Technical Session Agenda

Day One, Thursday, Oct. 9, 2014

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

9:30 Session 1B: **A New Model: Recovering Remediation Costs from Old Insurance Policies**
John Malanchuk, PhD, Eisenstein Malanchuk LLP, Washington, DC
John Fumero, ESQ, Nason Yeager Gerson White & Lioce PA, Boca Raton

While traditional funding sources for remediation costs have become more limited, new models are needed for cost recovery. Although not widely known in Florida, insurance recovery has been employed on dozens of sites by policy holders seeking to offset remediation costs. A policy holder might be a company, a city or county. Any entity with historical environmental liabilities, or contractors working for a policy holder should evaluate the merits of insurance recovery. Not to do so ignores a potential major funding source for remedial costs. A general liability insurance policy covers third party property damage that isn't specifically excluded. After 1985, there are pollution exclusions in GL policies meaning that coverage for events taking place now or in the future require you to have some sort of environmental policy. Prior to 1972, however, there were no pollution exclusions in GL policies. If site remediation today includes contamination that might have begun prior to 1972, it may be possible to make a claim under an insurance policy that was in effect when the contamination was occurring. Another important aspect of old GL policies is that they were written on an "occurrence" basis. Today, policy wording requires making the claim during the policy period. Formerly policy wording required only that the accident had to occur during the policy period, meaning that a claim can still be made on a policy that might be more than forty years old. Over the years, millions of dollars in claims have been lost because policy holders were unaware of this opportunity. No one with remedial obligations should ignore this potential funding source.

10:00 Morning Break

Session 2: In-Situ Chemical Oxidation

10:30 Session 2A: **Evaluation of Advanced Oxidation Process Treatment Options for Extracted Groundwater with Chlorinated Solvents, Aromatics and 1,4-Dioxane**
Antonio Cardoso, EI, Project Engineering Specialist, ARCADIS, Tampa

As a result of historic site operations, groundwater has been impacted with 1,4-dioxane, chlorinated ethenes, chlorinated ethanes and aromatics. Site activities included, but were not limited to, the manufacturing of electronics and communication hardware. Assessment activities were conducted to develop a high-resolution conceptual site model and improve understanding of the nature and extent of the constituents of concern. The driver and challenge for remediation is 1,4-dioxane because it is difficult to treat and has not been shown to naturally attenuate, except through dilution in aquifer environments. Selection of the appropriate technology for the extracted groundwater was essential to ensure compliance and treatment objectives. As an initial phase, a pump-and-treat system was installed as an interim remedial action, which provided the opportunity to test two advanced oxidation processes side-by-side. The AOPs tested were the HiPOx™ system developed by ULTURA, former APTwater Inc., and the Photo-Cat system developed by Purifics® ES Inc. The IRA was operated in

batch and continuous modes with data collected for the evaluation of AOP performance and optimization. The batch mode phase facilitated testing of different influent water quality, such as metal concentrations, 1,4-dioxane and/or volatile organic compounds load, while the effects of long-term groundwater extraction and AOP operation were observed through the continuous mode phase. The AOP systems were evaluated based on six criteria: treatment efficiency; treatment train complexity; chemical input; power usage; operation and maintenance; and economics. The results of this evaluation, the technical merits of each system and the performance of the IRA will be presented.

11:00 Session 2B: **In-Situ Chemical Oxidation of Pentachlorophenol and Dioxins/Furans at a Unique Cultural Site**

William Lundy, President, DeepEarth Technologies Inc., Alsip, IL

The Wiyot people inhabited Indian Island and the land around Humboldt Bay since prehistoric times. On Feb. 26, 1860, European settlers massacred an estimated 180 Wiyot villagers. Settlers claimed the land on the island until 2000 when the Wiyot Tribe purchased the 1.5-acre parcel where a shipyard was located. During occupation by the settlers, the site was contaminated with pentachlorophenol and dioxin/furan compounds and other chemicals used for preserving wooden ships. The objective of the cleanup project included: removing the majority of pentachlorophenol/dioxin-impacted soil, while minimizing the volume of soil disturbed; finding a technology to treat the remaining contamination on-site without damage to the contaminated shell mound; preventing impacts to groundwater or surface water; preventing human exposure to soils impacted with PCP and dioxins; and restoring the site for beneficial use. Cool-Ox® was selected for the ISCO bench-scale treatability study. Cool-Ox demonstrated significant reductions in contaminants of concern. Dioxin/furan TEQ was reduced by 84% and PCP was reduced by 86.4%. Cool-Ox destroyed the contaminants without destroying artifacts or remains on the historical burial grounds. The island site, in a tidally influenced bay of Pacific Ocean, provided no direct road access or functional dock facilities. Access was limited to boat at high tide or by foot from a bridge landing at low tide, and no electricity or municipal water supply was available. Added to that, there were significant cultural constraints. The comparison of soil analytical results from co-located pre- and post-ISCO soil samples indicated that the ISCO solution was effective in reducing concentrations of CoC. This allowed continued restoration of the site for beneficial use by the Wiyot Tribe. This case history and field data provide a valuable tool for the remediation community to evaluate this oxidant and treatment train for the restoration of similarly challenging sites.

11:30 Session 2C: **Evaluation of Multiple Biotic and Abiotic In-situ Treatment Methods for the Remediation of a Commingled TCE and Metals Plume**

Chad Northington, PE, Senior Engineer, WRS Infrastructure & Environment, Tallahassee

Continued vertical migration of a commingled trichloroethene and metals plume into the Floridan Aquifer at a former FDOT maintenance yard prompted implementation of a pilot study to evaluate the performance of several remedial alternatives simultaneously, prior to full-scale remediation. The study consisted of a series of discrete injections focused around three monitoring wells with a different technology and approach implemented at each location. The pilot test was intended to reduce overall remedial costs, mitigate performance uncertainties and expedite site cleanup by providing field data that would allow the full-scale approach to be tailored to the results of the study. Catalyzed hydrogen peroxide was continuously injected in the vicinity of a source well via a network of permanent injection wells fed by a vendor-provided system. Ferrous iron, controlled-release organic carbon substrate and DHC inoculum were injected directly during a single event with direct push technology. Sodium persulfate was injected into an existing monitoring well where depth limitations were a concern for DPT utilization. Prior to injections, more precise geotechnical data was obtained to better define the site model, improve the design approach and facilitate acquisition of hydrogeological parameters through utilization of the hydraulic profiling tool. Besides multiple contaminant classes that respond differently to treatment, the site presented additional challenges, such as inferred off-site contamination, large variations in geochemistry, elevated aluminum background concentrations, ongoing assessment and limited site access to adjacent properties. Field tests and measurements were also performed to evaluate the effectiveness of the various approaches.

12:00 **Day One Luncheon**
Sponsored by Advanced Environmental Labs

A virtual tour of the St. Johns River that focuses on the beauty of the river as well as the threats, and what we are doing to protect it
Lisa Rinaman, St. Johns Riverkeeper, Jacksonville

Session 3: Field Tools

1:30 Session 3A: **Real-Time Flux Measurement Using Direct Sensing, Quantitative Discrete Sampling and On-site Analysis**
Brad Carlson, Manager-Direct Sensing Tools, ZEBRA Environmental, Tampa
William Davis, PhD, Principal, Triad Environmental Solutions Inc., Durham, NC

The objective of data collection during site characterization is to provide decision makers with data of sufficient quantity and quality to allow definitive decisions on remedial actions. Recent advances in tools for the collection of high density hydro-stratigraphy and high density soil and groundwater contaminant data have allowed implementation of cost effective strategies for mapping contaminant flux in high resolution. One of the key requirements for successful high density site characterization projects is a reliable real-time field analysis for the contaminants and matrices of concern. Data required to understand contaminant flux include local geologic and hydrogeologic conditions as well as contaminant distribution in groundwater and bulk phase soil. This presentation discusses the tools currently available to collect data to allow an understanding of flux at sites at the scale required to design and implement remedial actions. Case studies will be presented where U.S. EPA Method 8265 was used to collect contaminant data in conjunction with the hydraulic profiling tool to measure hydraulic conductivity to determine the flux distribution at complex DNAPL sites. These data are collected in real-time allowing flux measurements in real-time. Case studies demonstrate the use of flux measurements to determine contaminant transport zones and, perhaps more importantly, zones where back diffusion from non-advective groundwater contamination is occurring.

1:55 Session 3B: **BTEX & MTBE Remediation in Challenging Florida Geology at Two Separate Sites Using ISCO/BIO Injections**
Brian Timmins, Principal, ETEC LLC, Washougal, WA

To address elevated BTEX concentrations in groundwater at two separate sites in Chipley, FL, a unique remediation approach combining iron-catalyzed hydrogen peroxide (Fenton's reagent) followed by bioamendments was applied at two sites. Each site injection event required three to four days and included simultaneous groundwater extraction with the ISCO/BIO injection. Substantial reductions in dissolved BTEX concentrations were achieved following the injection event at each site. Because of the mixed geology/hydrogeology at each site, significant injection/extraction challenges were encountered including off-gassing due to aggressive in situ chemical reactions, poor groundwater recovery, injection short-circuiting, and significant backpressure of fluid injection lines. These site-specific challenges and groundwater data are discussed in detail. At Site #1, following a source area soil excavation project, residual dissolved BTEX and MTBE constituents remained in the intermediate and deep groundwater zones. Treatment goals were Florida GCTL criteria and the ISCO/BIO pilot study was implemented around the most impacted site well. Following installation of several injection/extraction wells, the ISCO/BIO pilot study injection event was performed in January 2013, and six months later. The most impacted well had maintained an 85% reduction in BTEX and a 90% reduction in MTBE concentrations. Surprisingly, significant BTEX reductions were also noted in the intermediate groundwater zone in wells approximately 40 feet away from the injection wells. This larger-than-expected zone of influence is attributed to the permeable fill material in the excavation area. ***S***ite #2 contained an area with persistent dissolved-phase BTEX constituents in both the intermediate and deep groundwater zones. In the deep groundwater zone, benzene had migrated off-site across a roadway. Following installation of several injection/extraction wells in both zones, a pilot-scale ISCO/BIO injection event was performed in October 2013. Groundwater sampling performed three months after the pilot study showed three of the four wells in the target treatment area exhibited greater than 99% reductions in total BTEX. The other well, which is installed in tight silt/clay matrix, showed no change in BTEX concentration.

During the pilot, massive site-wide off-gassing was noted in response to ISCO injections, indicating an aggressive in-situ chemical reaction. This slowed injection rates. Contact throughout the target subsurface soil/groundwater zones was confirmed via changes in pH and conductivity in monitoring wells adjacent to the fluid injection wells. Attempts to perform simultaneous groundwater extraction in the intermediate groundwater zone failed due to low or non-existent groundwater extraction rates. Groundwater extraction in the deep groundwater zone was more successful, resulting in successful remediation of the off-site deep groundwater well.

2:20 Session 3C: **Application of MIP/HPT Logging for Source Zone Characterization and Water Quality Evaluations for Enhanced Conceptual Site Model Development**

Cathy Soistman, PE, Project Environmental Engineer, Geosyntec, Titusville

The development of an accurate, effective conceptual site model is crucial with regards to transitioning a complex site from assessment to remediation. Upon initiating work at a site with an extended assessment history, Geosyntec questioned the CSM and suspected that there was an undiscovered source contributing to the dissolved plume, and that the plume configuration may be a partial result of well construction contributing to vertical migration. To evaluate the first hypothesis prior to embarking on large-scale remediation efforts, an emerging assessment technology was used consisting of subsurface logging with a hydraulic profiling tool in combination with a membrane interface probe. Focused saturated zone soil and groundwater sampling was conducted. To evaluate the second hypothesis, geochemical parameters were evaluated to ascertain whether chlorinated solvent impacts in a monitoring well screened in the Floridan Aquifer were potentially attributable to vertical leakage from surficial aquifers along the outside of the well casing. During the initial development of the revised CSM, a review of the HPT and MIP logs indicated that there was a strong correlation between mass storage in low hydraulic conductivity zones and zones of apparent dissolved plume transport. Based upon the MIP/HPT boring program, focused direct-push technology soil and groundwater sampling confirmed the presence of a previously undiscovered area of elevated concentrations of tetrachloroethene in low hydraulic conductivity clay layers and associated plume transport from these layers. Elevated tetrachloroethene concentrations up to 1,700 milligrams per kilogram in saturated soil and up to 400,000 micrograms per liter in groundwater confirmed the MIP/HPT findings. The investigation of the Floridan Aquifer well focused on a comparison of water quality conditions within the surficial aquifer, within the Floridan and within the referenced well. A Piper diagram was used to evaluate geochemistry and document apparent cross-connection of aquifers due to well leakage. Collectively, questioning the CSM and developing an accurate CSM for the site has provided valuable information for developing a focused remediation design and for enhancing understanding of the dissolved plume attributes.

2:45 Session 3D: **Emerging Tools Used for In-Situ Chemical Oxidation/Reduction Projects**

Ron Adams, PE, LSRP, Executive Vice President Remediation, ERFS LLC, Boston, MA

ISCO and ISCR projects can be successfully implemented under pay for performance contracts relying on real-time monitoring and process adjustments. Due to significant mobilization and set-up costs, it is more cost efficient to adjust treatment techniques during a field event rather than after the fact. This eliminates re-mobilizing crews, materials and subcontractors to the site. Real-time monitoring incorporates down-well trolls and data loggers, hand-held instruments to measure groundwater and vapor space parameters, soil resistivity surveys to depict geochemical changes on cross sections and commercially available field test kits. Further, many field observations can be relayed to remotely located design engineers using mobile phone pictures and videos sent via the Internet. As real-time data is received, design engineers can adjust field crew instructions to make the best use of the field event. This talk presents this information in overview and then delves into specific projects utilizing these techniques with graphically presented data and pictures. Sites will include Superfund, RCRA and gas station sites within the U.S.

3:05 Session 3E: **SERDP Study Explores Well Flow Dynamics for Active "Purge" Sampling and Newer "Passive" Sampling Approaches**

Sandy Britt, PG, CHG, Principal, ProHydro Inc., Fairport, NY

Low flow purging and sampling techniques were introduced to limit purge volumes, reduce turbidity and agitation during sampling, and to improve repeatability. Passive, no-purge samples likewise have been introduced

to improve sampling by limiting waste generation and improving cost structures. How do these methods reflect aquifer concentrations? Do they represent aquifer concentrations differently? Strategic Environmental Research and Development Program Project ER-1704 tested passive and dynamic sampling procedures in the lab, in the field and in model domains to better understand flow dynamics in wells. Results describe a flow field where water moves horizontally from the formation to the well, then moves vertically in the well bore to the pump intake during pumping. Under un-pumped conditions, results show vertical transport and mixing due to tiny density contrasts. In many cases, several well volumes were required to clear the well and reach chemical steady state. Ultimately, maintenance of steady flow rate, very stable parameter measurements and purging several well volumes is required to assure flow-weighted average samples using a low-flow purging approach. "False" stability is a concern in early purge times as slow parameter drift may reflect continued contaminant concentration change. Passive sampling approaches usually yielded similar results without purging due to the vertical density mixing effect, but care was necessary to understand whether stratification in the aquifer was homogenized or partially maintained in the unpurged well. Determination of these effects required substantial effort and is probably not warranted for standard monitoring. However, the study is informative in that it explains some of the dynamics associated with why passive and active samples often yield similar chemical results, and illustrates why practitioners must always pay attention to seemingly unimportant details such as slow purge parameter drift.

3:30 Afternoon Break

Session 4: Sorption

4:00 Session 4A: **Sorption Coupled with Enhanced Biodegradation to Treat Petroleum and Chlorinated Contaminants in Groundwater**

Drew Baird, PG, East Region Manager, Regenesis, Greenville, SC

Enhanced biodegradation and monitored natural attenuation are effective, widely-used tools for elimination of organic contaminants in groundwater. However, the timeframe for treatment by these methods can be on the order of months to years. To significantly improve remediation performance beyond that of traditional enhanced bioremediation, a new in-situ colloidal biomatrix has been developed that accelerates biodegradation and drastically shortens the timeframes for reaching groundwater treatment goals. This presentation demonstrates the efficacy of a colloidal in-situ remediation agent that consists of highly sorptive activated carbon particles stabilized to transport widely through an aquifer upon injection. The stabilized colloids deposit on soil surfaces, forming a biomatrix that traps contaminants and accelerates their degradation. Some advantages of this approach include a rapid drop in groundwater concentrations, along with the ability to stop plume migration and protect sensitive property boundaries or environmental receptors. It is hypothesized that the protective effects of the colloidal agent last many years after its application. The presentation reviews the performance of the colloidal biomatrix material on multiple field sites with varying contaminants and site conditions. Data are presented from both the source and down-gradient plume area at a former leaking underground storage tank near a school. The direct-push application was a combined remedy that coupled the colloidal biomatrix with oxygen delivery to promote aerobic biodegradation. The presentation provides pre- and post-application soil cores to demonstrate zone of influence as well as groundwater monitoring to show >99% contaminant reductions within three months of application. A second site is discussed that shows contaminant reductions >99% for TCA and TCE. Overall, the presentation focuses on demonstrating field performance through evaluation of the distribution of the biomatrix and the corresponding contaminant reductions.

4:20 Session 4B: **Use of Colloidal Mg(OH)2 for Aquifer pH Adjustment from Concept to Laboratory to Field scale**

Brad Elkins, MS, PG, Technical Sales & Support, EOS Remediation LLC, Raleigh, NC

Aquifer pH has a major impact on contaminant mobility and attenuation including precipitation/sorption of metals and degradation of chlorinated solvents. However, adjusting aquifer pH can be challenging due to strong buffering by clays, iron oxides and sorbed Al3+. Commonly used bases can result in excessively high pH while others offer relatively low alkalinity/lb. Mg(OH)2 has many advantages over traditional alkalis including

lower equilibrium pH, greater alkalinity/lb and slow release over time. Despite these benefits, distribution of an aqueous Mg(OH)2 suspension in situ can be complicated by attractive forces between the positively-charged Mg(OH)2 particles and the negatively-charged aquifer sediments. For several years, EOS worked to develop methods to alter the surface charge of Mg(OH)2 to improve subsurface transport. Laboratory studies demonstrated that colloidal Mg(OH)2 suspensions could be transported through the columns packed with aquifer sand without significant permeability loss. The time before suspension breakthrough into the column effluent varied with surface treatment, indicating the Mg(OH)2 retention could be controlled by varying the suspension surface treatment. These lab results were used to develop a colloidal Mg(OH)2 formulation, CoBupH-Mg, where the particle size, surface charge, degree of flocculation and settling rate are controlled to enhance transport and distribution throughout the treatment zone. A pilot scale injection was performed in Virginia in February 2013. Results demonstrated pH increase over a one-year period at or above pH 6 and achieving pH adjustment over baseline samples up to 30 feet down gradient. These results demonstrate the ability of CoBupH-Mg to transport and adjust aquifer pH which can be used to enhance chlorinated solvent biodegradation in low-pH aquifers or to manipulate the dissolution of metals

4:40 Session 4C: **In-Situ Remediation of Commingled Plumes Utilizing an Injection Program for pH and Alkalinity Optimization**

Chad Hanna, Env. Engineering Specialist, ARCADIS, Tampa

The site is a chemical packaging and distribution center in operation since 1982. In July 1998, approximately 800 gallons of acetone were released during rail car unloading operations. Following the excavation of impacted soils, various phases of investigation were conducted to complete site characterization and groundwater plume delineation. The groundwater data revealed the presence of commingled plumes of aromatic and chlorinated volatile organic compounds in the surficial aquifer system. Intrinsic reductive dechlorination has been observed at the site, as evidenced by the presence of degradation products since initiation of groundwater monitoring in 1999. Despite the continued presence of aromatic VOCs, which can be utilized as electron donors for reductive dechlorination, declines in chlorinated VOC concentrations slowed and stabilized between 2005 and 2009. The lack of recent active reductive dechlorination has been attributed to low groundwater pH and limited buffering capacity in the aquifer. A pilot test was performed between March 2010 and December 2011 to evaluate the feasibility of an injection program to restore subsurface conditions and enhance reductive dechlorination processes. Based on the results of the pilot test, a combination of in-situ pH and alkalinity amendments coupled with monitored natural attenuation was proposed as the remedial approach for the site. The implementation of the full-scale remedy was initiated in April 2013. The initial performance and ongoing optimization of the remediation program are presented.

5:00 **FRC Reception**

Technical Session Agenda

Day Two, Friday, Oct. 10, 2014

Session 5: Laboratory Tools and Techniques

9:00 Session 5A: **Efficiency of an Online Chain of Custody Service**

Kent Patton, Global Managing Director, Promium LLC, Bothell, WA

A web-based online service provides an efficient, accurate and reliable process to replace paper-based chains of custody. This talk describes the components and benefits of one of these: EnviroChain from Promium, an online chain of custody service for environmental engineers, consultants and laboratories. For at least the last 40 years, environmental scientists and laboratories have been using paper chains of custody to manage samples.

Thousands of paper CoCs are handled every year in most labs. That paper-based system is inefficient—data must be entered on paper and then again in the LIMS. It is also inaccurate—every time data is hand-written and then transcribed repeatedly creates potential for data entry errors—and unreliable with the possibility of paper CoCs getting damaged or lost. A web-based electronic chain of custody service not only addresses those issues, it delivers a rich source of data in near real-time for laboratory project planning and sample management. The result is a reduction in costs and headaches. With the explosion in the use of smart phones and tablets, there is finally a field technology that can truly leverage web applications for managing chains of custody. Coupled with a tight integration with a laboratory information management system, the flow of data is accelerated from the field to final report.

9:30 Session 5B: **Interpreting 3D-CSIA Forensic Data: A Step-By-Step Demonstration**

Yi Wang, PhD, Director, Pace CSIA Center of Excellence, Pittsburgh, PA

Three-Dimensional Compound Specific Isotope Analysis has been demonstrated to be a promising approach for chlorinated solvent release site investigation. Obtaining carbon, chlorine and hydrogen isotopic signatures of PCE, TCE and their daughter products in groundwater, soil and vapor samples helps distinguish multiple release sources and assess biodegradation. However, how to interpret a 3D-CSIA forensic data report has been a big challenge to many site managers. It requires a full understanding of isotope geochemistry, stable isotope forensic approach and science-defendable interpretation based on the site information. For example, the typically negative isotope ratios obtained by 3D-CSIA for the target analytes are different from the positive concentrations obtained by the traditional EPA Method 8260B for the same analytes. Further, altered isotope ratios due to certain weathering effects like in-situ degradation, if occurring to the target analytes, would give data interpreters a lot of trouble, especially when they want to apply such data for contaminant source identification. During this presentation, a complicated PCE/TCE release site case study is presented to demonstrate step-by-step how we interpreted one of our 3D-CSIA data reports. Concentrations and carbon, chlorine and hydrogen isotope ratios of PCE, TCE and cDCE were measured in 31 shallow and deep groundwater samples from the site. In these samples, at least eight PCE sources and one TCE source were distinguished based on the isotopic signatures and the locations of the samples. Potential contaminant sources could be from a variety of historic industrial activities at the site.

10:00 Session 5C: **Optimization of Metals Remediation using Column and Microcosm Studies**

Jeff Roberts, Laboratory Manager, SiREM Laboratory, Guelph, ON, Canada

Metals remediation can be complex given the sensitivity of metals to geochemistry, in particular pH and redox potential. Remedial efforts such as the addition of electron donors can alter the redox state of an aquifer, thereby affecting the solubility and mobility of metal species. Furthermore, metals are often toxic to microorganisms and may be inhibitory to bioremediation of other compounds, such as chlorinated solvents, with implications for sites with commingled contaminants. Laboratory treatability studies are commonly used to evaluate remedial options prior to field implementation for a wide variety of contaminants including metals such as arsenic, chromium, zinc and nickel, chlorinated volatile organic compounds, petroleum hydrocarbons and polycyclic aromatic hydrocarbons. Treatability studies are used to determine the impact of amendments, electron donors, oxidants, zero valent iron and the effects of remediation efforts under various scenarios. This presentation focuses on the use of treatability studies to evaluate treatment options for metals. Case studies of laboratory batch and column treatability studies will be presented. In one study, effective dechlorination of trichloroethene was not observed until hexavalent chromium concentrations were reduced, at which point TCE dechlorination commenced and provided valuable information for managing the full scale remediation. Laboratory scale studies can be performed in both batch microcosms and continuous flow through columns. Batch microcosms offer the advantages of low cost and the ability to practically test numerous treatments simultaneously. Flow through column studies offer the advantages of simulating the movement of groundwater through an aquifer or permeable reactive barrier and are ideal for understanding the impact of geochemical gradients. Column studies can be used to evaluate design parameters such as amendment effectiveness, PRB residence time and treatment longevity under site specific conditions.

10:30 Morning Break

11:00 Session 6: **Performance-Based Assessment of Post-Closure Care at Landfills**

Moderator: Mark Hudgins, Conestoga Rovers & Associates, Orlando
Panelists: Emerson Raulerson, PE, Professional Engineer, DEP, Jacksonville
Neal Hornick, PG, Professional Geologist, DEP, Jacksonville
City of Jacksonville (Landfill Owner), *Invited*

In Florida, prescriptive post-closure care periods for closed landfills can last 30 years or longer. However, there are regulations that allow for the reduction of this period provided it can be demonstrated that such reductions will not negatively impact human health and the environment (FAC 62-701.620(3)). Over the last three years, reductions in groundwater monitoring have been granted via permit modification for 36 of 42 facilities reviewed so far, resulting in cost savings of more than $3.6 million. This panel, including an industry expert, state regulators and a facility manager, will discuss PCC re-assessment programs. The focus of the discussion will be to review such activity and projects, discussing requirements for PCC reduction candidacy and the development of consistent, state-wide criteria for performing such assessments in Florida.

12:00 **Day Two Luncheon**

1:30 Session 7: **Annual Environmental Regulatory Panel Discussion**

Moderator: Glenn MacGraw, PG, Vice President, The FGS Group, Tallahassee
Panelists: Jorge Caspary, PG, Director, Division of Waste Management, DEP; *Invited*
Valerie Huegel, Program Administrator, Petroleum Restoration Program, DEP
Additional DEP representatives, *invited*

3:00 Afternoon Break

Session 8: Fixation/Mobilization

3:30 Session 8A: **Chemical Fixation of Priority Heavy Metals in Soil, Sediment and Groundwater Using MetaFix™ Reagents**

Patrick Hicks, PhD, SE Region Technical Manager, PeroxyChem, 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—thus, 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. MetaFix™ 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 and processed reactive minerals. This new approach is insensitive to toxicity and will perform well even in environments that have high metals concentrations, high concentrations of organic contaminants such as solvents, high salt content or pH levels that would inhibit carbon fermentation and sulfate reduction. The approach used in these new reagents 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 are presented.

4:00 Session 8B: **Advances in Surfactant Selection for LNAPL Remediation**

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

A standardized approach to designing remedial actions essentially requires complete removal of free-phase and residual NAPL. Nevertheless, NAPL can be quite difficult to remediate due to capillary forces that trap organics in soil. Surfactant enhanced aquifer remediation achieves these removal goals in a matter of a few weeks to a few months. In many cases, it may even make economic sense to remove as much LNAPL as practicable by applying surfactants before adding oxidants or reductants to the matrix. This talk focuses on the use of state-of-the art surfactant solutions to mobilize residual LNAPL in the saturated soil of the subsurface. Surfactants typically found in household cleaning systems like laundry detergent or shampoo only lower the interfacial tension about one order of magnitude. This is sufficient because mechanical energy can be added to laundry or shampooing to mobilize the trapped oil. In a porous medium, however, the interfacial tension must be reduced by three or four orders of magnitude. Researchers at the University of Oklahoma blended a combination of surfactants that lowers the LNAPL-water interfacial tension to allow physical mobilization of residual LNAPL. The now mobile "oil bank" is then displaced by continuing flushing and withdrawal by the extraction wells. This presentation describes a remediation project that incorporated an optimized surfactant blend to maximize LNAPL removal and minimize waste at competitive costs.

4:30 Session 8C: **Treatment of Chromated Copper Arsenate Contaminated Water with Metsorb®**

Craig Cowdery, Senior Engineer, WRS Infrastructure & Environment, Tallahassee

Treatment of highly contaminated chromated copper arsenate water at wood treatment facilities can be challenging and can generate RCRA hazardous waste. The use of a single adsorbent, such as Metsorb®, greatly simplifies the treatment process. Metsorb represents an innovative green technology that can produce a non-hazardous waste that passes the RCRA toxicity characteristic leaching procedure requirements. WRS Infrastructure & Environment Inc. was requested by U.S. EPA Region IV to perform emergency response at a 12-acre CCA wood treatment facility to treat residual water from the treatment area and water stored in tanks on-site in Jacksonville, FL. The facility was abandoned with all of the chemicals and waste unsecured. Metsorb had never been used to treat extremely high metal concentrations before, so a treatability test was performed to test adsorption capacity and effluent concentrations. Based on the treatability study results, approximately 200,000 gallons of highly-contaminated water were treated on-site using Metsorb. Another 100,000 gallons of the contaminated water were recycled by sending it to another facility for reuse in their CCA process. During operation of the adsorption unit, it was determined that metal adsorption was causing pH shifts that were affecting the Metsorb adsorption capacity and the system's effluent concentrations. This was rectified by reducing the pH of the influent solution using hydrochloric acid. Upon treatment completion, TCLP was used to analyze the spent Metsorb and none of the spent material exceeded the RCRA toxicity characteristic.

5:00 **2014 conference adjourns**

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