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Wakulla dye tracking 8

The Wakulla Springs Alliance recently released red dye into Porter Sink to track how water travels underground to Wakulla Springs. The path of the dye may help identify how pollutants released into the ground are contributing to contaminant loading in the springs.

Lake Seminole muck 9

The Pinellas County Commission began a \$19 million project to improve water quality in Lake Seminole by dredging muck from the bottom of the lake. Current estimates indicate that as much as a million cubic yards of muck cover the lake's bottom.

Miami-Dade wastewater 10

Miami-Dade County officials are planning to construct a new wastewater treatment plant on the western boarder of the city of Miami. The new plant is anticipated to be on-line by the spring of 2026.

Irma debris 11

Hurricanes create a large amount of landscape wastes including fallen trees, branches, leaves and other debris when they move over land. Irma left millions of cubic yards of debris from one end of the Florida peninsula to the other. What happens to that debris?

Caulkins water farm 13

South Florida water managers are confident that a major new water farm project in Martin County will reduce pollution levels entering the St. Lucie Watershed and Indian River Lagoon.

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Got a story?

Got an idea for a story? Like to submit a column for consideration? Let us know. And don't forget to fill us in on your organization's new people and programs, projects and technologies—anything of interest to environmental professionals in Florida. Send to P.O. Box 2175, Goldenrod, FL 32733. Call us at (407) 671-7777 or email meast@enviro-net.com.

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Photo courtesy of Southwest Florida Water Management District

Scientists from the Southwest Florida Water Management District completed a second year of setting up wetland monitoring sites as part of a regional monitoring program that is part of the Central Florida Water Initiative. Above, Oren Reedy with O.C. Reedy Associates Inc. evaluates a soil profile point along a wetland transect. See story on Page 8.

Power loss, stormwater from Hurricane Irma cause hundreds of wastewater spills

By **BLANCHE HARDY, PG**

As a result of Hurricane Irma, over 450 Public Notices of Pollution reporting wastewater spills were submitted to the Florida Department of Environmental Protection between Sept. 9-13.

The reports indicated that millions of gallons of wastewater had been released to waterways in at least a third of Florida's counties.

"Wastewater incidents, or other spills or discharges, that may occur as a result of a storm event are still subject to reporting requirements—both to the Florida State Watch Office (part of

the state Division of Emergency Management) and the department's pollution notification system," said DEP Deputy Press Secretary Dee Ann Miller.

The Public Notices of Pollution provide data to DEP based on information reported and captured through the GeoForm reporting system.

According to DEP records, 65 percent of the wastewater releases resulting from Irma were due to power loss and 22 percent were due to excess rainfall. Other release causes reported include six percent categorized as "unknown," two percent due to equipment malfunctions, and two percent due to break-in-line incidents.

The remaining causes reported were classified as negligible by the department.

"Reporting to the State Watch Office is required for spills greater than 1,000 gallons or where information indicates public health or the environment (such as spills that reach surface waters) are impacted. All identified discharges are reported to the district regulatory office for review," she said.

While some of the spills included treated or untreated wastewater, many were wastewater combined with stormwater.

Flooding became an issue on several levels, both for the physical facilities as well as the operators.

Residents near spilled wastewater were advised to stay out of contaminated flood waters.

For those impacted, the smell of sewage was hard to ignore. The Florida Department of Health provided guidelines for residents to avoid or deal with cleaning up sewage contamination.

Several wastewater service providers asked residents to limit toilet flushing and other sanitary drain use because the lift stations conveying wastewater to the treatment plants were without power or were using generators or auxiliary pumps to operate on a limited basis.

This became obvious in areas without power for several days. Municipalities with aging infrastructure were particularly vulnerable.

"Our first priority is always to work with utilities to identify any releases and get them stopped," said Miller. "Once all necessary first response activities have been performed, the department

Report: Low natural gas prices, not regs, lead to downturn in coal usage

By **ROY LAUGHLIN**

Late this summer, the U.S. Department of Energy released a report commissioned by its secretary, Rick Perry, entitled "Staff Report to the Secretary on Electricity Markets and Reliability."

The take-away from the report is that natural gas prices are so low that coal cannot compete economically with it as an electricity-generating fuel.

The report undermined a constantly heard coal industry and Trump administration mantra that regulation is killing the coal industry and costing coal miners their jobs.

In fact, report details indicate that other factors played a much more significant role in undermining coal's value as a baseload fuel.

First, over the past 20 years, wholesale regional electricity generators have

come to dominate power supply. It is the lowest cost electricity supply and has won the competition for wholesale electricity sales.

Natural gas-fired generators, especially combined-cycle gas generators, are so efficient that they have undercut both coal and nuclear generation costs.

Stagnant electricity demand following a decline in demand after the 2008 recession changed the economic calculus for baseload electricity generation then dependent on large centralized coal and nuclear steam electric generators to supply regional power grids.

The definition of baseload, the report writers' noted, is essential to understanding the failing economics of large coal and nuclear plants:

"Baseload is a term used to describe

COAL
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SPILLS
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EPA IG report: Cleanup at federal Superfund sites slows to a crawl

Staff report

Across the country, efforts to cleanup Superfund sites have slowed considerably over the past few years, according to a recently released report by the U.S. Environmental Protection Agency's Inspector

General.

According to the report, uncontrolled human exposure to toxic chemicals is occurring at four Superfund sites. The sites are unsafe for humans working there, and human exposure to toxic chemicals outside the sites' boundaries is likely occurring.

ring.

The report cited several reasons for the agency's failure to adequately conduct Superfund site cleanups.

Under the Obama administration, the EPA went to court to force property owners or polluters to pay for cleanup, with some level of success. When that failed, taxpayers were stuck with the tab for cleanup, a problem since federal funding has fallen by half since the early 1990s.

The second reason is the EPA's inability to hire and retain staff to work on Superfund cleanups.

According to the report, more than half of the EPA's 10 regions reported that a lack of staff caused delays in project startup, and the inability to complete cleanup efforts, some of them at Superfund sites.

In EPA Region 10, the states of Idaho, Oregon and Washington, remediation activities at 49 Superfund sites were stopped or significantly slowed by staff shortages.

The report's findings discussed the

EPA's circumstances between February, 2016, and July, 2017, the final year of the Obama administration and the first half year of the current administration.

While identifying Superfund cleanup as one of EPA's core missions, newly appointed EPA Administrator Scott Pruitt proposed cutting funding for the program by 30 percent in his proposed 2018 budget.

In spite of the proposed funding cuts, his stated intention is to employ better management practices for Superfund cleanups, and prioritize cleanups for sites with redevelopment potential or sites that threaten adjacent residents.

Pruitt's goal may be to get more done with less money and manpower—but that approach has already caused significant performance failures.

The Superfund program has 1,300 listed sites but the bulk of the funding for cleanup cited in the study went

to sites in seven highly industrialized states. New Jersey topped the list of states with funded Superfund projects.

The IG's report proposed moving staff among different regions in response to project demand. But regional administrators, only two of which have been named under the Trump administration, said that reshuffling staff would be disruptive.

The report noted that the Department of Defense effectively reassigns staff responsibilities to meet needs. In response to the report, EPA officials said that it will study DOD's methods as a potential model for EPA staffing.

Regs delayed for coal-fired power plant releases. In mid-September, the EPA passed a final rule to delay deadlines in its Steam Electric Power Generating Effluent Guidelines - 2015 Final Rule.

The 2015 rule intended to reduce contaminated water releases from coal-fired power plants.

The new rule delays the implementation of limits or requirements for pretreatment of two wastewater streams: the wastewater stream from flue gas desulfurization and the wastewater stream from bottom ash transport waste.

Under the new rule, power plants are not expected to be in compliance until November, 2018. The benefit of delay to the industry, according to the EPA, are savings between \$27.5 - \$36.8 million.

The rule delay passed in September does not affect fly ash transport water, flue gas mercury control wastewater and gasification wastewater, all of which were also regulated under the EPA's 2015 rule.

EPA's awards SBIR grants. EPA awarded 15 Phase I Small Business Innovation Research grants in September.

The funding supports technologies aimed at creating cleaner manufacturing materials and better infrastructure in communities, the agency's press release noted in describing the selected recipients.

The development of mobile or new sensors or measurement devices dominated the awards, with six projects in the category.


Mobile and remote sensor technology lead the measurement/sensor category. Three funded projects put research to develop either new plastic resins or sustainable plastic resin syntheses in the second largest awards category.


Two companies proposing small scale water desalinators received awards as did another two that proposed new methods of reusing wood.

No Florida-based applicant and none in EPA Region 4 received a Phase I SBIR grant this round.

California companies, with five awards, lead the awards by state grouping, followed by Massachusetts with three.







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Jax's St. Johns River Power Park to be shut down

Staff report

Plans to shut down a coal-fired power plant in Jacksonville owned by JEA and Florida Power & Light Co. were approved by the Florida Public Service Commission.

Supporters said the decision to shutter the St. Johns River Power Park will reduce both carbon dioxide emission levels as well as some customer costs.

Carbon emissions could be reduced by 5.6 million tons, according to commission officials. JEA owns an 80 percent interest in the plant and FPL owns 20 percent.

The plant was not expected to be retired until 2052 before the deal was announced in March to close the 1,322-megawatt plant.

JEA will continue to use part of the land but no other plans have been announced for redevelopment of the site once the plant is demolished.

FPL will pay \$90.4 million to JEA as part of the deal to close the plant.

Customers are expected to save \$183 million by eliminating future costs related to the plant.

In 2015, FPL received approval to buy and later shut down the Cedar Bay power plant in Jacksonville.

And last year, the utility received approval to buy the Indiantown Cogeneration plant in Martin County. That plant is expected to close by the end of 2019.

In recent years, FPL has favored using natural gas to fuel power generation. The utility said the new gas plants operate more efficiently than the older coal plants.

St. Pete gun range cleanup. Cleanup is complete at the site of the former St. Petersburg Pistol Club.

Between 50 and 60 tons of soil contaminated with lead and other metals were removed from the site that will soon be home to a new firing range for the St. Petersburg Police Department.

The contaminated dirt was loaded into secure roll-off dumpsters and taken to an approved landfill for disposal over a two-week period.

More drilling in Big Cypress. Activists are fighting plans by a Texas company to drill for oil in the Everglades.

The Big Cypress National Preserve is home to wildlife including bears, panthers and wading birds. But since the 1970s, two active wellfields have been operating there.

Now, four environmental groups are fighting a proposal by the Burnett Oil Co. of Fort Worth to expand oil drilling. The company has applied for renewal of its state permit.

The activists said the company's work has harmed the preserve, killed or damaged trees and left ruts in the soil up to 17 inches deep.

In response, Burnett Oil officials said that any damage was minor and said the impacts were anticipated in the permits.

The firm also said it tried to reduce the rutting impacts by using lighter trucks.

Burnett Oil's permits never prohibited damaging or cutting down trees, said officials. The company still plans to complete all required restoration work.

Officials said that past seismic surveys have shown that non-intrusive seismic surveying causes no major or lasting environmental impacts.

The state had until Oct. 24 to make a decision on the permit.

South Florida has only a few oil fields and they run along a two-mile deep geological feature called the Sunniland Trend from Fort Myers to Miami.

FSU energy conservation. Florida State University could save millions of dollars in energy costs after signing a contract to implement a custom energy conservation program.

The agreement, signed with Cenergetic LLC, includes goals focused on organizational and behavioral changes within the university system.

The goals include limiting energy consumption to save money for project rein-

vestment, increasing awareness to empower energy users to become energy savers, and preserving a quality learning environment.

The company will perform on-site assessment of the university's facilities and make recommendations.

The firm's energy specialists will mainly be responsible for looking at savings opportunities and will work closely with university officials on ways to conserve energy.

Florida State will not pay for the management of the program. Cenergetic will be paid based on actual savings achieved by the university.

Florida State is expected to save more than \$12 million over the course of the five-year contract.

Beach renourishment in Pinellas. A Virginia company has been awarded a contract for nearly \$36.6 million for the Pinellas County Beach Renourishment project, part of the country's storm protection effort.

Using dredge material, Norfolk Dredg-

ing Co. will renourish critically eroded shoreline in Pinellas.

The U.S. Army Corps of Engineers is leading the federal project in partnership with Pinellas County and the Florida Department of Environmental Protection. The federal government is picking up 75 percent of the cost.

Construction is expected to start by late November with completion scheduled for October, 2018.

About a million cubic yards of beach quality sand will be placed along the critically eroded shoreline of Sand Key.


Another 63,000 cubic yards will be placed on Treasure Island at Sunshine Beach.

The corps and the county are investigating the impacts of Hurricane Irma to determine the need for additional sand placement and funding needs for Sand Key, Sunset Beach on Treasure Island and Uptown Beach on Long Key.


People news. Matthew Leopold, former general counsel to DEP and counsel

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Florida Notes




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Ecologists, risk assessors: Wetlands protect shorelines from storm surge, if appropriately situated

Staff report

In a recent technical article, a group of wetland ecologists and insurance company risk assessors quantitatively calculated the flood protection value of coastal wetlands to structures and infrastructure.

They analyzed financial loss data caused by Hurricane Sandy in 2012 in coastal communities between Southern Maine and North Carolina, the coastline affected most by Sandy.

The researchers correlated losses with proximity and characteristics of coastal wetlands that modify storm surge.

The analysis showed that in the 12 states affected by Hurricane Sandy, wetlands and marshes reduced storm surge damage by an average of 11 percent.

If one were to look at the data in terms of positive or negative benefits, more locations of minimal increase in damage near wetlands occurred than for locations with damage reduction.

Nevertheless, where benefits did occur, they were typically large, from 10 to 25 percent reduction of storm surge damage. That calculated out as an overall 11 per-

cent benefit.

In monetary terms, the benefits equaled a reduction of \$625 million in direct property damages where wetlands effectively buffered storm surge.

The most effective marshes for buffering storm surge were in Maryland, where reductions of up to 30 percent of damages were documented.

In states such as North Carolina and in the Chesapeake Bay, some wetlands had a

diametrically opposite effect. While wetlands protected property directly behind them from storm surge, in other cases they made property damage worse on the seaward side by causing greater flooding.

The primary focus of the study was on Hurricane Sandy damage, a one-time event. The researchers also looked at the records for storm events in Barnegat Bay, NJ, over multiple years.

On an annual basis, marshes there reduced storm surge damage an average of 16 percent, with a high value of 70 percent in the most protected locations.

This study is the first to correlate quantitative risk reductions with a GIS-focused wetland database to show in financial terms how significantly wetlands modify storm surge damages to property.

"Protecting and nurturing these natural first lines of defense (coastal wetlands) could help Florida homeowners reduce damages to their properties during future storms," noted the study's authors.

They also said that while coastal ecosystems that dampen storm surge are not a complete remedy that reduces flooding risks, they are an important component of risk reduction efforts.

Coincidentally, the article was accepted for publication Aug. 1 and published on the 31st of the month as hurricanes and their storm surge and flooding ravaged major industrial cities in Texas and Louisiana, and islands in the Caribbean.

These extreme events are, according to more than 95 percent of competent scientists, caused by human-influenced climate change and could be reduced by modifying human behavior.

Corps to partner on reservoir. After requesting and receiving a one-month delay in July, the U.S. Army Corps of Engineers agreed in early September to part-

ner with the South Florida Water Management District on the construction of a 14,000-acre stormwater reservoir south of Lake Okeechobee in the Everglades Agricultural Area.

The Florida Legislature approved the reservoir project and funding for its construction last spring.

The legislation includes a strict project schedule that requested the corps commitment by August to participate in the construction project.

When it asked for more time to make a decision in

August, the corps noted that it was not implementing denial by delay or searching for an escape from participation.

On Sept. 5, the corps formally agreed to partner on the reservoir construction project.

The state of Florida and the federal government, usually acting through the SFWMD and the corps, are equal partners in the Everglades restoration effort.

A reservoir south of Lake Okeechobee in the EAA has always been a part of the restoration plan, but initial planning for it was not on the schedule until 2021.

When Florida Senate President Joe Negron championed the legislature's recent commitment to fund reservoir construction on state land purchased through 2016's Amendment 1 proceeds, corps program managers needed the delay to determine if they could meet funding and programmatic requirements following the change of schedule.

Reservoir construction will cost approximately \$1.6 billion with equal cost-sharing between state and federal governments.

In his letter to SFWMD, Col. Jason Kirk, commander and district engineer in the corps' Jacksonville district, noted that his agency had not yet identified funding availability but would do so when the district and the corps were concluding contractual arrangements.

The next deadline in Florida's work plan is Jan. 8, 2018, when SFWMD will report on the status of the federal-state agreement.

It will also report to the legislature on lease modifications of state-owned land slated to be used for reservoir construction, and the acquisition of private land within the A-2 parcel where the planned reservoir will be constructed.

Indian Bayou sedimentation sparks controversy. Since March 2016, waters in Indian Bayou in Santa Rosa County have carried high sediment loads, sparking demands by local residents for more effective sediment retention before runoff carries it to the bayou.

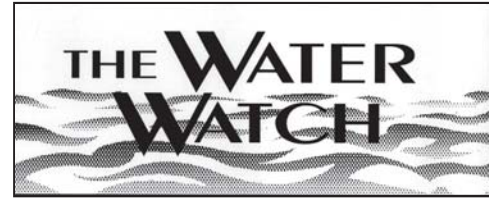
But state and local officials cannot agree on the sediment's source.

The issue came to a head late this summer when Lyle Seigler, director of the Division of Regulatory Services at the Northwest Florida Water Management District, sent a letter to the Florida Department of Transportation and to Santa Rosa County officials.

The letter demanded that FDOT and the county respond within seven days to provide an itemized schedule for completion of phased remedial activities and completion of the entire project to permanently end sediment releases to Indian Bayou.

Prior to that letter from the district, Pensacola Attorney William J. Dunaway, in a letter to Brett Cyphers, executive director of the NFWMD and Shawn Hamilton, district director of the Northwest District of the Florida Department of Environmental Protection, demanded that state agencies take corrective action and recommended fines for noncompliance under the Clean Water Act.

He recommended that the fines should



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WATCH
Continued on Page 5

Florida counties benefit from federal funding to improve air quality

By PRAKASH GANDHI

Late this summer, federal environmental officials awarded thousands of dollars to several Florida counties to help improve air quality.

The U.S. Environmental Protection Agency awarded more than \$70,000 to Pinellas County to support its work with protecting air quality.

The \$71,896 grant will support the county's air quality division that's working to reduce pollutants such as ozone, par-

WATCH From Page 4

be as high as \$625,000 under the Clean Water Act. That's \$25,000 for each of the 25 rain events since March 2016 that produced more than two inches of rain and sent sediment-laden runoff from construction sites and Santa Rosa County roads flowing into Indian Bayou.

Dunaway wrote the letters on behalf of a resident of a subdivision adjacent to Indian Bayou.

In response to that letter, Cyphers noted that the district had begun discussions early in the summer to address the sediment runoff problems.

The negotiations were complicated by the fact that DEP had issued a permit to Prince Contracting LLC for an interstate highway-widening project that explicitly acknowledged direct runoff into Indian Bayou during construction.

According to local news accounts, during the construction project's first phase, Prince Contracting effectively reduced sediment runoff. But as the project moved into another phase, runoff overflowed two retention ponds before it flowed into the bayou.

Santa Rosa County's contribution comes from runoff from San Juan Street and other streets in the bayou's watershed.

County officials said that runoff from the interstate project flows into its drainage swales along the street, contributing to the problem.

The county showed a video taken from a drone showing the runoff from the interstate construction project along adjacent streets into the bayou, strongly buttressing its contention that the construction project was the source of the sediments.

Nevertheless, in early September, Santa Rosa County agreed to replace sediment fences and hay bales in two locations along San Juan Street, to remove excess sediment from ditches along San Juan Street, and plant grass.

These measures were to be completed within 30 days. Within six weeks, the county agreed to build riprap check dams in drainage structures along San Juan Street.

In the longer term, the county is looking for funding to improve San Juan Street.

Deep well prohibition. Jackson County in Florida's Panhandle passed a county ordinance prohibiting deep injection wells.

The ordinance, first proposed this summer, was passed on Sept. 25.

The National Association for the Advancement of Colored People was a significant party to the decision, urging the board of county commissioners to ban deep injection wells.

State Sen. George Gainer was also involved in the negotiation of the local government issue.

Waste Management, which owns a large landfill in the county, was a proponent of deep injection. They wanted to use deep wells to dispose of landfill leachate in order to comply with surface water quality regulations.

Jackson County's new ordinance means that Waste Management must now identify a new method for disposing of its landfill leachate.

St. Andrews WWTP upgrades. The city of Panama City began upgrades to its St. Andrews Bay Wastewater Treatment Plant earlier this year.

ticulate matter, carbon monoxide and mercury.

"The grant is a continuing grant, and it supports our inspection and air monitoring program," said Sherrill Culliver, environmental program coordinator with Pinellas County. "Our office inspects different facilities, from dry cleaning businesses to power plants. The money is vital to the programs."

In the early 1990s, Pinellas was in non-attainment status for certain air pollutants. But the county has made strides to improve

Now in the middle of the project's first phase, contractors have completed a drain bed, water heaters in the electrical building and a dumpster slab. They are currently replacing and upgrading a chamber drain valve.

The project is on schedule to meet its January, 2019, completion date.

The total project is budgeted at \$34 million for the upgrades to the 40-year-old wastewater treatment plant.

Well conversion will conserve drinking water source. In Putnam County, Vulcan Materials Co. completed a well conversion project that will help conserve the drinking water supply in the Upper Floridan Aquifer.

Vulcan's new well will draw water—about 2.6 million gallons a day—from the Lower Floridan for use at its Grandin Sand Plant.

The project will help Clay and Putnam counties meet minimum flow and level standards, particularly for Lake Grandin, whose water level has dropped, many say because of water withdrawals for sand mining and grading at the Grandin Plant.

In a news release, the St. Johns River Water Management District touted the well conversion project as a public-private partnership.

The district funded up to \$425,000 of the \$985,000 project cost, which officials there termed an "investment."

"Doing the right thing is the only way to do business, and that includes conserving resources and protecting the environment," said Dean Sunas, vice president and general manager at Vulcan.

"This partnership with the St. Johns River Water Management District demonstrates how businesses and communities can come together for the benefit of all neighbors and stakeholders," he said.

Winter Garden reclaimed water. The city of Winter Garden initiated a reclaimed water/stormwater project that will provide up to two million gallons per day of stormwater to augment the city's reclaimed water supply for irrigation.

its air quality since then, Culliver said.

"Each time the ozone standard has been lowered, we have been able to meet the standards," he said. "I attribute this to the improvement in business processes and lower vehicle emission rates."

Other counties also received financial help for their air quality programs. The EPA awarded a \$246,829 grant to Hillsborough County to support their ongoing program to protect air quality.

Further south, EPA awarded two grants totaling \$133,135 to Palm Beach County

The diverted stormwater will decrease phosphorus loading to Lake Apopka by 11,000 pounds and nitrogen loading by 2,000 pounds per year.

In addition, it will reduce groundwater withdrawals from the Upper Floridan Aquifer.

Winter Garden is part of the Central Florida Water Initiative area, so the project will play a role in the regional water conservation program.

The total project cost is \$3.1 million. St. Johns River Water Management District and the Florida Department of Environmental Protection each provided \$750,000 to support the project.

Winter Garden will cover the balance, about \$1.6 million.

aimed at reducing air pollution there.

A \$109,792 grant will be used by Palm Beach County to support its ongoing program to protect air quality so that it achieves established ambient air standards.

Another \$23,343 grant will be used to support compliance with National Ambient Air Quality standards by continuing the ongoing collection of data on the ambient air concentration of fine particulate matter in the county.

One of Florida's biggest counties, Orange County, was awarded a \$79,530 grant to support ongoing efforts to protect Central Florida's air quality.

Federal officials said that Clean Air Act regulations help reduce pollution across the country. Even though the American economy has grown since the CAA was passed more than 40 years ago, common pollutants such as particulate matter, ozone, carbon monoxide, nitrogen oxide and sulfur dioxide have been reduced.

A recent study found that heart disease and heart attacks are more likely for individuals living in places with higher levels of air pollution.

The study found that exposure to even small amounts of fine particulate pollution over a year could increase a person's odds of a heart attack by up to 14 percent.



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FLORIDA REMEDiation CONFERENCE

The Premier Soil and Groundwater Cleanup Conference of the Year

Dec. 7-8, 2017, Rosen Centre Hotel, Orlando

Technical Agenda

Day One, Thursday, Dec. 7, 2017

Opening Session

9:00: **A Word from the Chair**
Jim Langenbach, PE, BCEE, Senior Principal, Geosyntec Consultants, Titusville

Keynote Address: Michael Annable, PhD, PE, Professor, University of Florida, Gainesville

9:30: **Environmental Consulting at Brownfield Sites is (Much, Much) More than Just Contamination Assessment and Remediation: Strategies for Limiting Professional Liability, Increasing Client Profitability and Improving Redevelopment Outcomes**

Michael Goldstein, Esq., Managing Partner, Goldstein Environmental Law Firm PA, Miami
In a brownfields context, consider the typical contamination discovery-reporting-assessment-remediation-NFA model historically marketed by environmental consultants to responsible parties fully disrupted. Clients taking on these types of sites for redevelopment are now demanding a more non-linear suite of services that emphasize evaluating incremental construction costs associated with properly managing contaminated media, obtaining regulatory agency approvals to properly manage contaminated media during construction, and actually managing contaminated media properly during construction to maintain pre-acquisition defenses to state and federal liability on the one hand while simultaneously limiting exposure to third-party liability claims from neighbors and adjacent property owners on the other. These services can also encompass tapping into federal and state redevelopment and rehabilitation incentive programs to subsidize incremental construction costs and create even greater insulation from legal liability. This presentation will suggest a "unified theory" of environmental redevelopment consulting with the intent of providing those in attendance with the knowledge, tools and resources necessary to offer a more robust and relevant suite of services to an ever-expanding pool of potential clients in the brownfields



marketplace. At the same time, the presentation will highlight emerging topics of professional malpractice and strategies for improving the quality and efficacy of consultant interactions with state and local regulatory agency officials. Areas of focus in this regard will include the relationship between stormwater system design and contaminated media, the plans and reports that regulators are now requiring to allow for on-site grading of affected soils and relocation and processing of solid waste materials, non-statutory environmental criteria applicable to construction dewatering effluent, monitoring and management of airborne contaminants, proper selection of engineering control options and early-stage planning for environmental deed restrictions. In addition, a concise and detailed summary of federal and state financial incentives available to subsidize rehabilitation and redevelopment activities will be presented with recommendations regarding how to timely and efficiently coordinate with other client-retained development professionals to maximize economic subsidy opportunities.

10:00 30-Minute Break

Session 2: Innovative Assessment and Remediation Strategies

10:30 **Using a Bottom-Up Approach to Develop a Sustainable Remediation Technology: Theory and Practice**

Paul Favara, PE, Global Practice Dir., Liability and Remediation, CH2M, Gainesville
In the ramp-up to integrating sustainability into remediation, a key industry focus area has been to reduce the environmental footprint of treatment processes. In-situ treatment processes involving injection of treatment reagents for chlorinated organics and fuel-related contaminants are considered inherently sustainable since they typically don't require continuous use of energy to provide effective treatment. However, a closer inspection of the burdens related to some remediation reagents shows there is room for improvement. For example, embedded energy and water used in some remediation reagents can be significant. By understanding these environmental burdens and using a bottom-up approach for using sustainable thinking to improve remediation technology, it is possible to improve sustainability profile of the technology while decreasing life-cycle costs. A solar/wind-powered subgrade biogeochemical reactor is a unique in-situ technology for treatment of contaminant source areas and groundwater plume hot spots. SBGRs have been used to treat chlorinated volatile organic compounds and fuel-related contaminants in soil and groundwater; and treatment of other contaminants continues to be evaluated. SBGRs consist of the following common elements: 1) excavation of contaminated source area soils, 2) backfill of the excavation with gravel and SBGR amendments tailored to the contaminant(s) of concern, and 3) installation of a solar- or wind-powered pumping system to recirculate groundwater through the SBGR for treatment. For enhanced reductive dechlorination approaches at CVOC sites, SBGR treatment media have contained various types of organic mulch, new or recycled vegetable oil, iron pyrite or magnetite sands. For fuel-related sites, SBGR treatment media have included recycled gypsum products for sulfate-enhanced degradation. Use of locally sourced farm and tree byproducts, reclaimed construction materials, along with off-grid groundwater pumping, creates a low-cost, low-maintenance and sustainable remediation solution. This presentation will provide an overview of the theory behind SBGR, discuss the sustainability attributes of the technology and provide examples of how this flexible remediation technology can be applied to address different site challenges.

10:50 **The Application of Engineered Phytotechnology for Remedial System Optimization and Ultimate Site Closure of a Complex 1,4-Dioxane Site in Sarasota**

P. James Linton, Principal, Geosyntec, Clearwater
Groundwater at a former manufacturing facility was contaminated with chlorinated volatile organic compounds, the emerging contaminant 1,4-dioxane and arsenic resulting from historic activities. Complex conditions making site cleanup challenging included a complex lithology, a residual source area, and coalescing, on- and off-site dissolved-phase plumes. An ineffective pump-and-treat system was operated by others for 12 years, and an additional 25 additional years of costly O&M was anticipated to obtain closure. Geosyntec planned and conducted high-resolution site investigation activities to refine the conceptual site model and prepared a focused feasibility study for remedial optimization. Investigation tools included vertical lithology and groundwater profiling, pump testing and groundwater flow modeling. The results indicated that the shallow surficial aquifer, the upper 15 feet, was characterized by sands, silty sand/sandy silt with layers of shells and lithified zones, and clay comparable to coastal Central Florida. A 1,4-dioxane/CVOC source area was identified within the fine-grained soils that was slowly back-diffusing into the permeable zones of the SA, resulting in an approximately three-acre dissolved-phase plume in the shallow. The FFS was finalized as a remedial action plan that met the requirements of Chapter 62-780, F.A.C. The final remedy included an impermeable barrier to isolate the 1,4-dioxane source area; innovative, engineered phytotechnology using native species for COC reduction and hydraulic containment; and long-term monitoring for the dissolved plumes. The RAP was implemented and by the second growing season, results demonstrated that the phytotechnology system had captured groundwater flow through hydraulic containment, and groundwater concentrations had decreased by two orders of magnitude. Geosyntec obtained DEP approval to shut down and decommission the P&T system and implement an optimized groundwater monitoring program specific to the phytoremediation design. By the fourth growing season, Geosyntec demonstrated that 1,4-dioxane within the isolation area had decreased to concentrations slightly above the GCTL and that the other plumes were stable and/or shrinking. Based on these results, Geosyntec successfully negotiated DEP approval for no further action with conditions.

11:10 **Demonstrating Plume Stability to Support Risk-Based Closure**

Ed Meyers, PG, Environmental Manager, UCPM Environmental LLC, Orlando
In 1997, Universal City Property Management purchased approximately 2,000 acres of property in the Orlando I-Drive tourist district area. Due to historical operations at the site, 46 solid waste management units and areas of concern were identified at the facility. Soil and groundwater contamination was identified at 17 SWMU/AOCs. UCPM has implemented corrective measures at each of the impacted SWMUs. All impacted soils have been removed from the facility. Groundwater treatment technologies have included excavation, air sparge, chemical oxidation and bioremediation. Eight sites have been closed without conditions and five sites have been closed with conditions. To date, over 800 acres of the facility have been redeveloped including the expansion of the Orange County Convention Center, and construction of two hotels, a golf course, shopping center and two apartment/condominium complexes. To support redevelopment of the impacted property and adjacent land parcels, UCPM performed a preliminary facility-wide risk assessment to evaluate future land use based on current and predicted groundwater contaminant concentrations. Risk assessment activities included development of alternative cleanup target levels associated with several possible development scenarios including commercial and residential use, onsite utility workers, short and long-term construction projects and vapor intrusion thresholds. Following contaminant reduction to acceptable levels, UCPM completed post active remediation monitoring to confirm that contaminant concentrations remain below cleanup target level criteria and remnant groundwater plumes remain stable. UCPM used several techniques to demonstrate that remnant groundwater plumes are stable and contained onsite. These techniques included analysis of groundwater contamination plume maps, groundwater contaminant trend analysis, Bichlor modeling, analysis of stable isotope data, and MAROS and Mann Kendal statistical analysis. This presentation will provide a summary of how UCPM has evaluated plume stability to support site closure

11:30 **Leveraging the Commercial Use of Drones on Military Installations for Environmental Site Cleanup**

Frank McInturff, PE, Principal, EnSafe Inc., Jacksonville
Brent Klavon, Director of Commercial Drones, Aviation Systems Eng. Co., Jacksonville
Although much of the technology evolution behind small unmanned aerial systems, or drones, has been driven by the U.S. Department of Defense's strategic defense initiatives, it is the emerging commercial applications of drones that has driven new regulations and business use cases for imagery collection, data analysis, visualization and management. Learn how we charted the path

A Quick Look at FRC 2017 Highlights

We welcome Michael D. Annable, PhD, PE, to FRC 2017 as our featured FRC 2017 Kickoff Speaker

Dr. Michael Annable is a professor in the Department of Environmental Engineering Sciences at the University of Florida. He joined the UF faculty in 1992 after receiving his Ph.D. from Michigan State University where he worked on soil vapor extraction of multi-component non-aqueous phase liquids. His current interests are in physical-chemical processes related to field scale application of innovative technologies for subsurface remediation.

He is also investigating innovative techniques for measuring groundwater flow and contaminant flux in aquifers. He has published more than 60 journal articles and currently serves as an associate editor for the *Journal of Contaminant Hydrology*.

Mike will kick off the 2017 FRC conference with a discussion of "Advances in Characterization of Water and Contaminant Flux in Porous Media." Don't miss this talk.

And just after that, the ever popular and always intriguing Michael Goldstein, managing partner with The Goldstein Environmental Law Firm PA in Miami, returns to FRC. Michael will provide his take on "Environmental Consulting at Brownfield Sites." He knows better than anyone that brownfields consulting is much more than contamination assessment and remediation. He will discuss strategies for limiting your professional liability, increasing your client's profitability and improving redevelopment outcomes.

In addition, FRC 2017 features two unusual sessions sure to please:

Our first ever Young Professionals Session

Several years ago, we noted that there were not a lot of young professionals in our audience. Since then, we have taken steps to encourage the participation of the 35-and-under crowd.

This year, we introduce a special session specifically designed for these young guns to take the podium and share their unique perspectives on a range of technical and management issues. Can we learn something from them? You bet.

Back again for 2017, our fast-paced Speed Talk Session

Many moons ago, we tried a crazy idea: we presented short five-minute talks from several speakers during lunch. Of course, the fact that it was done during lunch ensured it's failure. After all, who wants to listen to short technical presentations while you're finishing dessert and coffee, deep into conversation with your round table colleagues?

FRC Chair Jim Langenbach had a better idea last year: give the speed talks a session of their own during the conference when folks are not distracted. Plan it for the end of the day's talks to allow for follow-up questions at the FRC Reception. What a concept! Last year, it went so well that we have expanded the idea. Expect 10 rapid-fire talks chock fulla good stuff on topics from green remediation to ISM.

Add to that, our usual broad selection of topical and relevant subject matter presented by some of the industry's most knowledgeable and recognized experts, stir well and, voila, FRC 2017 is ready to serve.

2017 technical session menu items include:

- Innovative Assessment and Remediation Strategies
- Emerging Contaminants of Concern: PFAS
- Applications of In-Situ Assessment and Remedial Strategies
- Petroleum Remediation: Case Studies
- Thermal Technologies and Complex Strategies
- Enhanced In-Situ Remediation Applications
- Conceptual Site Models to Facilitate Successful Remedy Applications
- Our popular annual Regulatory Panel Discussion with DEP representatives

And don't forget our **8th Annual FRC Charity Golf Tournament** at the nearby Shingle Creek Golf Club. The course was recently redesigned and will present some new challenges to even the most seasoned golfers. Proceeds this year go to the Special Operations Warrior Foundation. Join us on the links for a great cause!

Two words best describe what we have put together this year at FRC: "More" and "Better." Do not miss FRC 2017.

for the first commercial drone use on U.S. Navy installations for the Navy Facilities Engineering Command Southeast's environmental cleanup sites. This project included the use of multiple drone aircraft, optical and LiDAR imagery collection, ground control, various post data analysis/visualizations and development of an ESRI ArcGIS Portal web application. The project included the data acquisition of high resolution imagery, real-world topographic mapping, stock pile volume analysis, and conceptual site model development with 3D views.

12:00 **Day One Luncheon** Sponsored by **Advanced Environmental Laboratories Inc.**

Session 3: Emerging Contaminants of Concern: PFAS

1:00 **Chemical Properties, Uses and Sources, and Risks Associated with PFAS**

Brian Moore, PE, Principal, GHD Services Inc., Tampa

Perfluoroalkyl and polyfluoroalkyl substances are a family of manufactured chemicals that do not occur naturally in the environment. Perfluorooctane sulfonate and perfluorooctanoic acid are two of the most well-known and are contaminants of emerging concern. They have been identified in the environmental at several known and suspected contaminated sites. These chemicals are not traditional industrial pollutants and they are not commonly monitored or measured. They have the potential to enter the environment and cause known or suspected adverse ecological and human health effects. PFAS have hydrophobic and hydrophilic ends, and repel oil and water. This presentation will provide background information on the chemical properties, uses and sources, and risks associated with PFAS. The presentation will also detail existing environmental quality guidelines and some of the challenges associated with assessment and remediation of PFAS in the environment. PFAS analysis can be complicated because of cross contamination, analytical limitations and inconsistencies in methodologies. Similarly, PFAS are extremely recalcitrant to degradation or destruction, which complicates the remediation process. The presentation will also provide examples of remedial approaches for PFAS cleanup.

1:30 **Perfluoroalkyl and Polyfluoroalkyl Substances: Treatment Options for Soil and Groundwater**

Gary Birk, PE, Managing Partner, Tersus Environmental, Wake Forest, NC

Perfluoroalkyl and polyfluoroalkyl substances are surfactants, polymers and other substances that are widely distributed across the higher trophic levels and are found in air, soil and groundwater at sites across the U.S. For decades, they have been used in hundreds of industrial applications and consumer products such as carpeting, apparels, upholstery, food paper wrappings and metal plating. Surfactant applications used heavily in the military include aqueous film-forming foams used to extinguish fires involving highly flammable liquids. The toxicity, mobility and bioaccumulation potential of PFAS pose potential adverse effects for the environment and human health. PFAS have been found at very low levels both in the environment and in the blood samples of the general U.S. population. To provide a margin of protection from a lifetime of exposure to perfluorooctanoic acid and perfluorooctyl sulfonate from drinking water, EPA established the health advisory levels at 70 parts per trillion. PFAS are fluorinated organic compounds in which the hydrogen atoms of the hydrocarbon skeleton are substituted fully or partially by fluorine atoms. In view of the strong covalent bond between the fluorine and the carbon atoms, these compounds are considered non-degradable and they persist in the environment. Practitioners have difficulty remediating these compounds at a reasonable cost because PFAS are extremely resistant to thermal, chemical and biological degradation processes. The current state of the practice for addressing highly concentrated source zones, mitigate mass flux of impacts to aquifers or PFAS in extracted water includes the use of granular activated carbon. Unfortunately, GAC is only a temporary solution as it is effective at removing only a portion of PFAS from groundwater. This is due to GAC's low binding capacity for PFOS as compared to nonpolar organic hydrocarbons and the low effective removal of shorter chain perfluoroalkyl acids, the daughter products resulting from biotransformation of polyfluorinated precursor compounds. As the PFAS family of compounds includes anions, cations and zwitterions, new sorbent media are being developed to remove both long and short chain PFAS that combine hydrophobic interactions with electrostatic interactions. Liquid surface-active reagents are also being developed for use as an initial pretreatment. In the pretreatment phase, dissolved PFAS are precipitated as micro-flocs by metering the liquid active compound into a stirring tank. With removal efficiencies of 96 to 98 percent, the precipitants can be concentrated to a very high degree, the life of sorbent media is significantly extended. This constitutes a considerably more sustainable approach. The presentation will include results and lessons learned from the latest laboratory and field implementation for the treatment of PFAS-impacted soil and groundwater. The presentation will also provide an update on advances in point-of-entry systems.

2:00 **Pilot Testing of Removal of Perfluoroalkyl and Polyfluoroalkyl Substances from Fire Training Site Soils**

William Kerfoot, PhD, Principal, Kerfoot Technologies Inc., Mashpee, MA

Perfluoroalkyl compounds have been used with fire-fighting foams and are found adsorbed in soils from the sites. Rainwater leaches the compounds downward when porous, sandy soils dominate resulting in vadose zone and saturated soil contamination. The soils also contain the remnants of the fuels which were ignited and subjected to elevated temperatures. A series of tests were conducted on example contaminated soils with different delivery methods using peroxide-activated nanobubble ozone slurries. Formation of the slurry above ground, followed by injection through slotted screens into the contaminated soil, showed PFOS and PFOA removal of 98.5 and 92.3%, respectively, within a two-day long exposure. Fluorotelomer sulfonates of two isotopes, 6:2 and 8:2, showed removal efficiencies over 98% when monitoring aqueous fractions. Formation of the slurry in ground from special nanoporous stainless-steel laminar Spargepoints® appeared to increase the rate of removal from adsorbed soil fractions. A rise in fluoride concentration, proportional with the decomposition of 85% of PFOS, the most abundant PFAS, was graphed during 72 hours of injection. Acidity rise, often observed due to formation of dilute hydrofluoric and carbonic acids, was controlled by use of slightly alkaline peroxide, yielding final pHs between 6.4 and 7.4. Different from chloride, residual fluoride concentrations, ranging up to .75 mg/L, gradually disappeared from groundwater solution.

2:30 **In-Situ Containment of PFAS Using Colloidal Activated Carbon**

Chad Northington, PE, SE District Technical Manager., Regenesis, Tallahassee

With the increasing awareness to the widespread contamination associated with PFOA, PFOS and other PFAS compounds, there is an established need for new and lower cost treatment options that can address the large dilute plumes that these contaminants commonly form. At the present time, the accepted remediation method is to use pump and treat systems equipped with activated carbon. The costs associated with running these systems and replacing the carbon can be quite high. For that reason, the ability to implement an in-situ barrier of activated carbon that can cutoff and contain these plumes for many years with a single application affords a beneficial means to decrease or avoid the operating and maintenance costs in the existing aboveground systems. This presentation examines the use of a colloidal activated carbon that readily distributes within the subsurface, providing a method for injecting an in-situ barrier of activated carbon for PFAS treatment. Laboratory batch studies were conducted to measure the relative adsorption of PFOS, PFOA, PFHpA and PFBS with a distributable form of colloidal activated carbon. Results of these studies demonstrated that a field relevant dose of the colloidal activated carbon could reduce 100 mg/L of each PFAS compound tested by at least 99.9% and the relative adsorption followed in the order: PFOS > PFOA > PFHpA > PFBS, as has been observed with other activated carbons. In these experiments PFOS and PFOA were reduced to below the 2016 revised EPA health advisory limits of 70 ng/L.

3:00 30-Minute Break

Concurrent Sessions

Session 4A: Speed Talks 3:30

- 1) **Green Remediation Alternative**
Nesmar Mora, Environmental Engineer, Royal Consulting Services, Longwood
- 2) **Post Remediation Performance and Aquifer pH**
Brad Elkins, MS, PG, Tech. Sales & Support, EOS Remediation LLC, Raleigh, NC
- 3) **Horizontal Well Used for Coal Ash Basin Dewatering**
David Bardsley, PG, Geologist, Directed Technologies Drilling Inc., Bellefonte, PA
- 4) **Sustainable and Cost-Effective Destruction of Chlorinated Alkane-Alkene Contaminants via Biostimulation and Enhanced Reductive Dechlorination**
Kent Armstrong, President, TerraStryke Products LLC, Andover, NH
- 5) **Tools for Monitoring Contaminant Biodegradation when Combined with Colloidal Activated Carbon**
Chad Northington, PE, SE District Technical Manager, Regenesis, Tallahassee

6) **Filing Data Gaps with Horizontal Wells**

Lance Robinson, PE, Chief Technology Officer, EN Rx Inc., Parrish

7) **Successful Large-Scale Remediation Projects Using a Variety of Emplacement of Amendments Techniques and Operational Procedures**

Robert Kelley, PhD, Client Solution Mgr-East, Cascade Tech. Services, Midland, NC

8) **Klozur One: A Built-In Soluble Activator with Klozur SP**

Patrick Hicks, PhD, SE Regional Technical Sales Manager, PeroxyChem, Philadelphia, PA

9) **Time-Tested Advantages of Horizontal Wells**

Mike Sequino, Senior Vice President, Directional Technologies Inc., Miramar Beach

10) **ISM to Delineate Soil for a Solid Waste Landfill Cell Expansion**

John Meade, Senior Account Executive, TestAmerica, Pensacola

Session 4B: Applications of In-Situ Assessment and Remedial Strategies

3:30 **Unusual Dichloroethylene Isomer Ratios and External Nitrate Input Help Decipher In-Situ Pilot Test Outcomes**

Jim Studer, PE, Principal Consultant, InfraSUR LL, Albuquerque NM

This case study represents an interesting example where outcomes from a field pilot test of an in-situ groundwater treatment technology strayed significantly from expectations. Careful review of pilot test performance assessment data, leveraged by insights obtained from a bench-scale treatability study, led to identification of subsurface features the awareness of which avoided a misleading summary conclusion that the treatment technology was incompatible with the remedial goal. The pilot test involved a shallow injection zone and a deeper injection zone within a variably weathered limestone harbouring a TCE and DCE groundwater plume. Natural biodegradation was slowly degrading the TCE to DCE but mineralization was not apparent. The pilot goal was to test biogeochemical reductive dechlorination, or BiRD, to accelerate remediation. A bench treatability study demonstrated in-situ biogenic ferrous sulphide production and TCE and DCE transformation without VC production. A reagent formulation identified from the bench study was the basis for 7,425 liters of reagent solution pressure injected into each zone. The central monitoring well in the shallow zone did not respond to injection—even after nine months. The central monitoring well in the deep zone did not immediately respond but eventually injectate components were detected

Continued on Page 16



Current List of FRC 2017 Exhibitors and Sponsors

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The exhibit hall will be open from 8:00 am until 7:00 pm on Thursday, Dec. 7, and from 8:00 am until 12:00 noon on Friday, Dec. 8. The fee to access to the largest assemblage of soil and groundwater technology and service providers in the Southeast is \$50. Call (407) 671-7777 or e-mail mrest@enviro-net.com for more information.

Dye tracking may help identify how pollutants contribute to decline in Wakulla Springs water quality

By **BLANCHE HARDY, PG**

Wakulla Springs has been one of Florida's most popular tourist attractions and a source of environmental interest for decades.

Edward Ball purchased the property in 1934, and preserved and promoted the springshed as a wildlife protection area and habitat attraction.

The springs served as the backdrop for several movies including the horror classic, *The Creature from the Black Lagoon*, and the original *Tarzan* movies.

But over the last decade, the once pristine waters of the springs have been clouded by nutrient imbalance, idling the springs' famous glass-bottom boats and threatening the wildlife.

The Wakulla Springs Alliance recently released red dye into Lake Jackson's Porter Sink to track how water travels to Wakulla Springs in an on-going effort to

improve the springs' at-risk water quality.

The path of the dye may help identify how pollutants released into the groundwater are contributing to contaminant loading in the springs. If the dye persists, it could take up to 40 days to reach the springs.

"The results can be used to predict the travel time of the water through the underground caverns," said Sean McGlynn, PhD, chair of the Wakulla Springs Alliance and technical director at McGlynn Laboratories Inc. in Tallahassee.

"A previous dye study from the sinkhole in Lake Lafayette to Wakulla Springs (a distance of 15 miles) took 31 days," he said. "This speed, almost a half mile per day, indicates cavernous flow through continuous conduits."

Groundwater flows through miles of Wakulla Springs' underground caverns.

Wakulla is one of the largest and deepest freshwater spring systems on Earth. It is also frequently noted as one of the largest and deepest underwater cave systems in the world.

"Dye studies work by dumping a lot of fluorescent dyes and seeing where it goes," McGlynn said. "We use fluorescent dyes like Rhodamine wt, a red dye. We can detect the fluorescence to the parts per billion level with a fluorimeter. We use field fluorimeters with data logging capabilities made by Hydrolab."

"We are doing the longest dye trace study that we know of, 20 miles from a sinkhole in Lake Jackson on the north side of Tallahassee to Wakulla Springs near the coast," he said. "Lake Jackson has two major depressions or sinkholes known as Porter Sink and Lime Sink."

"We ran the dye down a hose, using

divers, into the open sinkhole called Porter Sink. We set up the fluorescent sensors in Wakulla Springs, 20 miles to the south, the largest freshwater springs in the world."

The Wakulla River watershed and Wakulla Springs springshed extend from South Georgia and into Gadsden, Jefferson, Leon and Wakulla counties in Florida.

The springs discharge 250 million gallons of water a day creating the Wakulla River.

Three of the river's nine miles are protected within the Edward Ball Wakulla Springs State Park.

Florida bought the first half of the park in 1986. The state purchased the remainder in 2000 to protect the quality of groundwater feeding the spring and Cherokee Sink.

In October 2015, the Florida Department of Environmental Protection adopted the Upper Wakulla River and Wakulla Springs Basin Management Action Plan to protect the portion of the springshed located in Florida.

The BMAP encompasses an area of approximately 848,445 acres, or 1,325 square miles.

The alliance studies are providing valuable information to support the basin's BMAP.

"These dye studies are proving the connection between the waters of sinkhole lakes and springs in the Wakulla Springshed," said McGlynn. "They estimate the time of travel and the source of possible pollutants."

"Dye studies can also be used to estimate flushing rates, and are vital to calculating the water balance of the sinking lakes and associated springs."

SWFWMD completes second year of wetland monitor setup

Staff report

Scientists from the Southwest Florida Water Management District completed their second year of setting up wetland monitoring sites as part of the Central Florida Water Initiative, a regional monitoring program.

The CFWI is a water planning effort among the state's three largest water management districts, the Florida Department of Environmental Protection, the Florida Department of Agricultural and Consumer Services, water utilities, environmental groups, business organizations, agricultural communities and other stakeholders in a five-county area.

Southwest district scientists are part of the Data, Monitoring and Investigations Team, which also includes staff from the St. Johns River and South Florida water management districts. This ensures that all water management districts are using the same methods.

The goal is to set up a total of 107 sites across the CFWI area by 2020, with the SWFWMD tasked with establishing 44 wetland monitoring sites. District staff recently set up monitoring in six wetlands in Polk County.

The process is grueling fieldwork, which involves trekking by foot into remote areas in the summer heat.

"Because the fieldwork is so difficult, I think of it as an adventure challenge," said Kym Rouse Holzwart, senior environmental scientist in the district's Springs & Environmental Flows Section, who has been leading the effort for the district.

"It is a privilege to be involved in setting up this important regional wetland monitoring program and a great opportunity to collaborate with the other water management districts," she said.

The monitoring sites will help the CFWI team develop and maintain an inventory of available hydrologic, environmental, and other pertinent data and investigations in the region.

During the past two years, the district has set up monitoring in 14 wetlands.



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Single player registration is \$175 (checks payable to NTCC Inc.) **Foursomes are \$650.** If you'd like to take advantage of the four-some discount, please submit payment in full (\$650). Player spots will not be held without payment. All payments will be processed immediately.
The deadline for ordering tournament t-shirts is Nov. 1, 2017.

In the works for decades, Lake Seminole muck dredging gets underway

By **BLANCHE HARDY, PG**

The Pinellas County Commission is undertaking a \$19 million project to improve water quality in Lake Seminole by dredging muck from the bottom of the lake.

The county has been working to improve water quality in the lake for well over 20 years. Dredging has been considered for many of those years. Current estimates indicate that as much as one million cubic yards of muck cover the lake's bottom.

"The dredging will remove a significant source of nutrients from the lake that is contributing to poor water quality," said Kelli Hammer Levy, director of the Pinellas County Environmental Management Division. "By removing the internal source of nutrients, water quality will improve, which will also support a healthy fish and wildlife community."

Design and permitting for the muck removal effort are now underway. The actual dredging is not anticipated to begin until next August.

Levy said that the project schedule is phased and completion is expected to take up to 60 months.

During Phase 1, expected to take 12 months to complete, environmental and engineering work will be handled to amend the permits for the construction of the dredge material management area on county property adjacent to the lake.

During Phase 2, the dredging and dewatering work will be completed. This phase is expected to take 48 months to complete.

The pollutants of primary concern are

nitrogen and phosphorus.

"The county developed a reasonable assurance plan for the Florida Department of Environmental Protection to improve the water quality in Lake Seminole by reducing total nitrogen and chlorophyll-a," said Susanna Martinez Tarokh, public information officer at the Southwest Florida Water Management District. "This project is one of the actions prescribed by the reasonable assurance plan."

"The nutrient removal estimate is based on the amount of organic sediments removed," she said. "Removing approximately 900,000 cubic yards of sediments will reduce total nitrogen by about 870,000 pounds. The county is the lead for the project and hired a contractor this fall to modify permits and then dredge the lake."

Lake Seminole is a man-made waterbody. Pinellas County closed the upper portion of tidal estuary Long Bayou in the 1940s to create the freshwater lake.

The lake's watershed was subsequently altered in the 1970s with the construction of a bypass canal that diverted water from the freshwater basin into Long Bayou as a flood control measure.

The decreased water flow combined with increasing polluted, nutrient-rich urban runoff resulted in today's degraded water quality.

The recommendations to dredge the muck covering the lake bottom began as early as 1998.

The logistics of managing the increasing volume of anticipated sludge and lining up a funding source for the project delayed any significant action until 2005, at which point the county removed muck

from the lake's near-shore areas.

The resulting water quality improvement was unsatisfactory to county officials.

Although the county, and federal and state partners collaborated to improve water quality in Lake Seminole, the significant cost and technical difficulty of removing, transporting, staging and processing the huge volume of muck left dredging out of reach for years.

Innovations in dredging technology will now allow the staging and processing of muck to take place in a smaller area at a more reasonable cost than previous quotes.

"The Lake Seminole dredging project

is a sediment removal project funded by a cooperative funding agreement between the district and Pinellas County," said Martinez Tarokh.

"The district, through the agreement with the county, is contributing up to \$8,546,712 for design, permitting and construction of the project, with \$8,000,000 of the budgeted funds for construction (removal of the muck)," she said.

The county will manage the muck within an adjacent park in a roughly fifteen-acre area designated for that purpose. Eventually the mounded area may be repurposed as a sports field.

Controversial development approved by Manatee County commissioners

By **BLANCHE HARDY, PG**

In October, the Manatee County Commission unanimously approved the Aqua by the Bay development, formerly Long Bar Pointe, the previously denied and controversial 529-acre development on Sarasota Bay in Bradenton.

The property's potential for development has a long history of generating negative sentiments from local residents and environmental advocates.

Project developer Carlos Beruff is no stranger to controversy. He has sued the county in the past and resigned from the Southwest Florida Water Management District Governing Board the day after supporting a friend's development request for Harbor Sound that included the destruction of a high quality wetland.

An administrative law judge had previously recommended the Harbor Sound permit be denied due to "adverse cumulative effects on the conservation of fish and wildlife, fishing and recreational values, and marine productivity of Anna Maria Sound, an Outstanding Florida Water."

Beruff's Aqua by the Bay will include 510 houses, 2,384 multifamily residential units and 78,000 square feet of commercial space.

Significant changes were made to the development's details, particularly those generating environmental concern, in order to obtain the commission's approval.

But activists remain unconvinced.

Suncoast Waterkeeper Justin Bloom said the changes included removing the so called "estuary enhancement area" that would have dredged a canal behind the mangroves.

"We believe that the phony 'estuary enhancement area' would have significantly harmed the mangroves," he said. "The proposed seawall behind the canal also was removed from the plan and wetland impacts were reduced from about 14 to seven acres."

The estuary enhancement area was proposed between the development and the mangrove shoreline bordering the project.

The 20-foot-wide and eight-foot-deep enhancement area was intended to mitigate the project's wetland impacts.

In addition to the seawall behind the canal being eliminated from the plan, an upland retaining wall was replaced with a transitional slope.

The commission will review the preliminary plans in 750-unit increments and must also grant preliminary site plan approval at a public hearing rather than allowing staff to approve plans.

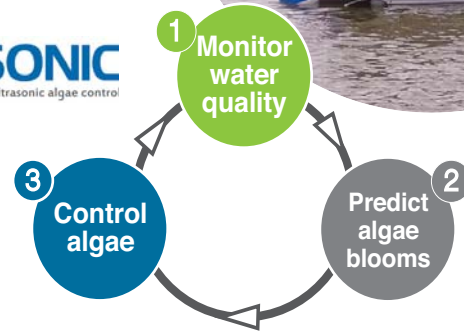
"The approval without the canal and seawall is a win for the environment," said Bloom. "The height approval, which the commissioners had full discretion to vote against, is a loss and still violates rules to protect waterfront vistas."

He said that the approval represents the maximum density possible in an area along

DEVELOPMENT
Continued on Page 20

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Sea level rise off Florida's east coast has scientists looking for answers

By ROY LAUGHLIN

University of Florida researchers recently released a report proposing a mechanism for scientific observations of unexpectedly high tides in South Florida and along the Atlantic coast.

To understand the research, it may help to know that the sea does not have a flat surface across the North Atlantic. It has a lumpy surface produced by tides and winds that drive currents. The earth's rotation plays a role driving currents that form two major circulating ocean surface currents, or gyres, in the North Atlantic.

Atmospheric pressure patterns and winds produced around persistent high-pressure regions also play a role. Their inconsistent strength and duration levels influence sea level.

The major gyre in the Atlantic Ocean is the subtropical gyre; the Gulf Stream is part of that gyre. Trade winds drive the current from east to west on the southern side of the gyre and to the east on the northern

side.

The other major North Atlantic circulation is the sub-polar gyre, south of the Arctic. The atmospheric high-pressure centers act like pistons pushing sea level down, and the wind belts tend to push levels higher along most of the U.S.'s Atlantic coast line.

The relative position and strength of high pressure centers and winds are significant players in the process that depends on coupling between the atmosphere's winds and ocean circulation.

If the simple circulation of the Atlantic's two major gyres were the only important forces influencing regional sea level off the Florida coast, there might be only modest seasonal changes.

But recent experience suggests that certain areas, particularly in Florida, are experiencing anomalously rapid rising sea levels.

To explain the sea level change, Arnoldo Valle-Levinson, PhD, a professor in the Civil and Coastal Engineering De-

partment at the University of Florida and the report's lead author, said in an interview that sea level change occurs due to tides and seasonal changes.

The highest sea levels off Florida occur in the fall and are lowest in late spring and early summer. Sea level change due to climate change, about 3-6 millimeters per year, is a third known factor causing relentlessly rising sea levels.

In the past 20 years, oceanographers have described intra-decadal sea level changes, first along North American shores north of Cape Hatteras and more recently south of it.

This is the change that UF researchers focused on. Their research characterized the frequency and temporal duration of the rise, as well as the length of shoreline affected.

For the UF researchers, the goal was to use numerical methods to analyze tide gauge data in a way to tease out a decadal repetitive pattern. It is sea level change that is significantly different from those caused by tides, seasonal oscillations or singular events such as a strong storm or windy season.

The researchers vetted 95 years of tide data for the U.S.'s Atlantic coast from near the Canadian border to South Florida.

They then used a numerical analysis tool, the cosine-Lanczos filter. The filter's function is to "smooth" lumpy data patterns produced by multiple factors with different temporal periods.

Because the tide data covered about two thousand miles of shoreline, the analysis provided the most extensive spatio-temporal analysis to date of periodic processes that influence sea level variation along North America's Atlantic coastline.

The results indicated a pattern of sea level "hot spots," defined as sea level rises greater than 20 mm per year.

The hot spots affect up to 1,500 kilometers of shoreline.

The rate of sea level increase due to global warming, the "base rate" through most of the 20th century, was about 3 mm per year. But during the past two decades, it appears to have risen to double that.

The first finding of the research is that the recent exceptional sea level rise in South Florida, in particular, is real. Furthermore, it is part of a larger pattern of accelerated intra-decadal sea level rise phenomena.

The hot spot in Miami appears to be persisting longer than the typical two-to-three-year time frame.

When asked if this indicated anything significant, Valle-Levinson hedged his bet.

"Its duration may be unprecedented but we're not sure," he said. "It could be because this hot spot is superimposed on global sea level rises.

"The current value of sea level in the last 25 years is twice the global mean

(through most of the 20th century). The global trend has been three millimeters a year. In 2011-2016, the trend became six millimeters a year and the hot spots have been superimposed. That may be why it is more persistent."

The data in the report suggest different amplitudes of intra-decadal sea level rise.

Miami's current rise looks to be the highest of any in the past 25 years.

"In 1947, you'll find the amplitude was also high and comparable," Valle-Levinson said. "The amplitude (of Florida's current event) is not novel but it's real."

At this point, the data analysis indicates that these hot spots move along the entire Atlantic coast, but the heights of the temporary increases over baseline sea level are not increasing significantly, based on a century of data.

The large geographic range of data analyzed allowed the UF researchers to address a larger oceanographic phenomenon involving the interaction of sea level changes, atmospheric processes and global warming-induced changes in sea level.

Because of the level of interest in recent sea level rise, this research received significant coverage in the non-science media.

Valle-Levinson noted that like all research, it could use some additional confirmation, even though it builds on existing research.

It does not propose new mechanisms. Instead, it is a new analysis and interpretation of almost a century of tide measurements.

When asked if the findings are applicable to Florida's Gulf Coast, Valle-Levinson was non-committal.

"We don't know ... We want to look at data from the Gulf of Mexico," he said.

He noted that anecdotal information suggests a similar phenomenon of short-term rapid increases in sea level occurring in the Louisiana area.

To do a Gulf of Mexico analysis, he said, researchers would have to vet tide data and, in particular, have data with no critical gaps that would make the analysis unreliable.

He said it could take several weeks to vet data and several more weeks to perform an analysis, perhaps longer, depending on what occurs during different stages of the analysis.

The recent study and its methods may provide a prediction capability, or the opportunity to develop that capability.

"We shall be able to predict only if we can confirm connectivity between mechanisms and the effect," he said. "We have only one cycle. We don't know how repeatable the cycle is."

That, he noted, requires financial support for the research. Perhaps support will come, eventually.

Miami-Dade County in planning stages of new wastewater treatment plant project

By BLANCHE HARDY, PG

Miami-Dade County officials are planning to construct a new wastewater treatment plant on the western boarder of the city of Miami.

The wastewater plant has been in the works for years and is anticipated to be complete and on-line by the spring of 2026.

The proposed plant location is west of NW 137th Avenue, north of SW 8th Street, and south of NW 12th Street, directly north of the intersection of NW 147th Avenue and NW 6th Street.

The location is outside the urban development boundary separating residential and commercial development from the Everglades.

The site is also directly between two of the county's largest wellfield protection areas, the Northwest Wellfield and the West Wellfield. The wellfield protection areas are roughly a mile apart.

The proposed plant, the West District Wastewater Treatment Plant, will handle

a portion of the wastewater flow currently going to the county's coastal North and Central District Wastewater Treatment Plants, both of which are at greater risk to storm surge and sea level rise. The new plant is intended reduce those risks.

The total cost of the project is estimated at \$1.850 billion.

Funds for land acquisition, design and construction are being provided through the state revolving fund, wastewater connection charges, county Water and Sewer Department revenue bonds and future WASD bond sales.

The county's schedule for the plant shows pre-design planning and selection of an engineering/design firm will be complete by February, 2018. Contractor selection is slated for July, 2019.

The county does not now own the property on which the plant is proposed. MDXQ, a holding company, bought the

WASTEWATER
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Lots of debris after Irma but little will go to waste-to-energy facilities

By ROY LAUGHLIN

Hurricanes create prodigious amounts of landscape wastes including fallen trees, branches, leaves and other debris when they move over land.

Hurricane Irma left millions of cubic yards from one end of the Florida peninsula to the other that is now being collected. But what happens to landscape debris after collection?

This time around, most it will be chipped or ground to produce quickly compostable material for landscape mulch. Some will be spread on land to degrade naturally.

News reports published shortly after Hurricane Irma moved through Florida suggested that waste-to-energy plants would benefit substantially by burning landscape debris and other suitable hurricane debris.

But that scenario is not plausible.

Florida's large waste-to-energy plants usually operate near functional capacity, according to Ray Schnauer, director of engineering and public works at the Solid Waste Authority of Palm Beach County.

"The (hurricane) debris is far in excess of what we can handle, speaking for Palm Beach County," said Schnauer. "To the

extent we have excess capacity to burn it, we will."

He explained that Palm Beach County's waste-to-energy facility, which began operation in 2015 and is Florida's newest, can burn 1.82 million tons annually under routine conditions and perhaps as much as 1.96 million tons "under absolutely perfect conditions."

The authority has an excess or reserve capacity of about 170,000 tons per year—the difference between what the county usually collects from residents and their incinerator's engineered capacity.

Some of that reserve is used for contract disposal of out-of-county waste.

Schnauer noted that waste-to-energy facilities are "valuable and efficient ways to handle solid wastes." But they're not intended to handle occasional surges of disaster-related combustibles.

In essence, the county's facility has only a small additional capacity to burn hurricane wastes. The county's hurricane debris total is estimated to be about 3.1 million cubic yards, or 600-700 thousand tons, depending on the water content at the time it's burned.

Kimberly Byer, director of Hillsborough County's Department of Solid Waste, said that little of the approximately 600,000 cubic yards likely to be collected

as Hurricane Irma waste will be burned in their waste-to-energy plant because it too operates with little unused capacity for additional waste incineration.

She agreed with Schnauer's assessment that other WTE plants in Florida are in a similar situation.

Landscape wastes are low BTU fuels, Schnauer said. The wood chips, branches and leaves have high water content that produces a cool fire as the water evaporates.

In some cases, the mix of material is low in easily combustible biomass. A huge pile of debris makes a huge fire, but it doesn't necessarily release a lot of energy as heat.

In addition, landscape debris does not store well.

Grinding and chipping to reduce volume is essential. But once it's ground, it starts to "cook," a colorful but accurate term Schnauer used to explain the decay during composting that accelerates rapidly

in the chipped, compacted and piled material.

It will last a few weeks in that form, or perhaps a few months during cool dry weather. But composted hurricane wastes won't be useful as biomass fuel by next summer, for sure.

The cost of transporting hundreds of thousands of cubic yards of landscape debris is another factor that lead counties across South and Central Florida to establish multiple debris collection areas that limit the trucking distance for the collectors and haulers clearing streets, shores and storm drains.

Hauling trucks have been in short supply while trying to clean up both Texas and Florida, and shortening their hauling trips is the low-hanging fruit to improve efficiency.

At collection facilities, the debris is mulched or ground, can be stored for several months, if needed, and then spread on land where it will compost to humus.

Research effort delving into nitrogen fixation in plants could have huge payoff

By ROY LAUGHLIN

Nitrogen fixation, a product of mutualism between legumes as host plants and nitrogen-fixing bacteria, is a notably successful symbiosis for a relatively limited number of earth's plant species.

Consequently, legumes often thrive in nutrient-poor soil that could not support other plants.

Matias Kirst, PhD, professor of plant genomics at the University of Florida Institute of Food and Agricultural Sciences, will lead scientists at UF and the University of Wisconsin-Madison to characterize the prospects for transgenic nitrogen-fixing plants.

Pamela and Doug Soltis, distinguished professors and curators at UF's Florida Museum of Natural History, discovered that all plants with nitrogen-fixing bacteria are part of a clade, an evolutionary assemblage that arose from a single early ancestor.

That ancestor acquired or developed a set of structural genes along with a controlling gene. They encode the developmental processes that causes root hairs to grow into nodules, a specialized type of root found only in plants that host nitrogen-fixing bacteria.

The nodules appear as small nodes or berries on roots that hold nitrogen-fixing bacteria. The ammonia produced in the nodule then passes to the plant to be used as a nutrient.

Kirst heard about the Soltis' discovery that all nitrogen-fixing angiosperms have a common evolutionary origin, but was even more intrigued by their finding that throughout this large clade, there are pairs of very closely related species, one of which produces nodules and hosts nitrogen-fixing bacteria while the other does not.

This suggested that relatively simple genetic processes control the ability to produce a nodule. It could be a relatively simple genetic array amenable to transgenic transplant to other plant species.

With that as a starting point, the collaborative goals of the research began with verifying the hypothesis that a single gene controls nodule formation.

That is an age-old question, but Matias' contemporary molecular biology techniques could answer the question within a short time frame.

The scientists will use cells of a well-known tree, the cottonwood poplar, whose wild strains are nitrogen-fixing plants.

The poplar is easily grown in the laboratory and in cell culture. The researchers will knock out genes to see if it impairs nodule formation.

For those clones with impaired nodule formation, the researchers will use another bacterium, *Agrobacterium*, to transgenically reintroduce knocked-out genes, one by one.

The hypothesis is that the cells in culture will, at some point during reintroduction, regain the ability to grow roots that form nodules, implying the reintroduced gene was responsible for nodule formation.

The researchers will then attempt to reintroduce nitrogen-fixing bacteria into transgenically-restored nodules of poplar plants.

Kirst explained that transformation of root hairs to nodules is under the control of a group of genes, similar to the homeobox genes that control limb structures in insects.

Research on the nodule genes and the control of their expression could lead to transferring the gene to phylogenetically unrelated flowering plants.

Kirst suggested that someday it might be possible to send cultured cells from a non-nitrogen-fixing plant to a genetics lab and get back young plants with nodules containing nitrogen-fixing symbiotic bacteria ready to be grown with far less nitrogen fertilizer applications.

Fertilizer is the primary source of nutrients for landscape and agricultural plants. According to Kirst, ammonia fertilizer production is responsible for about three percent of the annual fossil fuel related carbon dioxide emissions.

Transferring ammonia synthesis to nitrogen fixing bacteria in root nodules could significantly reduce the reliance on ammonia synthesis using fossil fuels, and significantly reduce the ensuing CO2 formation.

Bioengineering plants to fix ammonia would also significantly reduce nitrogen runoff from crop fields because fixed nitrogen stays in the host plant.

Kirst noted that if forestry trees could be reengineered to become nitrogen fixers like poplar, they could be grown as bio-fuel, reducing the need for fossil fuels and potentially providing short-term CO2 sinks in biomass.

The U.S. Department of Energy will provide \$7 million for this research effort that could have a huge and enduring payoff in three fields: evolutionary biology, molecular genetics and microbiology, and sustainable agriculture.



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COAL

From Page 1

generation that falls at the bottom of the economic dispatch stack, meaning those power plants that are the most economical to run. Coal and nuclear resources, by design, are designed for low cost O&M and continuous operation.

"However, it is not the economics of the fuel type that make these resources attractive from a reliability perspective. Rather these conventional steam-driven generation resources have low forced and maintenance outage hours traditionally and have low exposure to fuel supply chain issues."

This characterization leads to another significant point about the replacement of coal by natural gas as a preferred fuel.

The substantial replacement in the past decade of coal plants by gas-powered plants occurred as many relatively small coal plants reach the end of their useful lifetime, 40-50 years.

The small plants and some of the larger ones that are still to be retired over the next few years became less and less economical to operate. As O&M caused mainte-

nance down-time and inefficiency of electricity yield decreased their reliability, more and more of the old coal-burning plants were run less than half the time.

Their retirement and replacement opened a wide path for natural gas burning plants to replace them.

The cost of upgrading or replacing the old coal-fired plants was often greater than the cost of converting to gas. And the lower cost of improved technology favored natural gas over coal.

In his letter commissioning the report, Perry wrote that the diminishing diversity of the country's electric generation mix resulted in part "from regulatory burdens introduced by previous administrations that were designed to decrease coal-fired power generation."

The report provided information about the comparative costs of federal regulations on gas-powered and coal-powered electricity generation that supports that claim.

It cited eight federal regulations that affect both fossil fuels. The compliance costs for natural gas generation appear to be orders of magnitude lower than for coal.

According to a citation in the report, "ERCOT's December 2014 analysis estimated that the Cross-State Air Pollution Rule and the Cooling Water Intake Rule would impose moderate compliance costs on natural gas-fired power plants.

Specifically, ERCOT estimated costs of \$0.10 - \$2.7 per megawatt hour for CSAPR and \$0.10 - \$0.50/MWh for CWIR.

Obtaining pipeline permits was another environmental constraint mentioned, but applies only to a specific number of power plants.

For coal plants, to comply with fly ash emission standards, the report quoted an EPA estimate that "a typical coal-fueled unit with a capacity of 700 megawatts could incur incremental operating and maintenance costs ranging from \$287 million to \$351 million to install a scrubber, from \$116 million to \$137 million to install a selective catalytic reduction unit, and from \$97 million to \$114 million to install a baghouse (fabric filter).

"Fitch estimated the lifetime costs and reduced cash flow associated with environmental retrofits at \$1,700 - \$1,900 per kilowatt for a 100 MW plant burning bituminous coal, as compared with a range of \$1,200 - \$1,300/kW for a 500 MW plant."

The cost of retrofitting a generating plant, according to the report, was about the same or greater than building a new plant. Some utilities did that before 2015.

Smaller coal-burning plants, such as those predominantly retired over the recent decade, had higher incremental costs than large ones.

The 2015 Mercury and Air Toxics Rule is one the report identified as potentially the most expensive and immediate of the pending regulations with a compliance deadline of April, 2015, later extended to April, 2016, for some plants.

Sixty-two percent of U.S. generating plants could meet the MATS requirements, primarily using activated carbon injection at a cost of about \$5.8 million per generator.

Industry wide, that involved at least \$6.1 billion in compliance costs through 2015. The cost was considerably less than the \$9.6 billion EPA estimated for 2015.

Faced with MATS' imminent imposition and the increasing gulf between the profitability of using coal versus natural gas in a combined-cycle system, 2015 was a record year for the number of retirements of coal-burning power plants.

A second wave of retirement for larger plants that are reaching the end of their useful lives, the report noted, may occur over the next few years.

The report did not put a cost on electricity generators' compliance with the carbon rule, which currently is slated to be rescinded.

Nevertheless, it is clear that environmental regulation of coal-burning power plants was not prohibitively expensive. But it decisively affected the schedule of coal plant retirements in 2015 for plants that could not meet the MATS rule.

The report did not address whether rescinding MATS might reverse expected future coal-burning plant closures.

Through the first half of this year, coal became slightly more expensive. If natural gas prices remain low, one could reasonably expect electricity generators to continue to choose gas over coal to replace retiring coal-fired generating plants.

In comparison to coal, the situation is worse for nuclear power plants. Since the Fukushima Daiichi nuclear plant disaster, nuclear plants have faced regulatory costs approaching \$60 million per year.

The report noted that these costs exceed the profit margins of many nuclear plants.

Nuclear plants across the country are reaching the end of their expected 50-year useful lifetimes. Price competition with natural gas makes replacement of a retired nuclear plant by another nuclear plant unlikely.

In his commissioning letter, Perry also wrote that "analysts have thoroughly documented the market-distorting effects of federal subsidies that boost one form of energy at the expense of others. Those subsidies create acute and chronic problems

for maintaining adequate baseload generation and have impacted reliable generators of all types."

The report enumerated subsidies for all forms of U.S. electricity generation.

Coal gets \$901 million; nuclear gets \$1,660 million; and natural gas and petroleum liquids gets \$690 million. Transmission gets \$1,184 million; and solar and wind currently get \$4,393 million and \$5,936 million, respectively, of all electricity production subsidies and support.

The report fairly characterized the fact that new industries are generally those with the greatest subsidies, and those often occur through tax subsidies to end-users to increase the market, and secondarily to research and development support.

For the wind power industry, the greatest investment occurs in the final year of production tax credits.

In the past decade, the production tax credit for wind power was extended several times just after bursts of investment in wind generation facilities.

Solar power has an investment tax credit, currently 30 percent, a significant inducement. It applies to both commercial and industrial solar power projects.

The current wind PTC is scheduled for phase out in 2019.

The report said that the solar ITC will be reduced from 30 percent to its statutory level of 10 percent in 2021 for commercial and industrial solar power projects. It is scheduled to be completely phased out for residential projects.

If the current administration accomplishes nothing toward reducing renewable energy tax credits, the wind PTC will expire in two years, and the investment tax credit will disappear in four years for residence owners.

The current administration endorses cuts in federal tax subsidies, however, the report did not predict a resurgent use of coal for electricity generation when tax subsidies end because of stagnant power demand.

The report also addressed the employment benefits of coal versus other electricity sources.

Employment in coal mining, at about 50,000 people, is approximately one quarter or less of employment in oil and gas drilling, and is also a fraction of the growing employment in renewable energy facility construction and maintenance.

The expanding renewable energy sector is much more likely to experience an increase in employment levels across broader regions of the U.S. than the coal sector.

Perry's letter expressed concern about the U.S. electrical grid's reliability and resilience. The report discussed fuel availability as the major source of reliability uncertainty, but classified reliability as achievable through on-site storage of solid coal.

Storing natural gas on a generator site is rarely done, but gas pipelines, properly maintained and operated, have an excellent reliability history.

There certainly is an issue concerning our reliance on natural gas for power generation, now responsible for slightly more than 50 percent of the U.S. electricity generation. Will there be enough for the next half century or beyond?

It's not plausibly established in the report that wind and solar, referred to as variable generators, are a source of unreliable energy or that they will destabilize the grid.

They could, but the weather, climate change and not-so-smart technology in the transmission system pose greater risks and the latter is more easily corrected.

The report authors seem to have included enough details to show weaknesses in—rather than to directly refute—most of the reasons given for review when Perry commissioned the report.

All technologies have a lifecycle. As new, superior technologies arise, previous technologies risk extinction.

The report documents that while regulation was not the primary factor in the swing away from coal use, it was a factor in the growth of natural gas-powered electricity generation that is expected to continue for at least the next two decades.




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Clean Power Plan repeal: Threat to U.S. climate action response or another empty gesture?

By ROY LAUGHLIN

On Oct. 10, U.S. Environmental Protection Agency Administrator Scott Pruitt announced from the heart of coal country that the agency intended to repeal the 2015 Clean Power Plan.

The agency released a 43-page document that described the EPA's proposal to reduce CPP's "unfair burdens" on utilities that operate coal-power generating plants.

The document described two efforts that the agency will initiate to end the "war on coal," a phrase Pruitt frequently uses in his public remarks.

The first was to reinterpret a portion of the Clean Air Act that defines the "best system of emission reduction," or BSER.

This is a critical concept for three building blocks the EPA proposed for CPP compliance. The EPA intends to limit BSER interpretation to technology additions, retrofits or other structural components at a specific generating plant to reduce CO2 emissions.

If this reinterpretation is successful, the EPA will be able to repeal or ignore two other CPP building blocks.

One of the building blocks was to substitute lower-emitting fossil fuels for coal. The other was to substitute zero emission renewable energy generating capacity for fossil fuel generating units.

These two alternative methods currently exclude coal-fueled generation.

Following planned BSER reinterpretation, the agency is proposing to repeal the CPP in its entirety, along with other documents in the CPP docket, two of which were specifically named. This process could take years to accomplish.

But many industry insiders expressed doubt that Pruitt's second step, complete CPP repeal, could be done legally.

In 2009, a Supreme Court decision established CO2 as an atmospheric contami-

nant under the Clean Air Act. The EPA's CPP is an attempt to comply with the Supreme Court decision.

In its CPP rule repeal plan, the EPA did not say it would modify or rescind "Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act, 74 FR 66,496 (Dec. 15, 2009)."

That document was an essential first step to comply with the Supreme Court's finding, and established boundaries for the

EPA's subsequent efforts to regulate CO2 emissions from any source, including coal-fired power plants.

As long as those two legal foundations remain intact, the EPA by law is required to regulate coal-fired power plant CO2 emissions.

According to the *New York Times*, 25 states, including Florida, are likely to perform well enough to surpass the proposed CPP CO2 emission standards by 2030.

Ten additional states are likely to meet the 2030 targets for CO2 reductions, while 12 other states are likely to miss the standards. The latter include states that have made little effort to comply with the standards including Texas, Alabama, West Virginia, Ohio and Indiana.

States that will meet the CO2 reduction goals, or come close to meeting them, number three times more than the CPP scoff-laws. Pruitt should expect that the majority of states will not be allies in his attempt to repeal the CPP.

None of the coal industry's lost battles over the last two decades of the supposed "war on coal" had anything to do with the CPP.

"Withdrawing the Clean Power Plan will not revive the U.S. coal industry that is simply crumbling under increasing pressure from low natural gas prices and the rising competitiveness of renewable sources," wrote Sam Adams, the former

mayor of Portland, OR, and the director of the World Resources Institute U.S., in a blog. "Instead, withdrawing undercuts the country's economic competitive standing, squandering job growth in the burgeoning clean energy market."

"Consider that even with recent production declines (in coal), the nation produces nearly 50 percent more coal than (it) did in 1940, but employs one-eighth the number of miners," Adams wrote.

"The underlying shift to less labor-intensive methods of mining coal means that the industry will never see employment levels comparable to where they were decades ago," he concluded.

Ultimately, repealing the Clean Power Plan will do little, if anything, to restore coal mining jobs, despite what President Donald Trump tweets to his grievance-ridden base and what steps Pruitt and his cadre of pro-industry henchmen attempt to take in rolling back almost five decades of environmental progress.

Specifier opinion

Full scale water farm will reduce pollution reaching St. Lucie Watershed, IRL

By PRAKASH GANDHI

South Florida water managers are confident that a major new project in Martin County will reduce pollution in the St. Lucie Watershed and Indian River Lagoon.

At the Caulkins Water Farm, contaminated water will be pulled from the C-44 Canal to prevent it from reaching the St. Lucie River and Indian River Lagoon.

Officials with the South Florida Water Management District said that three pilot water farm projects have been so successful that they are embarking on the full-blown project that will sprawl across slightly more than 3,200 acres of former citrus groves on the north side of the canal east of the community of Indiantown.

"The (pilot) projects performed very well and so we have decided to go ahead with a much larger project at Caulkins," said Ansley Marr, Northern Everglades sectional administrator with the water management district. "Construction is mostly complete and we are getting ready to go to a full operation."

District officials said water farming is a way to retain runoff and reduce the excessive nutrient loads that impact many of Florida's waterways.

Water flowing from Lake Okeechobee down the C-44 Canal will be pumped out of the canal and into an inland reservoir that is surrounded by exterior earthen levees about six feet tall.

Officials said the water that is captured eventually evaporates or is filtered through the soil and ends up in the surficial aquifer.

As the water travels through the soil, it undergoes a filtration process whereby the soil, and tree and plant root systems capture the unwanted phosphorus and nitrogen.

Marr said that water farms prevent phosphorus and nitrogen in runoff from reaching the estuaries and help avoid the harmful effects those nutrients have on coastal ecosystems.

Over the past three years, a 450-acre pilot project on Caulkins Citrus Co. land

CAULKINS
Continued on Page 20

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Hurricane Irma forces delays for coal ash cleanup in South Georgia

By ROY LAUGHLIN

Hurricane Irma's storm surge topped a low dike around a coal ash pond at Georgia Power's McManus Plant, site of the former oil- and coal-fired electrical generation plant near Brunswick, GA.

Georgia Power drained the coal ash pond in March, 2017, and since then has been excavating and transporting an estimated 270,000 cubic yards of coal ash to an approved landfill for permanent disposal.

Now, due to Irma's visit, the pond will need to be dewatered again to complete the excavation and removal of the coal ash.

The potential environmental impacts at the site remain a hot topic of discussion between local environmental activists and Georgia Power officials.

In an interview in the *New Brunswick News*, Jenn Hilburn, the Altamaha Riverkeeper, said that she observed the McManus Plant's coal ash pond by air on Sept. 13 after Hurricane Irma's passage.

She said that the storm surge topped the pond's perimeter dike and released some of the pond's coal ash into Burnett Creek and adjacent marshes.

But Georgia Power officials took issue with Hilburn's conclusions.

They said that flooding did not breach the dike, the flooding washed no ash from

the pond and that the dike's structural condition will not affect the continued excavation of coal ash.

The power company will need to dewater the coal ash pond again, discharging the drainage water as before into adjacent Burnett Creek.

Before the ash pond flooded in September, Georgia Power had completed approximately 65 percent of the ash removal job at the plant, moving more than 550,000 tons, according to Georgia Power Spokesperson Craig Bell.

He said that the recent coal ash pond reflooding and other effects of the storm will delay ash excavation and removal by about three months, until the third quarter of 2018.

Georgia Power's National Pollution Discharge Elimination System permit is up for renewal with a hearing scheduled in early November.

The power company will need that permit approved in order to complete the job.

In its draft renewal request, the company requested the same permit conditions as before—permission to discharge 2.88 million gallons a day of "treated low-volume wastes and ash transport water commingled with stormwater" into Burnett Creek.

The Altamaha Riverkeeper would like to see a stricter permit this time around. They cite stricter heavy metal monitoring requirements for a dewatering plan for Plant Branch

in Milledgeville, GA, where a similar coal ash pond closure is underway.

Georgia Power's 2016 permit did not require effluent monitoring for heavy metals, but did require coagulant treatment and filtration prior to effluent discharge. That includes adjusting effluent pH to optimize coagulant performance.

Following coagulant additions, flocculated solids are filtered from the effluent,

WASTEWATER From Page 10

250-acre site in the 1990s. The county needs 140 of those acres for the plant.

Miami-Dade County Attorney Abigail Price-Williams presented a resolution to the board of county commissioners on May 2, 2017, declaring the acquisition of "Parcel 16" including the MDXQ property, a "public necessity" required for the plant.

This is a vital step if condemnation of the property is being considered by the county.

MDXQ then filed a lawsuit against the county. They pointed out the county's own rules indicate that wastewater treatment plants and residential development are not compatible.

MDXQ already sold land to the Miami-Dade Expressway Authority for an important roadway connection serving a large volume of commuters. MDXQ had exits built for their property in an area that will be re-designated once growth targets are met.

These additions and the expected fu-

dewatered and collected for transport to the permanent disposal site. The final effluent pH is adjusted to 6.4-8.6 operational units.

The effluent is monitored for total suspended solids twice each week using EPA-approved methods. Total solids are not to exceed 26 milligrams per liter.

The McManus Plant has not burned coal as a fuel since 1971. Electricity generation now relies on oil-powered turbines.

ture changes make the property considerably more valuable for future residential development—unless a huge wastewater treatment plant is built next door.

Now that plans for the WDWTP are back on the board, environmental advocates including the Miami Waterkeeper are also expressing concerns.

The proposed use of deep well injection to dispose of treated wastewater is one of the most frequently mentioned issues. In addition, the plant's location between two wellfield protection areas is a somewhat problematic area for pumping treated wastewater underground.

The potential to leak sewage into surface waters, including Biscayne Bay, and the resulting impact to wildlife and human populations are also being noted.

FEDFILE From Page 2

Trump operative reviewing EPA climate change research funding. The *Washington Post* reported in early September that John Konkus, formerly Leon County Trump campaign chairman, is now at the EPA reviewing existing and proposed EPA grant funding.

Citing comments by career staff at the agency, Konkus is flagging research that mentions "climate change."

Konkus' official title is deputy associate administrator to the EPA's Public Affairs Office, responsible for publicizing the funding of grants and serving as an advisor on policy and management issues.

According to media accounts, he has no scientific or technical background. He has a bachelor of arts in government and politics from the University of Maryland.

The *Post* quoted EPA employees, who remained anonymous to avoid reprisal, that Konkus said he's on the watch for use of the term "climate change" and has repeatedly "instructed" grant officers to eschew the word in grant solicitations.

Konkus' actions have, according to the article, cancelled half a dozen grants totaling close to \$2 million in funding to universities and non-profit applicants. About half of the EPA's \$8 billion budget funds grants and contracts.

JaxPort expansion dredging. The U.S. Army Corps of Engineers awarded a \$22.8 million contract to The Dutra Group of San Rafael, CA, for the first phase of the harbor deepening project at the city of Jacksonville's port.

The first phase will deepen and widen the shipping channel, allowing larger and more heavily-laden ships to use the port.

The first phase will deepen the channel between the ocean and just west of the St. Johns River Ferry landing in Mayport.

The dredge spoil will be carried to an offshore disposal site about six miles southeast of the channel's jetties. The work is expected to take two years to complete.

The total cost of dredging 13 miles of the St. Johns River is about \$704.5 million and will be shared approximately equally between the federal government and nonfederal sources.

The Jacksonville Port Authority is discussing reducing the 13-mile channel deepening to 11 miles by relocating the TraPac terminal for large cargo ships.

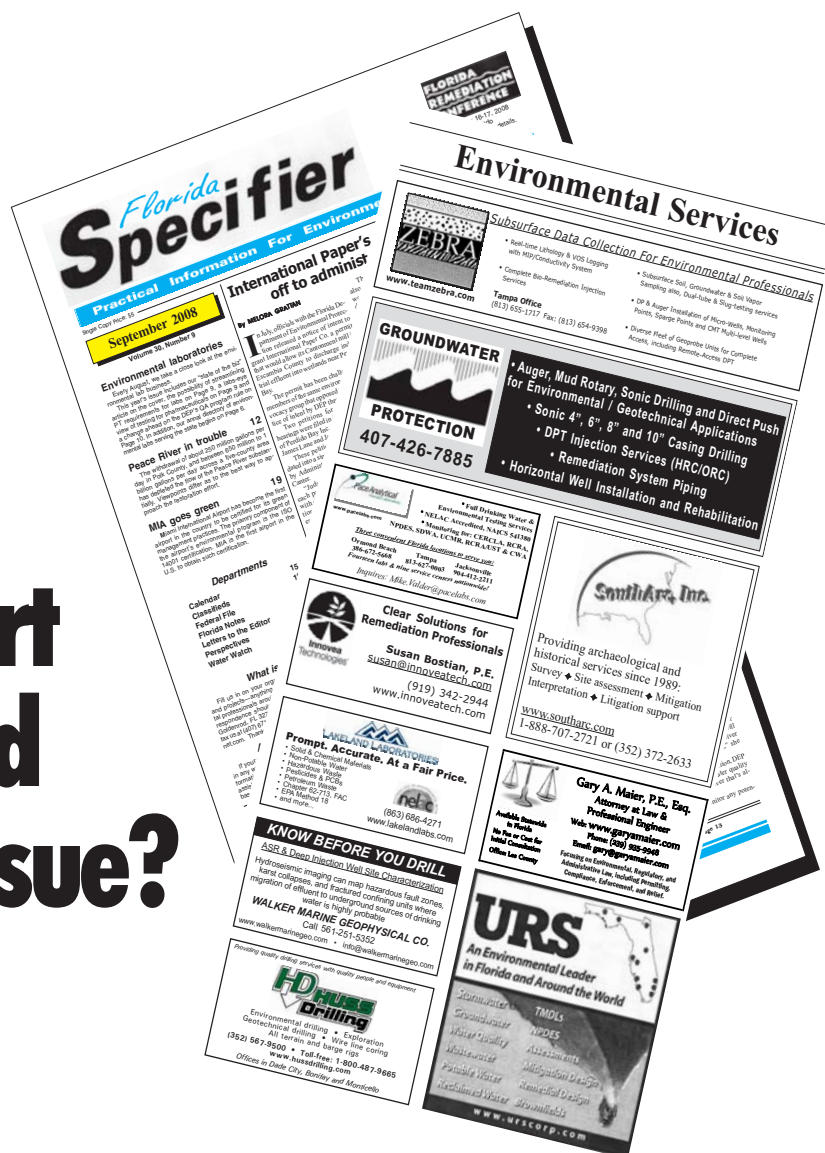
The current TraPac terminal is west of Jacksonville's Dames Point Bridge. If TraPac is relocated to the east side of that bridge, the dredge channel could be shortened and the cost reduced to about \$484 million.

Meanwhile, the St. Johns Riverkeeper has a lawsuit pending in federal court that seeks to stop the dredging project.



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Calendar

November

NOV. 1 – Course: Asbestos Refresher: Inspector, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 1 – Course: Asbestos Refresher: Management Planner, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 2 – Course: Dissolved Oxygen & Oxidation Reduction Potential Training, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 2 – Course: Asbestos Refresher: Contractor/Supervisor, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 3-4 – Course: Backflow Prevention Assembly Repair and Maintenance Training & Certification, Venice, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 4 – Meeting: Quarterly Membership Meeting of the Florida Ground Water Association, Panama City Beach, FL. Call (850) 205-5641 or visit www.fgwa.org.

NOV. 4-5 – Exam: Backflow Prevention Recertification Exam, Bradenton, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 5-9 – Conference: CERF 2017: Coastal Science Inflection Point, Celebrating Successes, Learning from Challenges, Providence, RI. Presented by the Coastal & Estuarine Research Foundation. Call (206) 209-5262, email info@erf.org or visit www.erf.org.

NOV. 6-7 – Exam: Backflow Prevention Recertification Exam, Altamonte Springs, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 6-9 – Conference: North American Lake Management Society 2017: Finding Balance, Westminster, CO. Contact Philip Forsberg at (608) 233-2836 ext. 700 or visit www.nalms.org/nalms2017/.

NOV. 6-10 – Course: Backflow Prevention Assembly Tester Training and Certification, Destin, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 6-10 – Course: Backflow Prevention Assembly Tester Training and Certification, Orlando, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 6-10 – Course: Backflow Prevention Assembly Tester Training and Certification, West Palm Beach, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 10-18 – Course: Backflow Prevention Assembly Tester Training and Certification, Venice, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 14 – Course: Refresher Training Course for Experienced Solid Waste Spotter, 4 Hour, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 14 – Course: Refresher Training Course for Experienced Solid Waste Operators, 4 Hour, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 14 – Course: Refresher Training Course for Experienced Solid Waste Operator, 8 Hour, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 14-15 – Course: Refresher Training Course for Experienced Solid Waste Operator, 16 Hour, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 14-15 – Course: Initial Training Course for Transfer Station Operators and Materials Recovery Facilities, 16 Hour, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 14-16 – Course: Respiratory Protection, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 14-16 – Course: Initial Training for Operators of Landfills and Waste Processing Facilities, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 14-16 – Course: Initial Training Course for Landfill Operators and C&D Sites, 24 Hour, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570.

NOV. 14-17 – Course: Water Class C Certification Review, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 14-17 – Seminar: National Clean Water Law Seminar, Savannah, GA. Presented by the National Association of Clean Water Agencies. Call (202) 833-2672 or visit www.nacwa.org.

NOV. 16-17 – Exam: Backflow Prevention Recertification Exam, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 17 – Meeting: November 2017 Technical Meeting of the Florida Section of the American Water Works Association, DeLand, FL. E-mail awra@awraflorida.org or visit www.awraflorida.org.

NOV. 18-19 – Exam: Backflow Prevention Recertification Exam, Tampa, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 26-30 – Conference: Fall Conference of the Florida Section of the American Water Works Association, Orlando, FL. Presented by the Florida Section of the American Water Works Association. Call at (407) 957-8448 or visit www.fswawa.org.

December

DEC. 1-2 – Exam: Backflow Prevention Recertification Exam Ft. Myers, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 2-3 – Exam: Backflow Prevention Recertification Exam, Bradenton, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 2-3 – Exam: Backflow Prevention Recertification Exam, Jacksonville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 4-5 – Exam: Backflow Prevention Recertification Exam, Altamonte Springs, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 4-5 – Exam: Backflow Prevention Recertification Exam, Destin, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 5 – Course: Initial Training Course for Spotters at Landfills, C&D Sites and Transfer Stations – 8 Hours, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 5 – Course: Refresher Training Course for Experienced Solid Waste Operators–4 Hours, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 5 – Course: Refresher Training Course for Experienced Solid Waste Spotter–4 Hours, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 5 – Course: Refresher Training Course for Experienced Solid Waste Operators–8 Hours, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 5-6 – Course: Initial Training Course for Transfer Station Operators and Materials Recovery Facili-

ties –16 Hour, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 5-6 – Course: Refresher Training Course for Experienced Solid Waste Operators–16 Hours, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 5-7 – Course: Introduction to Electrical Maintenance, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 5-7 – Course: Initial Training Course for Landfill Operators and C&D Sites –24 Hour, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 5-7 – Course: Initial Training Course for Landfills and Waste Processing Facilities, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 6 – Course: Refresher Training Course for Experienced Solid Waste Operators–4 Hours, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

DEC. 6-8 – Conference: Florida Stormwater Association Winter Conference, Orlando. Call 1-888-221-3124 or visit www.florida-stormwater.org.



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due primarily to diffusion and TCE and DCE concentrations declined without VC production. This was perplexing given that the central monitoring well screens were only 4.6 meters from multiple injection well screens. In depth analysis identified rapidly rising nitrate concentrations and high trans-1,2 DCE to cis-1,2 DCE ratios as two quite unusual site features that led to the conclusions that 1) injectate emplacement was highly preferential to the detriment of treatment at the central monitoring wells, 2) in-situ biogenic ferrous sulphide production with complete dechlorination treatment did occur in the limestone but native partial dechlorination of TCE was also stimulated, and 3) nitrate originating from a previously unknown overlying sewer leak was preventing the shallow zone near the central monitoring well from transitioning into deep reducing conditions necessary for sulphate reduction, a prerequisite to BiRD.

4:00 **Pilot Test Evaluation of Aerobic Co-Metabolic Strategy to Degrade Low Concentrations of Vinyl Chloride**
Eric Kramer, PE, Senior Project Engineer, and Janna Hall, EI, Environmental Engineer, APTIM, Winter Garden

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Aptim Environmental & Infrastructure, formerly known as CB&I Environmental & Infrastructure, performed a six-month pilot test to evaluate the effectiveness of utilizing an in-situ aerobic cometabolic bioremediation pathway to reduce low concentrations of vinyl chloride at a former circuit board manufacturing facility in Palm Bay, FL. Low concentrations of less chlorinated compounds such as VC are difficult to biologically degrade through the enhanced reductive dechlorination process. However, VC has been shown to degrade under aerobic conditions by both direct aerobic and cometabolic degradation mechanisms. The pilot test design extracted groundwater from a recovery well and infused the influent with oxygen, alkane gas (ethane) and nutrients before re-injecting to the aquifer by means of two injection wells. An array of eight monitoring points downgradient of the injection wells provided sampling locations to track the pilot test effectiveness. The field parameters monitored included pH, temperature, dissolved oxygen and ORP, while groundwater samples were periodically collected for analysis of volatile organic compounds, dissolved gases (methane, ethane, ethene), and Census analysis (qPCR for SMMO, PPO, EtnC and EtnE). Groundwater quality monitoring results indicated increases in ethene, DO and oxidase enzyme cell density with decreases in VC, methane, iron, ammonia, pH, and ORP, which are indicative of microbial activity and oxidation in the deep aquifer. Overall reductions in VC concentrations experienced 66 to 88 percent reduction from the aerobic cometabolic bioremediation strategy.

4:30 **Innovative Site Assessment Methods for Soil and Groundwater at Winter Haven Drycleaning Facility**

Brian Moore, PE, Principal, GHD Services Inc., Tampa

The House of Clean drycleaning facility operated in Winter Haven, FL. In the late 1990s, the facility was deemed eligible for cleanup through the Florida Drycleaning Solvent Cleanup Program. GHD conducted initial site assessment activities in 2006 and identified the presence of tetrachloroethene impacts to soil and groundwater beneath the site. Groundwater impacts were identified to depths over 50 feet and the groundwater plume extended over 1,500 feet downgradient. Following successful design and implementation of soil vapor extraction, the groundwater plume attenuated to levels below GCTLs in less than 10 years. This presentation details results of the site assessment and the innovative methods used to assess both soil and groundwater impacts. The presentation will also provide an overview of the approach to SVE, which involved the use of nested SVE wells to treat shallow sands along with the underlying sandy clay. Finally, the presentation will detail the optimization strategies used during active remediation and natural attenuation monitoring that resulted in groundwater attenuating to levels below GCTLs without measurable reductive dechlorination.

Day One adjourns

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Day Two

Friday, Dec. 8, 2017

Concurrent Sessions

Session 5A: Young Professionals

9:00 **Viewing Young Professionals as Positive Additions to the Environmental Remediation Workforce**

Jilian Drenning, Env. Specialist II; Max Levine, Env. Specialist II; and Matthew Pabich, Env. Specialist II, Florida Department of Health - Polk County, Lakeland

Hiring young professionals into a specialized and dynamic field such as environmental remediation can be a risk to any business, agency or organization. Business owners or hiring managers may be hesitant to consider hiring green personnel with limited or no experience due to the investment of resources required to train these employees. As young professionals, the goal of our presentation is to encourage seasoned industry professionals to view young professionals as a positive addition to the field of environmental remediation. Young professionals can bring unique insight, skills and abilities to the table. To illustrate this, we will provide a brief example of how young professionals were able to promote positive change and revitalize the Florida Department of Health in Polk County – Petroleum Cleanup Program, a DEP-PRP local program. Until recently the program suffered from a lack of organization, staffing shortages and low moral. A major part of the "active remediation" and recent success of our program has been the hiring of new and diverse staff members, including young professionals. Lastly, we will leave you with a few key considerations to keep in mind when building your workforce and planning for the future of environmental remediation.

9:15 **Thermal Soil Mixing and ZVI Injection Using Large Diameter Augers at a Former Dry Cleaner**

Matt Crews, PE, Senior Project Engineer, Golder Associates Inc., Jacksonville

Tetrachloroethene was released into the subsurface at a site located in Jacksonville, FL, during drycleaning activities over a period of approximately 20 years. The suspected source areas include a former UST that may have contained spent solvents, a floor drain, the former drycleaning machine and a former supply well that provided water for drycleaning operations. Site assessment activities reported chlorinated solvent contamination in soil and groundwater to a depth of approximately 65 feet below ground surface. A fine-grained sand is present from land surface to a depth of approximately 60 feet. A low permeability clay layer is present below this depth and appears to have prevented further vertical migration of contamination. Solvent contamination in the vadose zone soils appear to have been either removed during the UST closure excavations or during soil vapor extraction operations. Previous remedial methods for treating the contaminated groundwater have been largely unsuccessful due to the likely presence of DNAPL at varying depths within the saturated soils. The objective of this remedy is to remove the remaining adsorbed, soluble and potential DNAPL contaminant mass located in the source areas. Funding for this technology is being provided by the Florida Department of Environmental Protection's Drycleaning Solvent Cleanup Program. Golder will be using FECC Corp.'s chlorinated source contamination removal technology with thermal treatment followed by injection of zero-valent iron to remove adsorbed, soluble and potential DNAPL contaminant mass in the source area. This remedial approach uses an eight-foot large diameter auger and thermal soil mixing to quickly remove the majority of the chlorinated solvent mass followed by injection and mixing of ZVI into the heated soil and groundwater. The ZVI continues to remove residual chlorinated solvents long after the thermal treatment. The columns would extend to a depth of approximately 65 feet to make sure chlorinated solvents sitting on top of the clay are effectively treated. The treatment technology consists of the following major elements: soil mixing using the eight-foot diameter LDA; in-situ thermal treatment using a combination of hot air and steam; a vapor collection system that recovers the volatilized contaminants, steam, and hot air in a surface shroud under an applied vacuum; a data acquisition and recording system for real-time system monitoring and contaminant removal data; an off-gas conditioning system; a recovered liquid and vapor contaminant treatment system; and a ZVI mixing and injection system. Field activities are scheduled to commence in the fall of 2017. Golder will present the results of the source removal activities, including the final number and depth of the LDA locations; the treatment area; system operating parameters, such as the steam/hot air injection flow rates and temperatures, shroud temperature, and volatilized vapor extraction flow rates; effluent vapor and liquid concentrations; the estimated mass of contaminants removed, as determined by the DAR system outputs; and the amount of ZVI applied per location. Golder will also present on the advantages of using this technology over other industry accepted remedial methods for chlorinated solvent contamination

9:30 **The Effect of Sodium Persulfate Solution on Direct Push Drilling Rods**

Kyle Clarke, Redox Tech LLC
Downers Grove, IL

Sodium persulfate, a robust oxidant used in environmental remediation, can cause corrosion to metal and damage to direct push drilling rods during injection activities in the field. This corrosion can lead to difficulties while injecting as well as equipment loss during injection activities. The purpose of this study was to evaluate corrosion rates caused by sodium persulfate solution on direct push field equipment over certain periods of time. Steel samples of sections of direct push rods shaped as small cylinders and obtained from Geoprobe Systems® were used in this study. Two different types of samples were provided. Standard steel used to make their probe rods and "hardened" steel that is used on the ends and threads of their probe rods. The samples were exposed to varying concentrations of sodium persulfate solution over various time intervals. To evaluate corrosion rates, samples were removed at specific time intervals and physical properties like length, width, annular thickness and, most importantly, mass were measured. Temperature and pH of the solutions were also measured. Additionally, in order to simulate base-activated sodium persulfate—one of the most common methods used when working with this oxidant—varying concentrations of sodium hydroxide solution were also added when performing the tests. Samples were either immersed in a "bath" of solution or placed in a flow through cell where sodium persulfate solution was pumped to simulate injection activities in the field. Sodium persulfate solution, at all concentrations tested, caused significant corrosion of the samples. The relationship between



concentration of sodium persulfate, amount of base activator and corrosion rates of the samples will be explored in this presentation.

9:45 Using Real-time Data Monitoring During Large Diameter Auger Drilling with Steam and Zero-Valent Iron Injection to Enhance Source Zone Mass Removal
Zachary Munger, PhD, Hydrogeologist, Geosyntec Consultants, Titusville

Treatment efficiency and effectiveness are the premium attributes of aggressive remediation efforts. After developing a conceptual site model and performing a remedial alternatives evaluation for a site impacted with chlorinated volatile organic compounds, Geosyntec recommended using large diameter auger drilling with steam and zero-valent iron injection to rapidly eliminate the source zone and facilitate a transition to natural attenuation. The remedial technology involves using the auger to simultaneously mix the subsurface and introduce hot air/steam to promote thermal volatilization and stripping of CVOCs from soil and groundwater, followed by injection of ZVI as a polishing step to provide treatment of residual CVOCs. To focus the LDA/Steam/ZVI treatment in the depths and areas with the greatest CVOC mass, Geosyntec developed and implemented a treatment protocol in which the number of treatment passes, ZVI injection quantity, and the addition of step-out borings were based on real-time data, including off-gas CVOC concentrations. During the three months of LDA/Steam/ZVI implementation, 500 pounds of tetrachloroethylene were remediated with most of the recovered mass being removed from two low hydraulic conductivity layers. Approximately 370,000 pounds of ZVI were injected to treat residual CVOCs. Post-processing of the real-time data was performed to calculate the CVOC mass removed from each treatment boring and to visually present the distribution of mass recovered throughout the treatment area. Utilizing real-time data collection and an adaptive treatment protocol enabled Geosyntec to immediately respond to remediation performance and carefully focus efforts to maximize treatment efficiency and effectiveness.

10:00 Optimizing the Performance of ZVI for In-Situ Remediation: Effect of particle size and surface composition

James Harvey, Engineering Manager, OnMaterials, Escondido, CA

Zero valent iron is a powerful reductant used to decontaminate soil and groundwater containing halogenated hydrocarbons and other toxic contaminants. Zero valent iron products have widely different sizes and compositions, and remediation performance is highly dependent on material characteristics including include particle size, composition and surface modifications. This work investigated the ability of several variations of iron to degrade aqueous phase perchloroethylene, trichloroethylene and chloroform. Dry powders that were studied included sub-micrometer powder, carbonyl iron and screened commodity iron ranging in size from 600 mesh to 50 mesh. Colloidal products that were studied included OnMaterials Z-Loy™ MicroMetal, a zero valent iron suspended in glycerol, and Z-Loy™ AquaMetal ZVI, a zero valent iron suspended in water. Z-Loy™ PRB, an aqueous suspension of microscale iron was also evaluated. Surface modified products include small additions of palladium and iron sulfide that were deposited onto the surface of Z-Loy™ AquaMetal ZVI and Z-Loy™ PRB. Reactivity was evaluated by adding 2 g/L of colloidal products and 10 to 50 g/L of commodity microscale products to closed bottles. Composition was measured using headspace gas and a gas chromatograph with an ECD detector. Pseudo first order kinetic resulted with correlation coefficients generally greater than 0.99. The study indicated that for chlorinated ethenes, particle size had a modest effect of reactions kinetics. Surface modification had a much more dramatic effect, particularly for sulfidized colloidal products. These products exhibited pseudo-first order rate constants 30-50 times greater than dry commodity products. For chlorinated methanes, surface modifications had a smaller effect on degradation rates.

10:15 Using 3D Conceptual Site Models to Aid in Site Investigations and Remediation

Jim Depa, 3D Visualization Group Manager

St. John-Mittelhauser & Associates, Downers Grove, IL

The objective of this project was to create a 3D visualization and animation from soil and groundwater analytical results involving spills of perchloroethylene at a dry cleaner site in order to thoroughly understand and quantify the subsurface soil and groundwater contamination; design a cost-effective soil and groundwater remediation solution; and demonstrate the efficiency, timing and effectiveness of the remediation. Soil and groundwater analytical results, collected from multiple subsurface investigations at an active dry cleaner, were statistically analyzed, modeled and visualized using C-Tech's Earth Volumetric Studio. EVS uses mathematical kriging to interpolate a 3D field of data from a set of known points, typically soil and groundwater sample results. EVS was also used to interpolate analytical data between the soil and groundwater sampling events. The modeled data was used to create 3D conceptual site models of the soil contamination and groundwater plume, as well as a time lapse animation of the soil and groundwater remediation. The 3D conceptual site models successfully identified the source areas of the contamination, quantified the amount of PCE contamination in both soil and groundwater and assisted in the design of the remediation systems used to remove the contamination. Additionally, the time-lapse animation demonstrated how effectively the soil vapor extraction system removed the PCE in the soil and how quickly the biological injections remediated the groundwater in the source areas.

Session 5B: Petroleum Remediation: Case Studies

9:00 Use of Multiple EN Rx Innovative Technologies to Remediate an Off-Site Plume

Richard Roberts, PE, Senior Engineer, Earth Systems, Jacksonville Beach

The petroleum remediation site discussed in this presentation posed multiple challenges. The plume was deep and elongate and was moving rapidly downgradient. The impacts had migrated off-site beneath an adjacent Publix shopping center parking lot, and Publix would not approve a design that involved extensive construction on their property. The site was not part of a DEP-funded program and the insurance company was insistent that the cost of cleanup be minimized. Earth Systems overcame these obstacles using a variety of innovative techniques. To gain access to the Publix property, Earth Systems teamed with EN Rx Inc. to install horizontal vertebrae wells beneath the parking lot. Each Vertebrae well was approximately 25 feet deep, 400 feet long and contained multiple screened zones. Remediation was accomplished by in-situ chemical oxidation using EN Rx's proprietary blend of hydrogen peroxide, sodium hydroxide, a catalyst called Synergist and water. The oxidant was disbursed into the Vertebrae wells continuously over several months using a solar-powered FOCISmicro system. EN Rx agreed to conduct the cleanup under a Performance-Based Cleanup contract, so the cost was negotiated up-front and agreed upon by the insurance company. Although the end-point of the PBC contract was to remediate the site until all impacts were below natural attenuation default concentrations, the levels declined below groundwater cleanup target levels within six quarters of system operation. The site was transferred to post-remedial action monitoring in November, 2016, and all sampled wells have remained below GCTLs for two quarters of PARM.

9:20 Utilizing Multiple Methods to Remediate Groundwater in Heterogeneous Soils - Three Florida Case Studies

Lee Bienkowski, PhD, PG, Senior Geologist, Ellis & Associates Inc., Jacksonville

Heterogeneous soils add complexity to remediating petroleum constituents in groundwater. Mechanical methods such as air sparge/soil vapor extraction are often successful in removing dissolved volatile hydrocarbons from groundwater in sandy soils. However, when sand is interbedded with clay, the clay can serve as a reservoir for contaminants, causing concentrations to rebound once mechanical remediation is discontinued. A sequence of multiple remediation methods may be required to complete site rehabilitation. Numerous remediation methods are available that claim to be effective for remediating hydrocarbons in heterogeneous soils, but there are few unbiased published case studies. The purpose of this study is to determine if any of the methods tested at the three case study sites was effective alone at remediating groundwater in interbedded sand and clay. The three sites selected for this case study are Don Hodge Auto Service, 7-Eleven Eustis, and Giovanni B Corp. All three sites are located in Central Florida, are underlain by layers of sand and clay, and have been impacted by dissolved volatile constituents in groundwater. The author conducted research on all three sites to determine the effectiveness of the various remedial methods in reducing contaminant concentrations. Included in the study were the impact of the sequential remedial methods on dissolved concentrations and correlating the time to cleanup with the amount of clay present in the impacted zone. All three sites were first remediated by mechanical means and experienced rebound of contaminant concentrations once the mechanical remedial method ceased operations. The mechanical methods were followed by a sequence of injections of nutrients and microbes, and chemicals such as calcium oxyhydroxide, hydrogen peroxide and sodium persulfate. In most cases, these injections were followed by a reduction of contaminant levels but multiple injection events were typically required to prevent eventual rebound. Two injection events were sufficient to bring the Giovanni B Corp. site to closure, which had the lowest amount of clay in the impacted zone. 7-Eleven Eustis required two injection events combined with six years of nutrient-enhanced biosparge to bring concentrations down to natural attenuation levels. The long-term effectiveness of the injection of hydrogen peroxide, surfactants and nutrients at Don Hodge Auto Service will be determined by future sampling events. There appears to be a correlation between the thickness of clay in the impacted zone and the difficulty of achieving permanent contaminant concentration reductions. Many methods appear to have some effect but there is no one method that will complete the restoration of a site with significant clay with a single application. Multiple

methods that flush contaminants from the clay layers appear to have the greatest impact on BTEX concentrations in heterogeneous soils.

9:40 Does Plume Stop Work in Florida?

Wm. Gordon Dean, PE, President, Advanced Environmental Technologies LLC, Tallahassee

This presentation provides practical application notes and initial results from a petroleum site in Florida. The site is located in Perry, Taylor County, FL, and the work was awarded under an Innovative Technology pay-for-performance solicitation by the Florida Department of Environmental Protection's Petroleum Restoration Program. The innovative technologies used were Regenox, ORC Advanced and PlumeStop. All of these are proprietary technologies manufactured by Regenesis. Site constraints included a previous source removal using large diameter augers that covered the site with approximately 15 feet of flowable fill, aboveground utilities and underground utilities. The Regenox was applied first to reduce the contaminant concentrations, followed approximately 45 days later by PlumeStop and ORC Advanced. Application issues encountered included the lithology, well design and daylighting of the chemicals. Analytical results from the baseline sampling, post-Regenox/pre-PlumeStop sampling, and the first quarter post-PlumeStop sampling will be provided and discussed.

10:00 Innovative Petroleum Contamination Remediation Ozone Sparge Corrective Actions Dixie County, FL

Ronald Sanzi, Senior Project Manager, and Richard Carman, Corporate Director of Environmental Services, Universal Engineering Sciences Inc., Orlando

From 2011 through 2013, Universal Engineering Sciences was retained to initiate remediation services for a petroleum release at a boat marina located on the Suwannee River in Dixie County, FL. The facility operated a 10,000-gallon gasoline aboveground storage tank and a 4,000-gallon diesel AST. A critical issue involved with this project was the potential migration of the dissolved-phased contamination into the river. The water table depth fluctuated between one and four feet daily. Plume migration from the saturated zone at the boat ramp into the river was the primary concern. Based upon the unusual site configuration and general hydrogeological challenges, Universal chose to apply the best remedial solution to fit the site parameters and existing contaminant concentrations, which was ozone sparge. Ozone is a chemical oxidant that destroys chemicals of concern in situ without the use of pump and treat, soil vapor extraction and other common intrusive technologies. Universal completed soil source removal, site assessment and free product recovery prior to implementing ozone sparge. A key component of the design was the installation of horizontal sparge lines as opposed to the standard vertical sparge points commonly used. Universal installed

Continued on Page 18

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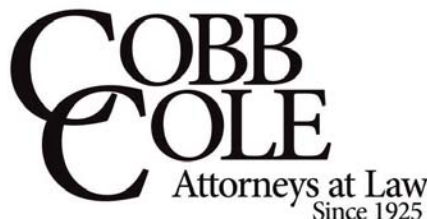
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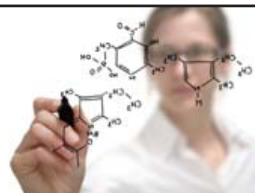
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eight, two-inch diameter horizontal sparge lines in a "fan" configuration that spanned the width and depth of the contaminant plume. The horizontal sparge lines were designed to treat the dissolved contaminants in the water table and smear zone impacted soil. The ozone system provided an output of three pounds of ozone per day and was supplemented by add-on sparge air. Universal constructed a manifold system where the eight horizontal sparge lines were linked to the ozone unit by stainless steel Teflon®-buffered solenoid valves. The entire system was connected to a control panel that directed all system activities. The system was run at bio-sparge pressures and flow so that SVE was not necessary. The initial laboratory results for benzene in two key monitoring wells exceeded 100 micrograms per liter. After operating the system for seven months, benzene was not detected above one ug/L. The system design and operation was successful and Universal obtained a site rehabilitation completion order for the client.

10:20 Bioremediation Approaches and Tools for Benzene Remediation Under Anaerobic Conditions

Jeff Roberts, MSc, Senior Manager, SiREM, Guelph, Ontario, Canada
Benzene, toluene, ethyl benzene, xylene and other aromatic hydrocarbons typically degrade faster under aerobic conditions than anaerobic conditions. When hydrocarbon-contaminated aquifers are predominantly anaerobic, aerobic bioremediation is not always feasible and anaerobic bioremediation approaches become favorable. Biostimulation and bioaugmentation with anaerobic

BTEX-degrading microorganisms may be required for effective remediation at anaerobic hydrocarbon contaminated sites. To address this need, anaerobic cultures capable of complete degradation of benzene toluene and xylene have been developed at the University of Toronto. These cultures have been characterized and key microorganisms have been identified. SiREM, the University of Toronto and Federated Cooperatives Ltd. are currently engaged in a three-year research project to advance anaerobic benzene degradation from the lab to the field, funded in part by Genome Canada and the Province of Ontario. The objectives of the project include scale-up of an anaerobic benzene culture to field volumes, demonstrating its effectiveness for bioaugmentation in treatability studies and field tests. This benzene-degrading culture is currently being assessed in microcosms constructed with materials from hydrocarbon contaminated sites. Information generated will include inoculum density requirements, degradation rates and the range of geochemical conditions required for optimal performance of the culture, and will be used to design field trials. Molecular genetic tools to quantify and track key microbes and functional genes involved in benzene degradation are also being developed. These tools will allow in-situ assessment and monitoring of enhanced bioremediation applications.

10:40 20-Minute Break

Concurrent Sessions

Session 6A: Thermal Technologies and Complex Strategies

11:00 Source Zone Treatment of CVOCs to Protect Local Groundwater - The Alaric Superfund Site, Tampa, FL

Chris Thomas, Senior Project Manager, TRS Group, Longview WA
The historical site owners and tenant at this site used chemical degreasers to clean metal. The mishandling of chemicals led to the underlying soil and groundwater contamination at the site. Site investigations showed the presence of DNAPL and groundwater contamination spread over an area of about five acres. In the early 2000s, chemical oxidation was attempted to remediate soil and groundwater but proved unsuccessful. Environmental Restoration LLC selected TRS Group under an EPA Region 4 ERRS contract to perform in-situ thermal remediation of the CVOCs in soil using electrical resistance heating. ERH is an in-situ thermal process for the remedial treatment of VOCs in both soil and groundwater. The remedial design was solely for the source area and volume of 6,218 ft² and 15,500 yd³, respectively. The remedial treatment objective was to remediate soil in the ERH treatment area and within the saturated zone from 5 to 67 feet below ground surface to 1 mg/kg for tetrachloroethene. Construction of the treatment system began in October, 2016. The site-specific ERH system includes 29 electrodes co-located with vapor recovery wells. A unique design challenge was constructing and operating the ERH system beneath a portion of an existing building. Due to the building design and height restrictions, exterior angled electrodes were installed to target impacts beneath the building. The treatment system became operational in March, 2017. Confirmation soil sampling in late July showed all the results in the treatment area achieved the cleanup objective. However, to further polish the remaining contaminants, the client requested continued operations through August. Background on the site and remediation timelines will be presented as well as design details, implementation and results of the ERH source removal.

11:20 Complex Sites and Recalcitrant Compounds: Combining Thermal Technologies for More Efficient Remediation Efforts

Robert D'Anjou, MSc, PhD, Assistant Technical Director
Global Remediation Solutions, Longview, WA
With the onset of improved technology and understanding, sites of increasing complexity and difficulty are coming into the realm of possibility as potential remediation sites. However, these complex sites require smarter, more informed remediation strategies. This presentation will discuss several complex sites where creative remediation system designs permitted successful remediation and will take a closer look at combining multiple in-situ thermal remediation technologies in order to optimize treatment on sites that would have otherwise been near impossible to clean. Steam-enhanced extraction, electrical resistance heating and in-situ thermal desorption represent the three major ISTR technologies available in the marketplace today. Each technology offers a unique method of energy transfer and heat propagation in the subsurface and performs optimally under differing subsurface conditions. This discussion will present multiple projects where ISTR technologies were combined to effectively mitigate impacts from varying hydrogeologic conditions, subsurface geologies, complex co-solvated and co-mingled contaminant plumes, and intricate site features by taking advantage of the strengths of each individual technology. The presentation will also discuss theoretical site conditions that warrant the use of different ISTR technologies, or combinations of technologies, the advantages of each treatment strategy, and how to effectively optimize in-situ treatment systems under each scenario to maximize system efficacy and minimize overall project costs.

11:40 Complex Site Assessment and Remediation of DNAPL, LNAPL, PCBs, Arsenic, Lead; Large Diameter Auger Source Removal; Conventional Source Removal and Off-Site Challenges

Matt McClure, PE, Environmental Engineer, JEA, Jacksonville
Matthew Hampton, Senior Project Geologist, Golder Associates Inc. Jacksonville
On-site DNAPL, LNAPL, PCBs, arsenic and lead impacts along with off-site arsenic impacts were identified during the site assessment at a former electrical equipment service facility in Jacksonville, FL. Given the complexity of conditions identified in the site assessment report, a feasibility study was performed to evaluate potential remedial alternatives. The Florida Department of Environmental Protection approved the feasibility study including the proposed phased remedial strategy. To address DNAPL impacts, a DNAPL source removal system consisting of a multi-phase extraction system, a soil vapor extraction system and a thermal conductive heating system was installed. Conventional and large diameter auger excavation techniques were used to excavate a total of 10,280 tons of non-Toxic Substance Control Act-regulated and 4,486 tons of TSCA-regulated soil for off-site disposal. This was combined with engineering and institutional controls to minimize risks of direct exposure to soil. Based on groundwater sampling results obtained after soil removal, no active groundwater remediation was warranted and the site moved into post-active remediation monitoring for groundwater. Off-site arsenic soil impacts were further delineated and discussions with off-site property owners about a remedial approach is currently underway. Golder Associates Inc. and JEA will present details of installation and operation of the DNAPL source removal system, on-site source removal, the PARM program, and challenges associated with liability and access for off-site impacts.

Session 6B: Enhanced In-Situ Remediation Applications

11:00 Surfactant Use for Enhancing Performance of Chemical Oxidation Remediation

Dan Socci, Chief Executive Officer, EthicalChem, South Windsor, CT
Remedial approaches using chemical oxidation deliver aqueous phase oxidant treatment fluids into the contaminated subsurface. These approaches are limited to addressing contamination in the groundwater while hydrophobic contaminants remain sorbed to soil. This remaining soil-sorbed contamination will in time transfer to the aqueous phase after the chemical oxidation treatment is completed, causing groundwater contaminant concentrations to increase, resulting in what is referred to as "contaminant rebound". Rebound is typically addressed with multiple rounds of follow-up chemical oxidation treatments. Contaminant sorption limits the availability of contaminants to the aqueous phase oxidant. Using a combined oxidant-surfactant solution, liberation of the sorbed hydrophobic contaminants and emulsification into to the aqueous phase as small particles with increased surface area available for reactions with the oxidants can significantly improve soil and groundwater remediation. This presentation will discuss independent third party comparative research by the University of Madrid on the performance of combined surfactant and oxidant versus oxidant alone treatment of contaminated soil. Additionally, field case studies on successful implementation of S-ISCO®, Surfactant-Enhanced In-Situ Chemical Oxidation, will be discussed.

11:20 Optimizing In-Situ Remediation Amendments Using Innovative Surfactant System Formulations

David Alden, PE, Technical Associate, Tersus Environmental, Wake Forest, NC
Surfactants, polymers and solvents are key chemicals in designing products that are injected during groundwater remediation activities. Although these ingredients should all be compatible with health and environmental requirements, their function varies according to each technology's objective. For example, practitioners have concluded that NAPL solubilization with surfactants was a necessary first step in the mobilization process and that surfactant concentration, up to a point, was generally proportional to performance. When, rather than NAPL recovery, its destruction is pursued, surfactants aid in creating complex water-ZVI suspensions in oil continuum or to disperse solids or non-water soluble amendments, such as vegetable oils, sands, iron or activated carbon into aquifers. Technology developed at the University of Oklahoma, originally focused for enhanced oil recovery at petroleum reservoirs and subsequently adapted to the environmental arena, can lower the IFT sufficiently to allow physical mobilization of residual LNAPL with the limited production of

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thermodynamically stable emulsions. This talk will focus on the use of artfully formulated surfactant blends that reduce solubilization and simply allow LNAPLs in saturated soils to become mobile. Surfactant studies targeted to specific technology objectives has allowed the group to formulate surfactant packages that allow field technicians to create their own EVOs in the field while significantly reducing droplet size, lowering overall costs and carbon footprint by procuring oils locally. The presentation will include results and lessons learned from innovative surfactant formulations as well as the latest field implementation where selecting an optimized surfactant blend minimized required flush water for NAPL recovery and costs for produced effluent fluids treatment from sites in the U.S. and South America.

11:40 Using Groundwater Recirculation for Enhanced Reductive Dechlorination at an Active Manufacturing Facility
Eric Bueltel, PE, Technical Director, ETEC LLC, Washougal, WA

The use of substrates for enhanced reductive dechlorination has been widespread with varying degrees of effectiveness. Typical applications of substrates are performed using direct-push injections. Limitations of the direct-push application method include using many injection points throughout the plume for product application, inability to contact contaminated areas underneath surface structures and incapability to make real-time changes to the treatment. To overcome the limitations of direct-push substrate injections, specialized groundwater recirculation equipment, the ISD™ system, delivering the soluble, nutrient-amended substrate CarBstrate™ was used for chlorinated solvent remediation at an active manufacturing facility. The groundwater at the site had been impacted by historical use of chlorinated solvents. The ISD™ equipment was installed in conjunction with a series of injection and extraction wells to extract groundwater and then recirculate the CarBstrate™-amended groundwater throughout the site restricted by aboveground structures. During operation, site data was collected for both the contaminant reduction process and ERD optimization. Both data sets will be presented for a technical discussion of the ERD process at the site. Also discussed will be a summary of challenges encountered with the application of the groundwater recirculation approach, treatment optimizations made real-time, and an overview of costs for implementation.

12:00 Day Two Luncheon Sponsored by CH2M

Session 7: Annual Regulatory Panel Discussion

1:30 Topics and Speakers to be announced

3:00 15-Minute Break

Session 8: Conceptual Site Models to Facilitate Successful Remedy Applications

3:15 PCE and Daughter Remediation in Limestone Bedrock - Brownfields Redevelopment of a Former Tubing Manufacturing Facility
Bill Brab, CPG, PG, AST Environmental Inc., Midway, KY

Virgin PCE used for parts cleaning was released from an aboveground storage tank into the shallow limestone bedrock at a former tubing manufacturing facility in Louisville, KY. Downhole geophysical and groundwater characterization methods determined contaminant migration in the shallow bedrock occurred along a bedding plane feature and extended to the subject site property line. Dual-phase extraction was utilized from 2002 through 2014 to prevent off-site migration of the release, however, source well concentrations began increasing following system shutdown. Interest in purchase of the facility spurred brownfields redevelopment and in-situ remedies were evaluated for their feasibility. The selected remedy for the site was an immiscible, activated carbon-based injectate impregnated with reactive iron designed for rapid degradation of chlorinated solvents. The corrective action plan included in-situ source mass reduction and two permeable reactive in-situ barriers to prevent further migration of contaminants from the source area. Remediation was implemented using a specialized injection system and straddle packer assembly using high flow rate (up to 180 gallons per minute) injections. Hydraulic connection was continuously monitored during injection using pressure transducers emplaced throughout the treatment area. Real-time well monitoring aided in optimizing the injection volumes and confirming that uniform distribution of the slurry was achieved. The monitoring demonstrated that the area of influence, using a 300-gallon slurry volume, varied up to 250 feet. Performance groundwater monitoring effectively demonstrated that contaminant migration ceased and contaminant destruction is continuing to occur across the treatment area. The site was granted no further action in May 2017.

3:40 Controlled Release Environmental Reactants – In-Situ Soil and Groundwater Remediation of Recalcitrant Compounds and Emerging Contaminants of Concern
Lindsay Swearingen, Managing Partner and Principal Scientist
Specialty Earth Sciences, New Albany, IN

The environmental science community has a collective interest in identifying viable and sustainable remedial solutions for groundwater contaminant plumes, seeking out remedies which reduce carbon footprint, minimize waste generation and limit energy inputs required for remediation implementation, operations and ongoing maintenance at sites impacted by CVOC's, PAH's, BTEX constituents and heavy metals. Stakeholders could benefit from greener cleanup technologies, especially in light of future requirements to remediate vast dissolved phase plumes of emerging contaminants of concern such as 1,4-dioxane. Sustained and controlled release reactant technology involves coating or encapsulating environmental reactant materials to facilitate a more user-friendly in-situ remediation implementation. The result is an efficient approach to soil and groundwater remediation that addresses the common challenges encountered with traditional liquid injection applications. Challenges include contaminant rebound, plume migration and the need for multiple mobilizations. Rather than pressurized liquid injection, the energy of concentration gradient-driven diffusion as well as natural groundwater movement is used to deliver oxidants in the subsurface without the need for specialized injection equipment or expensive injection field services providers. Sustained and controlled release reactant materials can be applied to the subsurface in a number of forms and methods. Multiple remediation practitioners have applied these materials at sites across the U.S., Europe, Canada and Brazil. Current and updated case studies will be presented including site selection, implementation design, cost and monitoring data.

4:05 Selection, Construction and Initial Operation - Ozone Sparging System for 1,4-Dioxane Impacts at a RCRA-Regulated Industrial Facility in Puerto Rico
Vicki Bierwirth, Assistant Staff Engineer, Trihydro Corp., Jacksonville
Bradley Pekas, PG, PE, Senior Engineer/Team Leader, Trihydro Corp., Tampa

This presentation describes the selection, construction, startup and preliminary operational performance of the ozone/in-situ chemical oxidation system at a RCRA-regulated industrial site in Puerto Rico to treat groundwater contaminated by chlorinated solvents including 1,4-dioxane. The groundwater contamination has migrated offsite and is being influenced by the operation of a couple of water supply wells. Several types of treatment technologies were screened to potentially address the chlorinated solvent and 1,4-dioxane contaminants present within the sand unit aquifer system including in-situ chemical oxidation, in-situ bioremediation, phytoremediation and monitored natural attenuation. Of these different technologies, ozone sparging was selected and approved for implementation. The ozone system was installed in September, 2016, and bump-started in early October, 2016. The self-contained ozone sparging system is powered by a diesel generator and was installed offsite at the leading edge of the 1,4-dioxane plume. As designed, the system operates three ozone sparge points on a rotational basis, and it is controlled and remotely monitored through cellular telemetry. Per cycle, each sparge point operates for three minutes with a high concentration, low flow injection rate followed by 117 minutes operating at a low concentration, high flow rate. The higher flow rate and lower concentration are the result of using a secondary "air-flow booster" compressor. In December, 2016, Trihydro received approval from the client and regulatory agencies to begin full-time operation of the ozone sparging system. The initial operational performance of the system, included a preliminary discussion of the groundwater monitoring data will be presented and discussed.

4:30 A New Risk Based Corrective Action Topics Under 62-780 FAC: Conceptual Site Models
Ziqi He, PE, PhD, Senior Environmental Engineer, HSW Engineering Inc., Orlando

The newly-adopted revisions to Chapter 62-780 for Contaminated Cleanup Site Criteria memorializes the use of the Conceptual Site Model in risk-based corrective action. The use of the CSM is an important step in streamlining the representation of contaminant releases, their fate and transport in the environment, and exposure to human and ecological receptors to contamination. Better representation and communication of these components between the responsible party and regulatory agency offers optimized exit strategies for scoping site assessment, conducting remedy evaluations and making informed risk management decisions.

5:00 FRC 2017 adjourns

Registration and Hotel Info for FRC

For general questions about participating in the 23rd 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 technical session agenda, a current list of exhibitors and booth availability, speaker updates and more.

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Hotel Information and Registration

The **Rosen Centre Hotel** is the host hotel and conference center for FRC 2017. 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>. 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 \$149 nightly, plus applicable taxes and fees. **This substantially discounted rate is only available until Wednesday, Nov. 15, 2017.**

Registration

Registration for the full 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 only.

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, or fax your completed registration form with credit card information to (407) 671-7757. This is a secure fax number. (Purchase order numbers are accepted for government employees.)

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 Nov. 6, 2017, 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. Substitute attendees will be accepted at any time, preferably with advance notice.

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CAULKINS

From Page 13

did such a good job keeping water pollution out of the river and lagoon that the state agreed to a 10-year, \$62.5 million contract with the citrus company to expand it.

The project will keep about 26 billion gallons of nutrient-rich water out of the waterways annually.

In all, the effort will keep between 17,600 and 37,500 pounds of phosphorus and between 123,500 and 271,000 pounds of nitrogen from the estuaries.

District officials said that too much water with too many nutrients can cause

DEVELOPMENT

From Page 9

Sarasota Bay's largest remaining natural shoreline.

"Protection of the waterfront vista and maintaining Manatee County's unique coastal character were issues that were largely ignored," he said. "Traffic issues were not addressed, nor were the public's significant concerns about height."

"Rather than scaling down the massive buildings that will be over 110 feet above sea level, the approval allows for at least 16 buildings that will tower over northern Sarasota Bay's coastline."

Other efforts and actions undertaken by

toxic algae blooms.

"All the nutrients in the water will seep into the earth so they never reach the estuary," Marr said

The pilot project was designed to pull about 2.2 billion gallons of water a year out of the C-44 Canal.

But according to district officials, from January, 2014, until August, 2016, the project kept 12 billion gallons of water out of the St. Lucie Estuary.

"The water farms are not going to solve the problem by themselves, but they are a step in the right direction," Marr said. "They are not a silver bullet. We are looking at every option."

the Waterkeeper will continue.

"We are still challenging the mitigation bank's attempt to get seagrass credits that would allow dredging a new channel in Sarasota Bay, and we continue challenging a conceptual permit approved by SWFMD that includes the new canal on the back of the mangroves," Bloom said.

In addition, they continue to provide information to the U.S. Army Corp of Engineers on what they believe are violations of federal rules.

Additional environmental advocates including the Sierra Club still oppose the development project and are working to dampen its impact on the environment.

Water farms have a clear advantage, she said. "They are much easier to implement. You can get them built at a much quicker pace and they are built on an agricultural scale so they are familiar to ranchers and farmers.

"We are not building reservoirs that hold ten feet of water. We are using agricultural-style pumps," she said. "We are doing a lot of things that the agricultural community has already been doing. We are

SPILLS

From Page 1

then focuses on gathering and analyzing any needed additional information surrounding the circumstances of reported incidents to evaluate it from a regulatory perspective to determine if there were any violations or if any further corrective action is needed including solutions to avoid further discharges."

The state made recommendations for wastewater management practice improvements after Hurricane Matthew. Once Irma data is digested, it is likely that additional recommendations to address some of the issues identified during the review will be made. But that may take some time.

"These numbers are constantly changing and are the best available at this time," said Miller. "These are initial incident reports. Information on the volume of waste-

just doing it on a larger scale."

Managing water on privately-owned lands is just one tool being used by the water management district to reduce the amount of polluted stormwater discharged into waterbodies and coastal estuaries, Marr said.

They are also working closely with the Florida Department of Environmental Protection to help meet the total maximum daily loads that the department developed.

water released during an event like Hurricane Irma may fluctuate depending on the initial estimates and the overall amounts that are able to be recovered after a spill."

Frequently, the numbers continue to be refined as additional information becomes available, she added.

Miller noted that, for future reference, readers may access the DEP's Pollution Notification website at <http://dep.state.fl.us/pollutionnotice/>, which is available to the public and is the best place to track reported spills in real time.

NOTES

From Page 3

at Carlton Fields in Tallahassee, was nominated to become general counsel at the U.S. Environmental Protection Agency.

He served on the U.S. Department of Justice's environment and natural resources division from 2007 to 2013.

Elsewhere, Gov. Rick Scott tapped former state Rep. Ritch Workman to serve on the state's Public Service Commission.

Scott appointed Workman and Gary Clark, a deputy secretary at DEP, to serve on the commission.

He also reappointed veteran commissioner Art Graham to another four-year term on the panel.

Innovative technology. A new tool is being used for sites where inaccessible contamination requires assessment or remediation.

The tool, known as Vertebrae™, is manufactured by EN Rx Inc. Recently, the innovative technology received an additional Florida Department of Environmental Protection procedure letter recommending its appropriate use by consultants. The letter can be found in the DEP tech portal as "Document 1522."

More information, the DEP letter and case studies for its use can be found online at enrxinc.com.

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