer Solutions, Inc./USA)

* **Investigating the Role of Fresh Mineral Surfaces on the Fate of Explosives in Soils.** *T. Douglas, L. Johnson, C. Collins, M. Walsh, C. McGrath, and C. Weiss*
Thomas A. Douglas (U.S. Army/USA)

* **Laboratory and In Situ Treatability Testing for Bioremediation of Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX) by the Dechlorinating Consortium WBC-2.** *M.M. Lorah, E.T. Vogler, P. Dennis, D. Graves, and J. Gallegos*
Michelle M. Lorah (U.S. Geological Survey/USA)

* **Laboratory Investigations of RDX Degradation by Permanganate.** *C. Chokejaroenrat, J. Albano, S.D. Comfort, S. Ornanong, and C.E. Harris*
Chanat Chokejaroenrat (University of Nebraska-Lincoln/USA)

* **Optimized Decomposition of Munition Constituent RDX by Electrolytic Generated Alkaline Front.** *D.B. Gent, J.L. Davis, A.H. Wani, and A. Alshawabkeh*
David B. Gent (U.S. Army Corps of Engineers/USA)

* **Performance-Based Acquisition of RDX in Low-Permeability Clay Aquifer Using In Situ Biodegradation.** *S. Muffler, R. Arnseth, B. Caldwell, and R. Allison*
Steve Muffler (Tetra Tech, Inc./USA)

Reduction of TNT and RDX by Core Material from a Permeable Reactive Barrier. *J.T. Nurmi, P.G. Tratnyek, R.L. Johnson, R.B. Thoms, and R. O'Brien Johnson*
Paul G. Tratnyek (Oregon Health & Science University/USA)

Successful In Situ Biological Reduction of High Explosives in Groundwater. *W.S. Clayton, S. Seitz, V. Holmes, B. Marvin, and T. Biggs*
Wilson S. Clayton (Aquifer Solutions, Inc./USA)

H3. Evaluation of Background Metals in Soil and Groundwater

Platform Papers Tuesday/Posters (*) Monday Evening
Chairs: Anne Lewis-Russ (Earth Tech, Inc.)
Stephen H. Rosansky (Battelle)

Building a Better Background Data Set: Sample Size, Real-World Constraints, and the Importance of Considering Geochemistry. *J. Myers and K. Thorbjornsen*
Jonathan Myers (Shaw Environmental, Inc./USA)

Environmental Background Analysis of Metals in Soil at Navy Oahu Facilities. *T. Hanneman and W. Wen*
Thomas F. Hanneman (Earth Tech, Inc./USA)

Evaluation of Arsenic in Groundwater—Naturally Occurring or a Result of Petroleum Contamination? *M.J. Martin, T. Martin, M. Stanton, and M. Brearly*
Michael J. Martin (Integral Consulting, Inc./USA)

* **Geochemical Evaluation of Soil Background Metals and Their Relation to Soil Minerals.** *A. Lewis-Russ, C.L. Stein, M. Sweeney, D. Oggeri, S. Duda, M. Stevens, and G. Fraley*
Anne Lewis-Russ (Earth Tech, Inc./USA)

* **Heavy Metals in an Urban Watershed in Southeastern Michigan.** *K.S. Murray, D.T. Rogers, and M.M. Kaufman*
Kent S. Murray (University of Michigan/USA)

Mapping the Background Soil Geochemistry of North America. *D.B. Smith, M.B. Goldhaber, and A. Rencz*
David B. Smith (U.S. Geological Survey/USA)

Soil Geochemical Baselines in Northern California.
M.B. Goldhaber, J.M. Morrison, J. Holloway, and D.B. Smith
Martin B. Goldhaber (U.S. Geological Survey/USA)

H4. Remediation of Lead- and Mercury-Contaminated Media

Platform Papers Tuesday/Posters (*) Monday Evening

Chairs: Alan G. Seech (Adventus Americas, Inc.)
Eliot D. Cooper (Vironex, Inc.)

Bioremediation of Mercury Contamination in Kazakhstan: A Multifaceted Approach. *K.A. Kajenthira, D. Porcelli, M. Gardner, S.A. Jackman, T. Scott, O. Riba, J. Wingate, F. De Leij, T. Hutchings, M.A. Ilyushchenko, and R.I. Kamberov*
Kobika A. Kajenthira (Oxford University/UNITED KINGDOM)

* **Evaluation of Risks Associated with Mercury Pollution at a Former Chloralkali Facility in Kazakhstan.** *M. Ilyushchenko, R. Kamberov, T. Tanton, S. Ullrich, and P. Randall*
Paul M. Randall (U.S. EPA/USA)

Field, Laboratory, and Modeling Assessment of Metals Treatment via Iron Addition. *T. Martin and M. Martin*
Todd Martin (Integral Consulting, Inc./USA)

* **Groundwater Modeling of Mercury Pollution at a Former Mercury Cell Chloralkali Facility in Pavlodar City, Kazakhstan.** *V. Panichkin, O. Miroshnichenko, M. Ilyushchenko, T. Tanton, and P.M. Randall*
Paul M. Randall (U.S. EPA/USA)

Managing Transient Metals Mobilization in Anaerobic Bioremediation. *J.F. Horst, J. Gillow, and R. Ellis*
John F. Horst (ARCADIS U.S., Inc./USA)

A New Biological System to Remove Mercury to Extra-Low Levels. *Y. Ma*
Yanguo Ma (GE Water and Process Technology/USA)

* **Novel Chipseal Cover for Lead-Impacted Soils from a Silver-Mining Operation.** *E. Tyler and R. Petrisko*
Edward Tyler (Kleinfelder West Inc./USA)

Pilot-Scale In Situ Biotransformation of Mercury-Contaminated Groundwater in Kazakhstan Utilizing Native Bacteria. *S.A. Abdrashitova, R. Devereux, S. Jackman, and W.J. Davis-Hoover*
Wendy J. Davis-Hoover (U.S. EPA/USA)

Use of a Ferrous Sulfate-Sodium Dithionite Blend to Treat a Dissolved-Phase Cr(VI) Plume. *R.D. Ludwig, C. Su, P. Clark, F. Beck, T.R. Lee, R.T. Wilkin, S.D. Acree, R.R. Ross, and A. Keeley*
Ralph D. Ludwig (U.S. EPA/USA)

* **Use of Bioaccessibility Assays for Lead Exposure Assessment.** *J. Weber, E. Smith, and A. Juhasz*
John Weber (University of South Australia/AUSTRALIA)

H5. Innovative Approaches for Treating Metals

Platform Papers Tuesday/Posters (*) Tuesday Evening

Chairs: Bill Deutsch (Pacific Northwest National Laboratory)
Ralph D. Ludwig (U.S. EPA)

* **Biosorption of Ni (II) by Green Algae.** *A. Gupta and R. Soni*
Asha Gupta (Guru Jambheshwar University/INDIA)

In Situ Chemical Stabilization of Antimony in Groundwater Using Hydrous Ferric Oxide. *T. Slater, E.C. Ipsen, B.D. Magee, and E. Dmitrovic*
Todd Slater (Legacy Site Services, LLC/USA)

In Situ Metal Remediation in Piedmont Aquifer. *D. Chiang, K. Bechely, and J. Morrison*
Dora Sheau-Yun Chiang (Earth Tech, Inc./USA)

In Situ Treatment of Groundwater Impacted with Copper, Cobalt, and Nickel. *R. McGregor, B. Tunnicliffe, K. Bolanos-Shaw, and A. Seech*
Rick McGregor (Vertex Environmental Solutions, Inc./CANADA)

* **Mercury-Arsenic Removal Media.** *Z. Wang, J. Olsta, and J. Darlington*
Zhen Wang (CETCO/USA)

* **A Pyoverdinin Siderophore Produced by *Pseudomonas aeruginosa* CHL-004 Binds Lead and Other Heavy Metals.** *D.J. Feldhake, R.J. Grosser, and W.J. Davis-Hoover*
Wendy J. Davis-Hoover (U.S. EPA/USA)

* **Remediation of a Mercury-Contaminated Site: A Case Study in India.** *M.P. Patil, T. Chakrabarti, and A.M. Deshkar*
Mahendra P. Patil (National Environmental Engineering Research Institute/INDIA)

Removal of Mercury in Groundwater via Chemical Reduction and Air-Stripping. *D.G. Jackson, B.B. Looney, M.C. Thompson, J.J. Kubar, and T.F. Kmetz*
Dennis Jackson (Savannah River National Laboratory/USA)

Stabilization of Soil and Groundwater Impacted by Arsenic- and Lead-Bearing Iron Oxide Slag. *J. Gillow, J. Horst, M. Hanish, D. Liles, C. Lutes, R. Ellis, B. Deutsch, and J. Rickner*
Jeff Gillow (ARCADIS U.S., Inc./USA)

Synergistic Effect for Lead Immobilization by Combined Application of Phosphate and Mn/Fe-Based Materials. *D.-Y. Yu, M.K. Banks, and A.P. Schwab*
Do-Yun Yu (ERM/SOUTH KOREA)

* **Use of Zero-Valent Iron for the Reduction of Selenium and Nitrate.** *M. Liskowitz, S. Chen, J. Hamill, and R. Gerads*
Michael Liskowitz (ARS Technologies/USA)

H6. Detection and Treatment of Chromium and Other Heavy Metals

Platform Papers Wednesday/
Posters (*) Tuesday Evening
Chairs: Bruce M. Sass (Battelle)
Richard T. Wilkin (U.S. EPA)

* **Bench-Scale Study on Hexavalent Chromium Reduction by Chemical and Biological Treatments.** *X. Zhai, D. Root, and T. Ladaa*
Xihong Zhai (Shaw Environmental/USA)

* **Biosorption Studies on Cr (VI) by Immobilised Fungi.** *A. Gupta, K. Bharti, and P. Kaushik*
Asha Gupta (Guru Jambheshwar University/INDIA)

* **Characterization of Chromium Immobilization in Hydrogen-Supplied Sediment Columns.** *L. Clapp and A. Bandyopadhyay*
Lee W. Clapp (Texas A&M University-Kingsville/USA)

Development of Long-Term Residual Treatment Capacity During In Situ Cr(VI) Reduction. *R. Murphy, J. Ely, J. Gillow, M. Gentile, and J. Harrington*
Margaret Gentile (ARCADIS U.S., Inc./USA)

* **Hexavalent Chromium Reduction by Ferrous Sulfate versus Zero-Valent Iron.** *J. Schwartz, M. Coons, B. Hitchens, and S. Dworatzek*
Jennifer Schwartz (Geosyntec Consultants/USA)

* **In Situ Chemical Reduction of Hexavalent Chromium at a Plating Facility.** *J.T. Francis*
Jude T. Francis (URS Corporation/USA)

In Situ Chemical Reduction of Hexavalent Chromium Using Calcium Polysulfide. *S. Perkins and G. Chui*
Steven M. Perkins (ERM/USA)

In Situ Remediation of Cr(VI)-Impacted Vadose Zone Soils. *E. Zavarin, B.J. Wuerl, A.C. Jones, F. Lenzo, and J. Horst*
Erin Zavarin (ARCADIS/USA)

* **In Situ Remediation of Hexavalent Chromium in Groundwater Using Calcium Polysulfide.** *B.D. Magee, E.C. Ipsen, B.A. Robinson, and J.T. Slater*
Brian D. Magee (ERM/USA)

* **Innovative Injection Design to Support In Situ Treatment of a Large-Scale Cr(VI) Plume.** *J. Forbort, F. Lenzo, W. May, and J. Harrington*
Wesley May (ARCADIS US, Inc./USA)

* **Innovative Reagent Delivery System Design to Support In Situ Treatment of a Cr(VI) Plume.** *M. Gentile, B.J. Wuerl, K. Glover, J.S. Davis, X. Song, and F. Lenzo*
Margaret Gentile (ARCADIS U.S., Inc./USA)

Long-Term Stability of Chromate Reduction in Soil Using Organic Carbon. *T.K. Tokunaga, J. Wan, A. Lanzirrotti, S. Sutton, M. Newville, and B. Rao*
Tetsu K. Tokunaga (Lawrence Berkeley National Laboratory/USA)

* **Predicting Bioavailable Copper through Use of the Biotic Ligand Model and DGT Technology.** *J. Teo*
James A. Teo (Shaw E&I Inc./USA)

* **Reduction of Toxic Cr(VI) into Less Toxic Cr(III) by Two *Synechocystis* sp. and Their Mutants Obtained by Gamma Irradiation.** *S. Razi and S. Hasnain*
Saiqa Razi (University of the Punjab/PAKISTAN)

* **Sequential In Situ Remediation of Hexavalent Chromium and Arsenic in Groundwater.** *J.V. Rouse, R.M. Thomasser, and J. Jonas*
Jim V. Rouse (Virotec USA Inc./USA)

Successful Field-Scale Biological Reduction of Hexavalent Chromium in Groundwater. *D.R. Lippincott, S.H. Abrams, M. Kaouris, M. Gopal, and M.A. Apfelbaum*
David R. Lippincott (Shaw Environmental/USA)

H7. Detection and Treatment of Arsenic

Platform Papers Wednesday/
Posters (*) Tuesday Evening
Chair: Richard Dulcey (ERM)

Arsenic Speciation and Its Impact on Human Health Bioavailability. *E. Smith, A. Juhasz, J. Weber, R. Naidu, M. Rees, A. Rofe, T. Kuchel, and L. Sansom*
Euan Smith (University of South Australia/AUSTRALIA)

* **Assessment and Remediation of a Former Plant Nursery with Arsenic-Contaminated Soil and Groundwater.** *R.K. Sillan, T. Arguden, and G.C. Gilles*
Randall K. Sillan (LFR Inc./USA)

* **Background Concentrations of Arsenic in Seven States.** *K.A.S. Vosnakis, A.E. Perry, L.J.N. Bradley, and K. Madsen*
Kelly A.S. Vosnakis (ENSR/USA)

* **Determination of Arsenic Exposure from Incidental Ingestion of Soil Using Bioaccessibility and Bioavailability Assays.** *A. Juhasz, E. Smith, J. Weber, R. Naidu, M. Rees, A. Rofe, T. Kuchel, and L. Sansom*
Albert L. Juhasz (University of South Australia/AUSTRALIA)

Field Study of Arsenic Removal from Groundwater by Zero-Valent Iron. *R.T. Wilkin, S.G. Acree, R.R. Ross, T.R. Lee, and D.G. Beak*
Richard T. Wilkin (U.S. EPA/USA)

* **Geochemical Fate of Arsenic, Iron, and Lanthanum after Iron Sulfate and Iron Sulfate+Lanthanum Chloride Treatments of Arsenic-Contaminated Soils.** *G. Neupane, R.J. Donahoe, and Y. Qi*
Ghanashyam Neupane (University of Alabama/USA)

* **Geochemistry of Bioaccessible Arsenic.** *W. Cutler and N. Hue*
William Cutler (ERM/USA)

In Situ Chemical Stabilization of Arsenic in Groundwater Using Hydrous Ferric Oxide (HFO) and Ferrous Sulfate. *R. Legrand, S. Fain, G. Shelby, T. Slater, and K. Sullivan*
Robert Legrand (URS Corporation/USA)

* **ISCR for In Situ Stabilization of Arsenic in Soil and Groundwater.** *J. Bold, J. Mueller, and M. Tischuk*
Jeffrey G. Bold (Brown and Caldwell/USA)

* **Natural Attenuation of Arsenic in Groundwater at a Brownfield Redevelopment Site.** *J.R. Starr and D.S. Lipson*
Jesse R. Starr (ARCADIS BBL/USA)

* **Spectrophotometric Determination of Low Levels of Arsenic.** *M. Azad and W.A. Farone*
Maryam H. Azad (Applied Power Concepts, Inc./USA)

* **Sulfide Inhibition of Arsenic Attenuation via Sulfate Reduction.** *M.D. Zimmerman, K.E. Patterson, R.A. Brown, D.B. Vance, and M.D. Lee*
Mitchell D. Zimmerman (ERM/USA)

Treatability of Arsenic-Contaminated Groundwater Using a Waste-Product Fishbone. *B. Fisher, J.W. Talley, and D. Hanson*
Jeffrey W. Talley (University of Notre Dame/USA)

H8. Acid Mine Drainage and Mine-Waste Management

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chair: F. Michael von Fahnestock (Battelle)

* **Application of Lime Slurry Injections to Treat Acidic Aquifers.** *M. Carver, H. Pesari, T. Griffin, and R.A. Brown*
Marc Carver (ERM, Inc./USA)

* **Case Studies—On-Site Bench-Scale Sulfate-Reducing Bioreactors at the Iron King Mine, Arizona.** *R.J. Buchanan, T. Claridge, J. Gusek, and T. Rutkowski*
James Gusek (Golder Associates, Inc./USA)

Designing, Permitting, and Constructing a Biobarrier to Treat Acid Mine Drainage from the Historic Gibson Mine. *P. Eshraghi and J.A. Field*
Pejman Eshraghi (Brown and Caldwell/USA)

* **Diagenesis of Buried Chrome Ore Spoils.** *B.M. Sass, D.T. Kremser, M. Bhargava, and J. Lipps*
Bruce M. Sass (Battelle/USA)

In Situ Chemical Reduction of Hexavalent Chrome at Chromite Ore Processing Residue Sites. *L.H. Carlblom, R.A. Jacobs, G.L. Post, and R.A. Brown*
Richard A. Brown (ERM/USA)

* **Overview of USEPA's ORD Technical Outreach and Support Activities on Hard Rock Mining.** *D.W. Grosse*
Douglas W. Grosse (U.S. EPA/USA)

Pilot-Scale Biochemical Reactor Treatability Study for Metals Removal from Mining-Influenced Water. *C. Venot, L.A. Figueroa, R.A. Brennan, S.R. Al-Abed, and D.J. Reisman*
Rachel A. Brennan (The Pennsylvania State University/USA)

Purifying AMD without Sludge Production Using Liquid-Liquid Extraction. *H.N. Conkle, B.M. Monzyk, and F.M. von Fahnestock*
F. Michael von Fahnestock (Battelle/USA)

Slag Chemistry and Geochemical Extremes at a Metals-Impacted Site. *J. Gillow, J. Horst, M. Hanish, B. Deutsch, and J. Rickner*
Jeff Gillow (ARCADIS U.S., Inc./USA)

* **Use of Mercury Speciation to Characterize a Historic Cinnabar Mine and Retort, Maricopa County, Arizona.** *J.N. Clarke and D. Barsotti*
James N. Clarke (MACTEC Engineering & Consulting, Inc./USA)

H9. Wastewater, Storm Water, and Landfill-Leachate Control

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: Steve Figgins (Brown and Caldwell)
Javier Santillan (U.S. Air Force)

* **Anaerobic Biodegradation of an LNAPL in a Continuous-Flow Fixed-Biofilm Reactor.** *K. Acuna-Askar, K.H. Lozano-Rodriguez, R. Tijerina-Menchaca, M.T. Garza-Gonzalez, J.A. Vidales-Contreras, G. Buitron, and B. Chavez-Gomez*
Karim Acuna-Askar (Universidad Autonoma de Nuevo Leon/MEXICO)

* **Application of Coal Combustion By-Product Aggregates to Landfills as an Alternative Daily Cover.** *A. Fonseca and S. Hwang*
Arellys Fonseca (University of Puerto Rico/USA)

Basic Oxygen Furnace Pilot-Scale Stormwater Treatment System for Arsenic. *G. Parrott, J. Halstead, D. Kantor, J. Monczka, and D. Blowes*
Gerry Parrott (O'Connor Associates Environmental Inc./CANADA)

* **Biodegradation of Aniline by Newly Isolated Strain of *Moraxella* sp. ST3.** *S. Rabeel, S. Ahmed, and A. Hameed*
Shazia Rabeel (Quaid-i-Azam University/PAKISTAN)

* **Biofilm-Based Process for Bioremediation of Industrial Wastewaters Polluted by Aniline.** *J. Masak, A. Cejkova, V. Jirku, J. Hrdinova, T. Krulikovska, and T. Lederer*
Jan Masak (Institute of Chemical Technology (ICT)/CZECH REPUBLIC)

* **Biological Treatment of Selenium in Flue Gas Desulfurization (FGD) Wastewater.** *S. Scarborough, E. Morren, and D. Jerger*
Shirley P. Scarborough (Shaw Environmental, Inc./USA)

* **Bioscreen upon Indigenous Microbiota for Azo Dye Decolorization.** *B.-Y. Chen and C.-Y. Yen*
Bor-Yann Chen (National I-Lan University/TAIWAN)

* **Construction of a Tunnel/Drain Collection System to Control Contaminant Migration in Fractured Bedrock.** *J.R. Bridge, J. Leerkes, C. Tallon, J. Fletcher Baltz, D. Tripp, A. Sheehan, J.H. Guswa, J. Smith, and E. LaPoint*
Jonathan R. Bridge (GeoTrans, Inc./USA)

* **Coupling Continuous Bioreactors with Zero-Valent Iron Filters: The Effect on Removal of High Concentrations of Perchloroethylene.** *D. Herrera-Lopez, J. Garcia-Mena, and H.M. Poggi-Varaldo*
David Herrera-Lopez (CINVESTAV/MEXICO)

* **Decolorization and Degradation of Textile Azo Dyes by Sequential Static-Shaking Culture of *Pseudomonas aeruginosa* CR-25.** *R.K. Kothari and C.R. Kothari*
Ramesh K. Kothari (Christ College/INDIA)

* **Design and Characterization of a Microbial Fuel Cell for Electricity Production from Leachates.** *A. Carmona-Martinez, O. Solorza-Feria, and H.M. Poggi-Varaldo*
Alessandro Carmona-Martinez (CINVESTAV del IPN/MEXICO)

Effect of Trichlorophenol Concentration Increase on Performance of a Fluidized-Bed Bioreactor. *D. Barcenas-Torres, J. Garcia-Mena, and H.M. Poggi-Varaldo*
Diego Barcenas-Torres (CINVESTAV del IPN/MEXICO)

Effectiveness of Bioaugmentation with *Dehalococcoides* on the Dechlorination of Tetrachloroethene in a Landfill Bioreactor. *C. Beal, R. Edwards, G. Sanchez, and B. Vanderglas*
Robert W. Edwards (Noblis/USA)

* **Evaluation of Natural Attenuation at a Closed Landfill Site.** *D.R. Gray, F.R. Coll, and J. Powers*
Douglas R. Gray (URS Corporation/USA)

* **Influence of Sewers on Groundwater Contamination Distribution, Parris Island, South Carolina.** *D.A. Vroblesky*
Don A. Vroblesky (U.S. Geological Survey/USA)

Natural Attenuation Assessment of Chlorinated and Fluorinated Recalcitrant Compounds at a Major Minnesota Landfill. *K.D. Barr and L. Lehmicke*
Kelton D. Barr (Braun Intertec Corporation/USA)

* **Phenol Removal from Wastewater with Encapsulated Horseradish Peroxidase.** *I. Alemzadeh, S. Nejati, and M. Vossoughi*
Iran Alemzadeh (Sharif University of Technology/IRAN)

PRB Treatment of Landfill Leachates Containing Metals and Salts. *P. Eskola and E. Vestola*
Paula Eskola (VTT Technical Research Center of Finland/FINLAND)

* **A Reactivation Strategy Based on Partial Replacement of Biocatalysts for the Post-Treatment of Recalcitrant Pulp Effluents in Fungal Fluidized-Bed Bioreactors.** *A. Ortega-Clemente, J. Barrera-Cortes, and H.M. Poggi-Varaldo*
Alfredo Ortega-Clemente (CINVESTAV del IPN/MEXICO)

* **Review of Innovative Sustainable BMPs Implemented for Chemical, Physical, and Biological Stormwater Remediation.** *A. Casey and E. Ueda*
Ann Casey (Earth Tech/USA)

* **TCE Source Reduction Using Strategic Application of SVE, ERD, and Groundwater Recovery.** *A. Herch, U. Desery, and M.C. Leahy*
Maureen C. Leahy (ERM/USA)

H10. Site Restoration Using Combined Remediation Strategies

Platform Papers Thursday/
Posters (*) Wednesday Afternoon

Chairs: Ed Meyers (Earth Tech)
Michael A. Singletary (U.S. Navy)

All Aboard the Treatment Train—A Study for Site Restoration Using Combined Remediation Strategies.

E. Meyers, L. Davies, J. Perdicaris, N. Scroggins, and M. Martin

Ed Meyers (Earth Tech/USA)

Assessing Combinations of Active Remediation and Natural Attenuation for Chlorinated Solvents Using Numerical Modeling. *M.J. Truex, C.D. Johnson, and J.R. Spencer*

Michael J. Truex (Pacific Northwest National Laboratory/USA)

* **Bioremediation of TCE and TCA Using SDC-9™ After Sodium Permanganate Treatment.** *R.J. Cadorette, L. Nesbitt, and T. Ladaa*

Raymond J. Cadorette (Shaw Environmental, Inc./USA)

* **Case History of In Situ Chemical Oxidation and Enhanced Bioremediation of Chlorinated Solvents in Groundwater at the KSC POL Site.** *D.D. Brayack, R. Santos-Ebaugh, and M. Speranza*

David D. Brayack (Tetra Tech/USA)

* **Combined Bioremediation and Zero-Valent Iron for In Situ Treatment of PCE.** *S. Archer, P. Bennett, L. Feldman, M. Goerz, M. Calhoun, and P. Peischl*

Spencer Archer (Geomatrix Consultants/USA)

Enhanced Bioremediation for a TCE Source Area Combined with Biosparging for Dissolved Plume Management. *R.C. Daprato, J. Langanbach, T.A. Peel, and M.J. Deliz*

Rebecca C. Daprato (Geosyntec Consultants/USA)

* **Enhanced Monitored Natural Attenuation of Dichloroethene through Mn(IV) Addition.** *A.V. Callaghan, P.B. Hatzinger, R.C. Borden, M.T. Lieberman, and R.P. Rogero*

Amy Callaghan (Shaw Environmental/USA)

* **Full-Scale Application of Emulsified ZVI with Vegetable Oil and Bioaugmentation at Site OT-30.**

M.A. Kershner, H. Faircloth, G. Farrer, G. Fazzio, M. Higgins, P. Juriasingani, and J.P. Matthews
Guy Fazzio (Jacobs Engineering/USA)

* **Integrated Site-Wide Approach to Chlorinated Solvent Plume Remediation.** *J.T. Kelley, J.R. Dickson, and R. Stenson*

Justin T. Kelley (Earth Tech, Inc./USA)

* **Modeling Innovative Groundwater Remedial Alternatives: A Case Study.** *C.D. Race*

Charles D. Race (Tetra Tech/USA)

* **Multifaceted Large-Scale Site Cleanup, Botany Bay, Australia.** *J. Fairweather, J. Stening, and J. Lear*

James Fairweather (Orica Australia Pty Ltd./AUSTRALIA)

* **Novel Treatment Approach: In Situ Chemical Oxidation Combined with Enhanced Aerobic Bioremediation.** *D. Baird and R. Knight*

Drew Baird (Regenesis/USA)

Phased Full-Scale Remediation of a Complex Site Using a Treatment Train of Multiple Technologies.

T. Ladaa, A. Tingle, R. Mayer, B. McInturff, C. Jerrard, J. Hodges, and D. Morrissey

Tarek Ladaa (Shaw Environmental, Inc./USA)

* **Remediation of Gasoline-Impacted Groundwater Using Combined Chemical Oxidation and Aerobic Bioremediation.** *M.A. Ingalsbe, J.G. Smith, and T. Taylor*

Melissa A. Ingalsbe (Earth Tech, Inc./USA)

* **Remediation Station of Service Port Star.**

S.A. Cardona-Gallo

Santiago A. Cardona-Gallo (Universidad Nacional de Colombia Sede Medellin/COLOMBIA)

Sequential In Situ Enhanced Bioremediation and Chemical Oxidation of Solvents and Hydrocarbons.

A. Chemburkar, R. Dyer, D. Lind, J. Warner, D. Brown, D. Tisoncik, and T. Wells

Rob Dyer (ERM/USA)

* **Site Characterization to Optimize Remediation.**

R. Lewis, M. Ryan, S. Meier, and M. Harkness

Richard L. Lewis (ERM/USA)

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

Jonathan M. Meier (ERM/JAPAN)