21st Annual

# FLORIDA REMEDIATION CONFERENCE

An NTCC Conference

## October 8-9, 2015

**Rosen Centre Hotel**
**Orlando, FL**

## The Top Soil and Groundwater Cleanup Conference and Expo in the Southeast

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*Wednesday, Oct. 7, 2015*

# Day 1 Thursday, October 8, 2015

FLORIDA REMEDIATION CONFERENCE

8:00 **Registration**
**Exhibit Hall Opens**

9:00: **Keynote Address from the Conference Chair**
Nick Albergo, PE, DEE, Senior Engineer
GHD, Tampa

9:30: **Contamination Discharge Reporting Obligations: Technical, Legal and Ethical Requirements and Implications for the Environmental Professional**
Michael Goldstein, Esq., Managing Partner
The Goldstein Environmental Law Firm PA, Miami

Environmental consultants can be challenged when asked to advise clients on whether a contamination reporting obligation exists and, if so, by whom, to whom and when. These questions, which can involve not only a scientific analysis but a legal analysis, become especially complicated in the context of a real estate deal when the consultant may be representing a buyer who may or may not elect to close and may or may not have obligated itself to share the results of a Phase II investigation with a seller. This discussion will carefully and methodically walk through the contamination reporting obligations under Florida law, as well as certain county ordinances where a local pollution control program has created its own enforcement process, such as Broward, Miami-Dade and Hillsborough counties. We'll address the contamination reporting obligations that apply to owners and operators, buyers, lenders and sellers. Special emphasis will be placed on real estate transactions to help the environmental professional understand what reporting obligations are triggered for the buyer and the seller when the discharge has been discovered by the buyer, if any, which is the typical fact pattern giving rise to these questions. We'll also discuss what contamination disclosure obligations a professional engineer or professional geologist may have by licensure—as opposed to statute—that could create an unanticipated dynamic for the professional and a conflict with whatever confidentiality provisions have been included in the underlying service agreement with the client or even the transaction document itself. We'll also discuss the mechanics of how disclosure must be made, and pursuant to what timeframes, depending on the type of contamination and whether the contamination has migrated off-site or remains completely off-site.

*10:00: Break in Exhibit Hall*

## Session 2: Assessment Tools

10: 30 Session 2A: **Multi-Component NAPL Investigation of MGP Waste With Focus on TarGOST® Technology**
Terry Griffin, PG, Senior Project Geologist
Engineering & Environmental Services Division, Cardno, Clearwater

A comprehensive nonaqueous phase liquid investigation was conducted at a site with documented manufactured gas plant free product with a primary focus on the use of Tar-Specific Green Optical Screening Tool, TarGOST®, assessment technology. TarGOST is a laser-induced fluorescence screening tool that is specifically designed to detect NAPL in the subsurface. It responds almost exclusively to the NAPL found at former MGP and creosote/pentachlorophenol sites. It does this by sensing the fluorescence of polycyclic aromatic hydrocarbons found in MGP and creosote NAPL. A preliminary phase of site and NAPL characterization was performed to determine the likely efficacy of using TarGOST technology and to optimize the subsequent TarGOST investigation. The initial assessment phase utilized Flute Liner™ in conjunction with rotasonic drilling and sample screening with Sudan IV dye. The TarGOST system was used in conjunction with Geoprobe™ direct push technology wherein fiber optic cable was run down the DPT drill rods, connecting a sapphire-windowed probe on the downhole drill rods to an above-ground spectrometer. Filters in the instrument allow certain ranges of light to be detected with the fluorescence signal providing immediate information regarding the quantity and nature of the NAPL encountered. The TarGOST investigation included advancement of 64 TarGOST/DPT borings throughout an approximately 3.5-acre study area. Based on this investigation, free product was typically present where the maximum fluorescence signal exceeded 100 percent RE response. Based on this relationship, the area and precise interval of MGP NAPL was fully characterized and delineated, and a total of approximately 35,000 gallons of free product was estimated in the subsurface.

11:00 Session 2B: **Reducing the Cost of Meeting Business Goals for Fuel Release Remediation Using Real-Time Web-Based Analysis of High Resolution Site Characterization Data**
John Sohl, Chief Executive Officer
COLUMBIA Technologies, Columbia, MD
Roger Lamb, Principal Geologist
COLUMBIA Technologies, Columbia, MD

To reduce the cost of meeting business goals for a fuel release into the environment, real-time analysis of high resolution site characterization data is invaluable. The use of high resolution tools such as the uVost/LIF®, hydraulic profiling tools, membrane interface probes and mobile laboratories to perform site characterization work for chemical release assessment is becoming common practice in the industry. Integrated analysis of these HRSC data sets by all the project stakeholders—regulators, potentially

responsible parties and consultants—in real-time is not commonly performed but is critical to ensuring the HRSC program achieves the project business goals at the lowest possible cost. COLUMBIA Technologies has developed a web-based tool that performs this function—Smart Data Solutions®. Smart Data Solutions has been used on 170 projects as of July 2015 including a 400-acre oil refinery, multiple TCE health risk assessment projects, multiple gasoline release remediation designs, railroad yard diesel recovery projects and chlorinated solvent ISCO remediation designs projects. This presentation will provide a project case study on how real-time analysis of uVost/LIF and HPT data via Smart Data Solutions was used by the consultant and regulators to ensure a high resolution LNAPL conceptual site model was developed to aid in determining the feasibility of remediation design and path toward site closure.

11:30 Session 2C: **High Resolution Site Characterization of 1,4 Dioxane Sites Using a New On-site, Real-time Analysis**

William Davis, PhD, President, Christopher P. Antworth and Christopher A. Horrell
Triad Environmental Solutions Inc., Durham, NC

1,4 dioxane was a widely used stabilizer in chlorinated solvents that is highly soluble and commonly found in large dissolved phase plumes. The U.S. Environmental Protection Agency designated 1,4 dioxane as a potential human carcinogen. Many states are now regulating 1,4 dioxane in drinking water, making it an emerging contaminant of concern for groundwater investigations. Current laboratory methods for 1,4 dioxane use either purge and trap methods (EPA Methods 524.2 or 8260b) or solid phase extraction (EPA Method 522). Due to the high water solubility of 1,4 dioxane, purging methods show high limits of detection and require special method adjustments including heating the sample and/or the addition of salt. Solid phase extraction methods are time consuming with multiple steps including concentration of the final extract to obtain the desired sensitivity. These factors make the use of these methods impractical for rapid, on-site analysis of 1,4 dioxane. The method described here is a new 1,4 dioxane analysis method based on solid phase micro-extraction followed by mass spectrometric analysis using the direct sampling ion trap mass spectrometer. This method has been demonstrated to provide quantitative analysis of 1,4 dioxane to limits of detection of 1-2 ug/L for groundwater and 5-8 ug/kg for soil samples. Due to the extremely simple nature of the SPME extraction and the rapid DSITMS analysis—five minutes—an analyst operating a single DSITMS can provide up to 50 on-site analyses per day. The method has been applied to provide high resolution site characterization at a number of sites. The real-time analysis for 1,4 dioxane allowed project managers to take advantage of Triad Approach site characterization to ensure sampling and analysis results managed site heterogeneity. Case studies will be presented to demonstrate the value of using this new method in the field to provide data densities that have not been possible due to off-site analytical costs.

12:00 **Day One Luncheon**

Sponsored by Advanced Environmental Laboratories

**North American Shale Development and the Impacts on Energy & Petrochemical Markets**

Chuck Whisman, PE, Vice President, Global Energy Market Leader
CH2M, Philadelphia, PA

This luncheon talk explores how oil and gas development in the U.S. and Canada is creating significant business opportunities worldwide, while also bringing our scientific community together to develop best practices, minimize risks and lead research initiatives. North American crude, natural gas and natural gas liquid markets will be discussed, as well as their impact in the U.S and globally including recent pricing impacts. For example, U.S. NGL production is changing the landscape of the international petrochemical industry, providing a new low-cost feedstock in the U.S. The presentation provides an overview of natural gas liquids, processing and petrochemical markets, as well as current and future initiatives. We will explore the impact on processing, manufacturing, pipelines, rail and exporting and how it impacts the U.S. as well as the world petrochemical industry. Similar impacts of North American crude and natural gas production will also be discussed, including their impacts on U.S. refineries and LNG exporting projects. The presentation will also explore some research and development initiatives in the U.S. related to developing improved best practices, reducing risks and providing enhanced regulatory compliance programs. Examples of research projects will be shared, in addition to information on how stakeholders are working together to share research and best practices.

## Session 3: Enhanced Remediation Technologies

1:30 Session 3A: **In-Situ Microcosms for Evaluation of Sulfate-Enhanced Bioremediation**

David Alden, Technical Associate
Tersus Environmental, Wake Forest, NC

This presentation summarizes the field implementation and results of a field treatability study performed to evaluate the anaerobic bioremediation of petroleum hydrocarbons at a site located in the Southeast U.S. Enhanced aerobic bioremediation technologies such as air sparging, oxygen injection, oxygen diffusion or the use of oxygen releasing compounds are commonly used to accelerate naturally occurring degradation of petroleum hydrocarbons and recalcitrant fuel oxygenates such as MTBE and TBA by indigenous microorganisms in the subsurface. However, these indigenous microorganisms do not function well in the high contaminant concentrations of the source area. Therefore, oxygen addition technologies have to overcome the anaerobic conditions first by meeting chemical and oxygen demand of the source area. An evolution in the remediation of petroleum hydrocarbons has occurred that employs a sulfate-enhanced in-situ remediation strategy. Sulfate reduction and methanogenic conditions appear to dominate natural

degradation processes at most sites. These processes will cease in the presence of added oxygen. On the other hand, rejuvenating depleted sulfate, anaerobic groundwater bacteria may continue to use PHCs, MTBE and TBA for carbon and energy and thus mineralize them to carbon dioxide and water. This talk summarizes the field implementation and results of a field treatability study performed to evaluate sulfate enhanced bioremediation PHCs using modern molecular technologies. The objective is to compare three approaches for the remediation of PHCs under anaerobic conditions: monitored natural attenuation, sulfate addition and sulfate/nutrient addition. The use of modern molecular technologies allows for the direct monitoring of a site's indigenous microbial population. These techniques can be used to provide a significant insight into current bioremediation activities and provide strong direction in regards to electron acceptor selection and proposed remediation activities at a site. These insights can result in more efficient and effective remediation activities, greater bioremediation success and an overall reduction in project lifecycle costs. The presentation provides the results of molecular testing and presents an evaluation of the effectiveness of anaerobic bioremediation of PHCs.

### 2:00 Session 3B: **Creosote Remediation with Surfactant-Enhanced Product Recovery and In-Situ Chemical Oxidation Technologies**

Dan Socci, Chief Executive Officer
EthicalChem, South Windsor, CT

A pilot test was implemented using surfactant-enhanced product recovery and surfactant-enhanced in-situ chemical oxidation at a former wood treatment facility in Delaware at which creosote waste and condensate water had been released into an unlined lagoon. Site investigations revealed extensive DNAPL impacts throughout the soil matrix, with only minimal product accumulation in monitoring wells—evidence of the limited mobility of the highly viscous creosote oil. During this pilot test, the SEPR chemical formulation was customized to enhance its effectiveness at emulsifying and thereby breaking apart the creosote oil into easily extractable globules. In addition, the pilot trial examined the relationship of SEPR to the subsequent S-ISCO® polishing phase, to determine the most efficient and effective treatment sequence. VeruSOL®, a customized mixture of plant-based surfactants and co-solvents, is simultaneously injected with low concentrations of peroxide during SEPR implementation to desorb and emulsify DNAPL free product for subsequent extraction. SEPR can be used as a cost-effective measure to enhance the performance of site recovery systems and as a pretreatment for S-ISCO remediation, a treatment that involves injections of VeruSOL to emulsify NAPL into aqueous phase for oxidative destruction by simultaneously injected oxidants. The case study of this pilot test is presented, including an overview of the treatment chemicals and the innovative design of the injection and extraction system. Data will also be presented about the relationship between SEPR and S-ISCO and its effectiveness for treatment of sites with extensive DNAPL free product, particularly related to creosote and No. 6 fuel oil.

### 2:30 Session 3C: **NAPL Source Area to Chic Mixed Use High Rise: Remediation for Redevelopment in Downtown Tampa**

Rachel Klinger, PE, Project Environmental Engineer
Geosyntec Consultants, Jacksonville

Over 100 years ago, on the outskirts of Ybor City in Tampa, FL, the Tampa Electric Company operated a manufactured gas plant. MGP operations were ceased in 1960 when the property use was modified for natural gas distribution. But the legacy of MGP operations remained in the form of free phase light and dense nonaqueous phase liquids and a stable dissolved benzene and naphthalene groundwater plume. To address remedial activities and position the property for future redevelopment, a Brownfield Site Rehabilitation Agreement with the Florida Department of Environmental Protection was obtained. Due to a recent pending real estate transaction, this project grew exponentially into a $1.5 million plus, high-profile project that required the expedited design of a 100-gallon-per-minute multi-phase extraction system to recover mobile LNAPL and DNAPL. To maximize mobile NAPL recovery, the MPE system design included modular and flexible design elements to allow for continuous optimization. Design enhancement and optimization strategies included adjustable drop pipe elevations, a zoned manifold design, operation of select MPE wells across the treatment area, reinjection of treated groundwater, a flexible well head design to allow for conversion of injection wells to extraction wells, the ability to control retention times in various treatment components, and multiple discharge points for treated groundwater effluent. This presentation focuses on the MPE system design, implementation, operation and the lessons learned with a focus on design elements and field optimization activities completed to enhance and maximize the mobile NAPL recovery and ultimately position the site for the construction of two 29-story towers.

*3:00: Break in Exhibit Hall*

## Session 4: New Remedial Approaches

### 3:30 Session 4A: **New Developments in the Chemical Fixation of Priority Heavy Metals Using MetaFix™ Reagents**

Fayaz Lakhwala, PhD, Technology Applications Manager
PeroxyChem LLC, Philadelphia, PA

High concentrations of heavy metals are found in many soil and sediment environments. At very high concentrations, heavy metals are known to create toxicity to microorganisms. Treatment approaches that rely on microbial process may not function well in an acutely toxic matrix because important processes such as carbon fermentation, oxygen consumption and biological sulfate reduction can be significantly slowed or completely inhibited. The understanding of many metals removal mechanisms operative in soil and groundwater has advanced significantly over the past decade and we are now in a better position to develop a new platform of effective metal remediation products. In toxic environments, treatment reagents that do not depend entirely on microbial activity but rather combine reduction with adsorption and precipitation of heavy metals are advantageous. MetaFixTM reagents represent an entirely new family of products for treatment of soil, sediment, industrial wastes and groundwater contaminated with heavy metals. Treatment

mechanisms based on iron, iron sulfides and other iron-bearing minerals have significant advantages due to lower solubility and greater stability of iron-bearing mineral precipitates formed with heavy metals. The new reagents enrich the aquifer with a mixture of reducing agents —ZVI, iron sulfides—and processed reactive minerals—iron oxides and iron oxyhydroxides. This new approach is insensitive to toxicity and can perform well even in environments that have high metals concentrations, high concentrations of organic contaminants such as solvents, high salt content, or high or low pH levels that would inhibit carbon fermentation and sulfate reduction. The approach used is to create an effective blend of reducing agents, reactive minerals, mineral activators, catalysts, pH modifiers and adsorbents for either ex-situ or in-situ applications. Dredge spoils containing high levels of TCLP/SPLP metals can be quickly treated and stabilized before final disposal. In-situ reactive zones can be constructed to prevent migration of heavy metals into sediments or surface water. MetaFix reagents can also be directly delivered into sediments for in-situ stabilization of heavy metals and thereby reduce exposure to aquatic life. Laboratory results showing reduction in TCLP and SPLP of key metals will be presented. Concepts on full-scale application of MetaFix to soil, sediment and groundwater environments will be discussed.

4:00 Session 4B: **The Biogeochemical Reductive Dehalogenation Groundwater Treatment Process: Commercialization Status at Bench, Pilot and Full Scale**

James E. Studer, MS, PE, Principal
InfraSUR LLC, Albuquerque, NM

Interest in biogeochemical groundwater treatment, a new in-situ treatment category combining biological and abiotic processes, has accelerated with the commercialization of the patented BiRD engineering process. Biogeochemical reductive dehalogenation, or BiRD, is aimed at generating in-situ, amorphous and crystalline forms of iron sulfide, referred to here as FexSy. FexSy can dehalogenate compounds such as PCE, TCE and other chlorinated aliphatics at significant rates. The FexSy reactive zone is created rapidly and can treat passing groundwater over a relatively long period of time. The process can be applied by use of direct injection or trenching techniques using inexpensive nontoxic reactants that are readily available in either liquid or solid form. Both permeable reactive barrier and area-wide treatment can be pursued. Benefits of BiRD include: 1) rapid degradation of a wide range of halogenated compounds; 2) little or no accumulation of undesirable transformation products such as cis-1, 2 DCE and vinyl chloride from PCE and TCE; 3) reduced requirement for labile organic matter and less conversion of that which is applied to methane; 4) implementation using low-cost treatment materials with trench-based or direct injection construction techniques; and 5) compatibility with enhanced bioremediation and ZVI. This biogeochemical technology is currently being tested and implemented at commercial scale as an economically effective alternative to other methods of groundwater treatment. For fractured bedrock or relatively low permeability unconsolidated porous media sites the option to use soluble reactants to create the FexSy reactive zone is attractive in the face of large subsurface coverage requirements and back diffusion potential. Results from several bench scale treatability studies and several field pilot tests are presented. A high percentage of the BiRD projects at bench or pilot level are proceeding to full scale and an update on those projects will be presented.

4:30 Session 4C: **A Technology Platform to Harness Speed, Certainty in Groundwater Remediation**

Rick Gillespie, Vice President
Regenesis, San Clemente, CA

This presentation focuses on utilizing a technology platform based on combined remedial approaches to maximize speed and certainty to achieve groundwater remediation objectives. The platform has a dual function; it sorbs contaminants quickly removing them from the mobile phase and provides a high surface area matrix favorable for microbial colonization and growth. Contaminant availability within a risk pathway is therefore reduced, while at the same time contaminant destruction is accelerated. A detailed discussion regarding the use of conventional technologies like groundwater extraction, soil excavation and in-situ bioremediation will show how combined technologies can significantly improve remediation efficiency. Data from full-scale field applications with long-term performance monitoring—greater than 18 months—on mixed plumes with chlorinated solvents and petroleum hydrocarbons will be highlighted. The presentation includes a case study featuring a manufacturing facility in the Midwest that utilized the liquid activated carbon solution coupled with a slow release electron donor to control migration of a TCA and TCE plume off-site. Long-term performance data showing up to a 99 percent reduction in contaminant concentrations was observed and will be discussed. In addition, a brownfield redevelopment project in downtown Chicago will be presented. The urban site was planned for redevelopment and future use as a convention center and sports arena. With groundwater contamination as the primary concern and time/cost-sensitive deadlines rapidly approaching, a fast and permanent remediation strategy was required. Performance data and results of the redevelopment will be outlined. The talk will also include representative data from three legacy sites in California in support of the in-situ bio process. The legacy sites to be discussed had been stuck in a monitoring-only phase for several years, but transitioned to a combined approach with in-situ bio and sorption to rapidly reduce contaminant concentrations below regulatory standards. Lessons learned on how to successfully navigate the regulatory process to closure will be presented.

5:00 - 6:30 **FRC Reception in Exhibit Hall**
Sponsored by CH2M

## Session 5: Assessment Tools for Multiple Release Sources

9:00 Session 5A: **Multiple Source Forensic Assessment Using 13C and 37Cl at a Site Impacted with Tetrachloroethene and Trichloroethene**

Aaron Peacock, PhD, Senior Scientist/General Manager
Pace EMD, Pittsburgh, PA

Vapor intrusion issues are now being found to be more of a hazard than previously realized. In many cases, it becomes paramount to understand site forensics and to answer questions regarding the possibility of multiple sources. At one such property, multiple industrial uses resulted in impacts of chlorinated ethenes to the groundwater, and vapor intrusion issues. The subsurface at the site was characterized by complex, three-dimensional structure, with separate lower and upper units in some areas but no such separations in adjoining locations. The forensic study produced two separate lines of evidence: chemical composition and isotopic ratio as one line and a study of the site hydrology and transport as another independent line. This presentation focuses on the chemical composition and isotopic analysis. The site was impacted with PCE and TCE and was mostly oxic. Though it had been monitored regularly, there had been only sporadic observations of low concentrations of cis-dichloroethene. More than thirty samples of groundwater were collected in locations ranging from presumed sources to distal locations where impacts of PCE and TCE were minimal. Of the 30 samples analyzed, 23 contained enough PCE and 19 contained enough TCE to yield reliable 37Cl and 13C data. Results showed most of the TCE was directly released, and was not a product of the dechlorination of PCE. The ratio of PCE to TCE suggested five sources: two of those sources were represented by only one well each and three others represented by multiple wells. The compound-specific isotope analysis data confirmed a separate source to one of the single wells, showed the other to be impacted both by an independent source and one of the other groups, and helped resolve the three groups into five separate groups that better explained the concentration ratios.

9:30 Session 5B: **An Alternate and Multiuse Method to High Resolution Site Characterization that Allows Multi-Technology Treatments**

Lance Robinson, PE, Principal Research and Design Engineer
EN Rx Inc., Flower Mound, TX
Eric Arenberg, PG, Principal Geologist
AMEC Foster Wheeler, Jacksonville

High resolution sampling is a key to optimizing all remedial technologies. Increased sampling sets horizontally and vertically via HRSC methods are leading to reduced life cycle costs and more accurate planning and remediation from consultants. High resolution tools, such as membrane interface probes, are also improving the understanding of contaminant distribution at sites. One shortcoming of most of the hi-res assessment tools being used today is that they only provide a snapshot and do not have any treatment use. EN Rx Inc. has developed a method of collecting abundant samples through the use of multi-screen horizontal wells known as Vertebrae™. These Vertebrae wells have the inherent flexibility that allows for any preferred level of discreteness in design. The wells can be used with a variety of technologies and sampled periodically in time to provide additional understanding as site conditions change or as remediation occurs. The horizontal nature of the technology also allows increased sampling frequency in locations unaccessible or where increased disruption limits horizontal sample sets. One site to use this technology is a site in Southeast Florida. As with most sites, a standard assessment was conducted. Due to site conditions, specifically a large active building with limited access, an accurate location and quantity of contamination was not determined and characterization was provided by only one well inside the building. AMEC Foster Wheeler chose to utilize Vertebrae wells for treatment purposes, installing 26 well segments in four horizontal bores. However, the real multipurpose benefit was noticed when the wells were sampled providing a much clearer characterization of the site. This information has led to a more surgical approach and remedy optimization that one would expect after a HRSC tool was used, and should reduce cleanup time and costs.

10:00 Session 5C: **CSIA Forensics for 1,4-Dioxane**

Yi Wang, PhD, Director, Sr. Environmental Geochemist
Pace CSIA Center of Excellence, Pittsburgh, PA

Compound-specific isotope analysis forensics has recently been developed for 1,4-dioxane to supplement chlorinated solvents release site investigations. Obtaining stable isotopic signatures of dioxane along with those for chlorinated solvents helps distinguish between multiple release sources. 1,4-dioxane, often simply called dioxane because the 1,2 and 1,3 isomers of dioxane are rare, is a heterocyclic organic compound. Dioxane is irritating to the eyes and respiratory tract. Exposure may cause damage to the central nervous system, liver and kidneys. Accidental worker exposure to dioxane has resulted in several deaths. The U.S. Environmental Protection Agency classifies dioxane as a probable human carcinogen. Until the end of 1995, dioxane was used primarily as a stabilizer in chlorinated solvents, particularly 1,1,1-trichloroethane. Approximately 90 percent of former production of dioxane was used in this application. Dioxane was typically used at a concentration of about 3.5 percent in chlorinated solvents. Dioxane has also been reported to be used in the production processes of the following product categories: pharmaceuticals/pesticides, magnetic tape and adhesives. Dioxane is completely miscible in water, therefore if released—unlike chlorinated solvents—it can readily migrate away from its source of release in groundwater. When more than one plume exists at a site, it is often difficult for the site managers to identify who

contributed dioxane to the specific monitoring wells. The CSIA forensic approach, however, may be able to assist in such cases because stable isotope fingerprints of dioxane are basically controlled by (1) the source material being used during the commercial production of dioxane. (In the U.S., it is in a closed system by acid catalyzed conversion of diethylene glycol via dehydration and ring closure by two manufacturers: Dow Chemical, Freeport, TX and Ferro Corp., Baton Rouge, LA); (2) the operating condition temperature range of 130 to 200 °C and the pressure range from a partial vacuum to slight pressure; and (3) any weathering effects like degradation. Microbial degradation of dioxane has been reported ineffective in most cases, which somehow helps preserve CSIA fingerprints. CSIA for dioxane has been technically challenging, due to its high solubility in water. During this presentation, after a brief introduction on the development of CSIA method, a case study is presented to demonstrate how the obtained CSIA fingerprints for dioxane in water from different locations helped distinguish an additional source. Potential contaminant sources could be from a variety of historic industrial activities at the site.

*10:30: Break in Exhibit Hall*

## 11:00 Session 6: Panel Discussion: Debunking the Myths of Sustainability

Moderator/Speaker: Liza Grudin, PE, Principal
NovelEsolutions Inc., Tampa
Panelists: Qiong Zhang, PhD, Associate Professor, University of South Florida, Tampa
Jessica Gattenby, Project Environmental Engineer, Arcadis US Inc., Tampa

Green, Sustainable, Resilient: This is the nomenclature of our profession. Common perception holds that sustainable design decreases performance or safety—and even that such efforts may increase cost. In actuality, system integration, life cycle analysis and stakeholder engagement increase cost effectiveness, decrease timelines and lead to better solutions. Energy reduction and end-of-life options are a key part of meeting a client's criteria and exceeding their expectations. Part of the solution is to move beyond the conceptual blocks of our experience and look at multi-disciplinary approaches and alternatives. One should not assume that sustainability enters the design at the end but, in execution, green principles should be optimized at the project's initiation. As consultants and engineers, let's veer away from traditional linear thinking to leverage the power of interdisciplinary input and out-of-the-box solutions. This can seem daunting at first. But aren't our most fruitful experiences normally the ones that challenge us the most? As stewards of the environment, we work to reduce our carbon footprint, water footprint and ecological footprint in our daily lives and can apply these same concepts to design and management principles in our workplace. Please join us for an open discussion of possibilities, evolution and synthesis in the application of sustainable principles and green engineering design.

12:00 **Exhibit Hall Closes**

**Day Two Luncheon**
Sponsored by The Goldstein Environmental Law Firm

## 1:30 Session 7: Regulatory Panel Discussion

Moderator: Glenn MacGraw, PG, Principal
Clean Asset Environmental LLC, Tallahassee
Panelists: Diane Pickett, PG, Administrator, Petroleum Restoration Program
Florida Department of Environmental Protection, Tallahassee
John Wright, PE, Professionals Engineer III, Petroleum Restoration Program
Florida Department of Environmental Protection, Tallahassee
Keith Tolson, PhD, Principal Environmental Scientist
Geosyntec Consultants, Tampa

This year's regulatory panel discussion features two key officials with the DEP's Petroleum Restoration Program and a private sector scientist intimately familiar with the DEP's Contaminated Media Forum. Though there have been significant issues related to the program's reformation over the past few years, the PRP remains a significant driver of cleanups throughout the state. Diane Pickett and John Wright will provide a "state of the PRP" report and answer questions from conference participants in an extended Q&A session. In addition, Dr. Keith Tolson will be with us to discuss recent activity with the DEP's Contaminated Media Forum. The CMF, a successor group to the state's earlier Contaminated Soils Forum, serves as a venue for discussing topics related to contaminated site cleanup policies, and scientific and application issues, and the reuse of media using risk-based management principles. CMF workgroups have been established to make recommendations on 1) Background contaminant levels, 2) Direct exposure, institutional controls/ engineering controls and leachability, 3) Ecological risk and 4) Chapter 62-777, Florida Administrative Code, contaminant cleanup target levels.

*3:00 Break in Pre-Function Registration Area*

## 3:30 Session 8: The Use of ZVI in Chlorinated Solvent Remediation

3:30 Session 8A: **Synergistic Remediation using EZVI, Carbon Sources and KB-1 to Promote Risk-Based Cleanup of Chlorinated Ethenes at a Historical Train Derailment Site**
Bradley Droy, PhD, President and Chief Executive Officer, TEA Inc., Santa Rosa Beach, FL

A soil and groundwater remediation design using multiple concepts was effectively developed and implemented at a historical train derailment site in the Southeast U.S. contaminated with chlorinated ethenes. Contaminants of concern included tetrachloroethene, trichloroethene, cis-1,2-dichloroethene and vinyl chloride. Site investigation revealed groundwater contamination was primarily located in the shallow aquifer and underlying clays. In addition, the existence and persistence of dense nonaqueous phase liquids was also indicated in shallow aquifer sediments. A synergistic remediation approach was designed to create a result that exceeded the anticipated "sum of its parts." The approach involved engineering an existing pump and treat remediation system with multiple technologies to achieve a timely, risk-based site closure. EZVI, vegetable oil, lactate, and KB-1® bacteria culture were injected as remediation amendments to enhance the biogeochemistry of the subsurface and accelerate the reductive dechlorination reactions. EZVI was injected to treat the residual DNAPL source in the subsurface, KB-1 bacteria culture was injected to bioaugment the existing dechlorinating bacteria, and vegetable oil and lactate were injected to provide additional carbon for the microbial populations. A detailed soil and groundwater monitoring system was used to assess the effectiveness of the corrective action activities in reducing the concentrations of site COC to health protective levels. Soil and groundwater monitoring results indicate that the concentrations of the site COC have been remediated to levels that are below the cleanup objectives and pose no threat to human health or the environment. Risk assessment, in-situ chemical reduction and the knowledge of the existing remediation system were synergistically combined to expedite site cleanup in a manner that eliminated years of pump and treat operation and maintenance. Based on these results, regulatory approval has been given to develop a site closure plan.

## 4:00 Session 8B: **Comparison of Biological Dechlorination to In-Situ Chemical Reduction at Concord Naval Weapons Station**

Eliot Cooper, National Director Remediation Support Services
Vironex Technical Services, Golden, CO

A trichloroethene plume at the Concord Naval Weapons Station extends approximately 700 feet down gradient from the source area and up to 100 feet below ground surface. The aquifer consists of unconsolidated silt, sands and clays. Groundwater in the treatment area is highly aerobic. An enhanced anaerobic bioremediation pilot test conducted by CB&I demonstrated complete degradation of the TCE concentration from approximately 5,000 microgram per liter to less than 1 µg/L in approximately 500 days. The U.S. Navy wanted to evaluate a more aggressive approach to achieve site cleanup. CB&I conducted a second pilot test to evaluate enhancement of the biological approach by in-situ chemical reduction. This process was selected to aggressively treat the TCE, reduce the potential for generation of toxic degradation products and provide long lasting substrates to reduce the potential for rebound of the contaminants. ISCR applied abiotic processes by distribution of zero valent iron to provide a long lasting substrate that degrades TCE while minimizing the generation of daughter products. The test incorporated biological degradation processes by amending the ZVI with long lasting organic substrates, Emulsified Lecithin Substrate® from PeroxyChem. Lactate was added to the amendment water to create reducing conditions prior to injection and to help establish the bioaugmentation culture in the aerobic aquifer. Bioaugmentation was conducted using SDC-9™. Substrate distribution was conducted using direct push technology. At each interval, the aquifer was first primed by fracturing the aquifer with the injection solution. Following confirmation of fracture development, ZVI in guar was injected into the interval followed immediately by the remaining injection solution. The EAB and ISCR pilot test data were compared to evaluate effectiveness. The injection process distributed substrates a minimum of 15 feet from the injection point. The ISCR process also degraded trichloroethene, dichloroethene and vinyl chloride to below MCLs within 220 days—less than half the time required for biotic only approach. TCE degradation appears to be biologically mediated in both approaches. The reduced treatment time in the ISCR approach is attributed to beta-elimination of DCE compared to the hydrogenolysis pathway in the EAB approach. Notably, the ISCR process did not generate arsenic in excess of the MCL as did the EAB process. Based on the successful ISCR pilot test, this approach has been applied for full-scale treatment of the trichloroethene plume.

## 4:30 Session 8C: **Large Diameter Auger Remediation at Wilson Corners on Kennedy Space Center**

Robert Kline, PE, Environmental Control Technician, NASA/Kennedy Space Center
Anne Chrest, Remediation Program Manager. NASA/Kennedy Space Center

The Wilson Corners site at Kennedy Space Center was used as a rocket engine component cleaning facility and laboratory in support of the Apollo program in the 1960s and 70s. Trichloroethene was used in the laboratory and in an outside cleaning facility. TCE was discharged to a septic system and directly to the ground via direct spills. The first site assessment activities conducted in the 1980s confirmed the presence of TCE and breakdown products in groundwater throughout the site. Since that time, several phases of investigation and cleanup have been conducted, removing approximately 20,000 pounds of chlorinated volatile organic contaminants. Unfortunately, several areas of high concentration CVOCs still remain. Between September 2014 and February 2015, NASA implemented an interim measure, or IM, to treat one of the remaining high concentration areas with the objective of reducing contaminant concentrations to natural attenuation default criteria values or lower. The large diameter auger IM consisted of the following major elements: soil mixing, hot air/steam generation and delivery, vapor extraction and conditioning, off-gas vapor treatment, recovered-liquid treatment and discharge, and zero valent iron mixing and delivery. The treatment system includes a monitoring system for real-time data evaluation that assists in controlling the process parameters to maximize CVOC removal and supports decision making for operation of the LDA and injection systems. Real-time data monitoring is an integral part of the treatment technology because it is utilized to enhance the efficiency of treatment and maximize the results. The effectiveness of the LDA IM will be evaluated through the comparison of pretreatment and posttreatment discrete groundwater samples. Due to the expected elevated subsurface temperatures following the IM, performance monitoring is expected to begin six months after completion. Initially, samples will be collected through direct push technology sampling with monitoring wells to follow once subsurface temperatures subside. The first round of data is expected to be collected in August, 2015.

## 5:00 Conference adjourns

# 6th Annual Charity Golf Tournament

## Wednesday, Oct. 7, 2015
## Shingle Creek Golf Club, Orlando, FL

You're invited to join us at our 6th Annual FRC Charity Golf Tournament scheduled for Wednesday, Oct. 7, 2015, the day before FRC 2015 begins. Registration opens at 12:00 noon and play begins at 1:00 pm. The tournament will be played at the Shingle Creek Golf Club, a sister property of our 2015 host hotel, the Rosen Centre Hotel, about five minutes away.

The registration fee is $175 per player with a nice discount for foursome registrations. After play, stick around for the postplay awards ceremony and cook out, where we'll all enjoy a cold beverage, distribute trophies, have a bit to eat and wind down from the day.

This year, proceeds from the tournament will be donated to the **Yellow Brick Road Foundation.** The foundation commits its resources to increasing the exposure and awareness of congenital heart defects, the world's most common and deadly birth defect, while providing assistance and support to families of hospitalized children with CHDs. To date they have assisted several families with hospital care bags that include gift cards, toys and other vital day-to-day items. The foundation plans on financially assisting CHD families in the near future.

We are again seeking tournament corporate sponsors for holes, contest holes, beverage carts, the awards barbecue and several other categories.

For complete information about the 2015 tournament or to register to play, visit www.enviro-net.com and click on "FRC Charity Golf Tournament" under the FRC logo at the top left. If you have any questions or would like more information about playing or sponsoring an event, contact Conference Manager Mike Eastman, *Florida Specifier*, at (407) 671-7777 or mreast@enviro-net.com.

# Current List of 2015 Exhibitors/Sponsors

A&D Environmental Services
Accutest Laboratories
Action Environmental
Adler Tank Rentals
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Analytical Labs of Florida
BakerCorp
Carbonair Environmental Systems
Cascade Drilling LP and Subsidiaries
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Clark Environmental
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Cliff Berry Inc.
COLUMBIA Technologies
Custom Drilling Services Inc.
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Elemental AG
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EON Products
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ESC Lab Sciences
EthicalChem
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Fruits & Associates
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LogitEasy
Microbial Insights
NASA/Kennedy Space Center
Pace Analytical Services
Palm Beach Environmental Labs
Performance Technologies
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Petroleum Resources & Development Inc.
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Terra Systems
Terradex
U.S. Ecology
U.S. Environmental Rental
USP Technologies
URETEK Holdings Inc.
Vironex Technical Services
Waste Management
FTS Analytical Services - XENCO Labs
ZEBRA Technical Services

# Registration and Hotel Information

## 2015 FRC Conference Information

For general questions about the 21st Annual Florida Remediation Conference, call (407) 671-7777 or e-mail mreast@enviro-net.com. Visit our website at www.enviro-net.com for FRC updates, the 2015 technical session agenda, a current list of exhibitors and booth availability, speaker updates and more.

## Charity Golf Tournament

For questions regarding our 6th Annual FRC Charity Golf Tournament at the Shingle Creek Golf Club, contact Mike Eastman at mreast@enviro-net.com or call (407) 671-7777. Our charity this year is the **Yellow Brick Road Foundation** (www.ybrf.org), a nonprofit organization committed to increasing the awareness of congenital heart defects, the world's most common and deadly birth defect, while providing assistance and support to families of hospitalized children with CHDs.

The golf tournament registration form is available on our website at www.enviro-net.com.

## Continuing Education Credits: PEs, PGs and LEPs

National Technical Communications Co. Inc., producer of the Florida Remediation Conference, is an approved Continuing Education Provider (CEP 0004002) for the Florida Board of Professional Engineers. As an approved provider, NTCC offers professional development hours for attending FRC 2015 to professional engineers who are licensed in Florida (and other states) as follows: Attend both days, earn 11.5 PDHs; attend Day One only and earn 6 PDHs; Day Two, 5.5 PDHs. **Sign-in is mandatory for PEs and your PE license number is required.** Continuing education credits are also available for professional geologists in South Carolina, Alabama and other states where continuing education is required for PG license renewal.

In addition, FRC has qualified for continuing education credits through the International Society of Technical and Environmental Professionals Inc., INSTEP. Credits apply to those currently registered by this association. Participants will receive one CE credit for every actual hour of instruction. LEP's may enter their credits on the LEP Center Section of the INSTEP website.

## Hotel Information

The **Rosen Centre Hotel** is the host hotel and conference center for FRC 2015. The Rosen Centre has impeccable guest rooms and suites to accommodate any need of the business traveler. The hotel is located on International Drive near the Orange County Convention Center in Orlando. For directions and additional information about the hotel, visit their website at http://www.rosencentre.com.

## Hotel Reservations

To make your sleeping room reservations, go to our website at www.enviro-net.com and click on "**Room Reservations at the Rosen Centre**" under the FRC logo. If you prefer to make arrangements by phone, call 1-800-204-7234 and identify yourself as an attendee of the Florida Remediation Conference. Our discounted room rate is $145 nightly, plus applicable taxes and fees. **This discounted rate is only available until Wednesday, Sept. 16, 2015.**

## Exhibit Hall

The exhibit hall is open all day on the first day of the conference, 8:00 AM until 5:00 PM and a half day on the second day of the conference, 8:00 until noon.

## Registration

Registration for the full 2015 Florida Remediation Conference is $395. Day One Only is $295 and Day Two Only is $245. The fee includes registration for the conference, conference manual and flash drive containing PDF files of all the talks, continental breakfasts, beverage breaks, luncheons and the conference reception for Day One registrants.

To register for the conference, complete and return the registration form on the next page with payment in full to: NTCC Inc., P.O. Box 2175, Goldenrod, FL 32733, fax your completed form with credit card information to (407) 671-7757 (a secure fax number), or scan and e-mail form to mreast@enviro-net.com. Purchase order numbers are accepted for government employees. Digital registration will soon be available at www.enviro-net.com.

We encourage you to register early. Conference registration is limited to avoid overcrowding. Please note: Payment in full is required to confirm your registration. Cancellations received before Sept. 16, 2015, will be refunded, less a $75 service charge. No refunds will be made for cancellations received after that date. However, paid no-shows will receive a copy of the presentation materials upon request. Substitutions will be accepted at any time, preferably with advance notice.