Florida Specifier

Practical Information For Environmental Professionals

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Photo by Brian Cousin, FAU Harbor Branch

FAU Harbor Branch Researcher Jon Richardson completes the installation of a Land/Ocean Biogeochemical Observatory, an in-situ, real-time environmental monitoring package. FAU Harbor Branch's Indian River Lagoon Observatory operates the largest LOBO array in the world in the St. Lucie Estuary and adjacent Indian River. Data from the array provided crucial continuous environmental data during the recent algal blooms to give FAU Harbor Branch researchers new insights to the role of biological and physical factors acting together to initiate and sustain record-setting algal blooms this spring. See story below.

Lake Okeechobee inflow just one of several factors causing recent algal blooms

By ROY LAUGHLIN

Both freshwater inflow from Lake Okeechobee and substantial nutrient inputs from the St. Lucie River watershed contributed in tandem to cause this summer's exceptional algae blooms in St. Lucie River and adjacent Indian River Lagoon near Stuart and Jensen Beach.

Research Professor Brian LaPointe, PhD, with Florida Atlantic University's Harbor Branch Oceanographic Institute, first proposed a watershed nutrient source after sampling three times in 2005-2006, following two years of record-setting hurricane rains.

His hypothesis received substantial confirmation by measurements made during the 2016 algae bloom.

The deployment of an array of continuous samplers, the Land/Ocean Biogeochemical Observatory, or LOBO, that reports water quality and physical data by telemetry in real time has played an essential role in identifying contributing factors.

One of the world's densest robotic environmental monitoring arrays now provides a clearer picture of how high volume Lake Okeechobee water releases to the St. Lucie Estuary interact with St. Lucie River watershed nutrient inflows to create high nutrient concentrations, maintain a freshwater character to the river, and reduce tidal flushing—all contributing to explosive microalgal blooms.

Lake O not the only cause

The new hypothesis is that high-volume releases from Lake Okeechobee to the South Fork of the St. Lucie River form a freshwater "dam" in the lower St. Lucie River that prevents low nutrient seawater in tidal pulses from diluting the nutrients in river, regardless of their source.

The dam also prevents seaward outflow of St. Lucie River water that carries nutrients to sea before they can reach high concentrations.

The nutrients build up behind the freshwater dam, particularly in the North Fork of the St. Lucie River adjacent to Port St. Lucie where the watershed is more highly developed.

To be clear, Lake Okeechobee releases contain high nitrogen and phosphate concentrations—higher than water typically found in the St. Lucie when tidal flushing occurs.

Several monitoring stations showed twice or higher the nutrient concentrations of Lake Okeechobee water, with those in the North Fork segment being the highest.

The extremely high nutrient levels plus the change to a "freshwater lake" behind the outflow dam, created the essential conditions for initiation and persistence of the algal bloom.

Ian Walsh, PhD, director of science in the Ocean Research Business Unit at Oregon-based Sea-Bird Scientific, the company that provides the LOBO

BLOOMS
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St. Johns Riverkeeper moves dredging battle to federal level

By BLANCHE HARDY, PG

In late July, the St. Johns Riverkeeper withdrew its legal challenge of a state environmental resource permit for the proposed St. Johns River harbor deepening project in Jacksonville.

Motions and determinations related to the case made it clear that the state's permit is unenforceable. The U.S. Army Corps of Engineers has "federal supremacy" and, as such, has sovereign immunity from state law.

"By refusing to waive its sovereign immunity, the U.S. Army Corps of Engineers cannot be held accountable to the conditions of the state permit and the Florida Department of Environmental Protection cannot enforce potential permit violations," said Lisa Rinaman, St. Johns Riverkeeper. "It's merely a procedural exercise giving the public a false sense of protection."

The Riverkeeper is moving its challenge to federal court to ensure that advocates have a chance to protect the river from damage resulting from of the proposed deep dredge.

According to the Riverkeeper, the list of potential negative impacts to the river is long.

"Salinity will move farther upstream, impacting hundreds of acres of wetlands and submerged aquatic veg-

ST. JOHNS
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BLM lacks authority to regulate hydraulic fracturing on federal lands

Staff report

U.S. District Court for the District of Wyoming Judge Scott Skavdahl ruled that the U.S Bureau of Land Management lacks the authority to regulate hydraulic fracturing on federal lands.

The decision noted that among federal agencies, only the U.S. Environmental Protection Agency has the authority to regulate fracking. A court decision in the late 1990s upheld that authority.

But, in 2005, Congress passed the Energy Policy Act, which Judge Skavdahl noted "expressly and unambiguously" limits the EPA's regulatory authority to fracking operations that use diesel fuels. EPA is currently reviewing rules for that type of fracking.

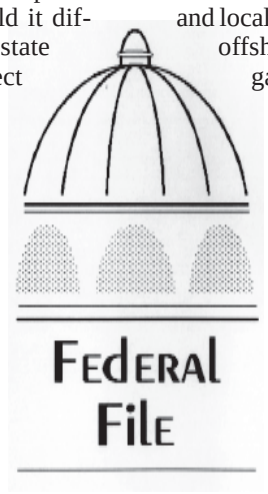
Judge Skavdahl concluded in his decision that since Congress expressly limited the EPA's authority to regulate fracking, another federal agency may not step in to make rules—not even for fracking only on federal land under its stewardship.

That effectively relieves BLM of the necessary authority to manage federal lands where fracking occurs.

The district court case influenced U.S. fracking operations long before its verdict. In 2015, Judge Skavdahl stayed BLM's regulations, now permanent across the U.S.

Going forward in the short term, the federal Court of Appeals of the 10th Circuit is also reviewing the rule. The appeals court has appellate jurisdiction over district courts in Colorado, Kansas and New Mexico.

That court's decision will supersede Judge Skavdahl's ruling should it differ. Therefore, currently only state and local regulations now affect fracking operations.



The BLM rule recently vacated required companies drilling on federal lands to disclose chemicals used in fracking, mandated storage procedures for recovered wastewater, required cement casings around oil and gas wells where the drill pipes passed through aquifers, and required detailed disclosure of well locations.

The four states party to the suit, Colorado, North Dakota, Utah and Wyoming, as well as industry representatives that joined the suit, argued that these conditions were onerous and impeded drilling on federal lands.

Florida is permitting fracking only under provisional permits, only one of which has been issued.

Local governments may prevent fracking operations if they do not approve DEP's permit for fracking in their jurisdiction, a crucial step in Florida before the Florida Department of Environmental Protection approves a fracking permit.

However, the state has less influence—and local governments have none—over offshore Continental Shelf oil and gas reserves that may be found in the future.

Binding coal ash in polyurethane. Researchers at North Carolina Agricultural and Technical State University have demonstrated successful coal ash incorporation into urethane resins.

Their process of combining large proportional volumes of coal ash into hardened resins effectively isolates solids into a degradation-resistant plastic.

Typically, coal ash is 75 percent of the resin-ash mixture, but can be up to 80 percent. The mixture is malleable while the urethane resins polymerize, allowing the mixture to be pressed or molded into useful materials including building supplies, exterior siding, decking and interior moldings.

In the absence of any other use for the plastic, the resin-ash mixture, hardened into large blocks, could be stored indefinitely without leaching significant amounts of heavy metals or other coal ash materials.

The storage blocks would not have to be sent to lined landfills for disposal, eliminating the use of containment ponds. Pond breaches can release tons of contaminated coal ash slurry across the landscape.

The researchers looked particularly at radioactive elements in urethane-coal ash plastic and found that coal ash did not release harmful levels of the radioactive elements or emit significant radiation.

The researchers also measured leaching from blocks submerged in water. They neither take up water nor release substances from the encased coal ash.

In contrast to other candidate techniques that permanently bind coal ash into a bulk material, this process requires no heat as competing processes do, and has the prospect of yielding a lightweight material that can be molded or shaped during formation.

The state of North Carolina funded the R&D project with a two-year, $400,000 grant to the University's Center for Composite Materials Research, directed by Kunigal Shivakumar.

The urethane-coal ash plastic is still under the researchers' scrutiny, but at the very least, its developers said it holds significant promise to economically and safely immobilize coal ash indefinitely, and could supply a beneficial material for construction use.

Outlook for U.S. environmental industry. The U.S. environmental industry is poised to grow four percent in 2016, according to midyear outlook for the industry provided by Environmental Business International.

U.S. construction and infrastructure spending, which is driving the economy as a whole, is seen as beneficially spurring substantial growth in several environmental industry client sectors.

Some industry sectors are expected to show much more favorable growth rates than the industry as a whole.

For example, the Environmental Services sector anticipated growth rates of 5.6 percent. Another sector, Environmental Management Information Systems, has been growing by double digits for the past few years, and similar rates are likely to again lead the growth of the environmental industry in 2016.

By client sector, renewable energy is expected to lead growth in environmental services, ahead of even water utilities. This year, about 90 percent of all new electrical generating capacity will be renewable energy, particularly wind and solar.

Multi-year extension of the production tax credit last year is expected to fuel continued growth in solar and wind energy, which began notable expansion last year.

Environmental companies and professionals who provide environmental impact statements, citing, planning and permitting, design and construction will all benefit.

Water utilities, including potable water and reuse water facilities and upgrades, also rank highly among the top six client sectors.

Strong growth of water utilities as a client sector is also influencing growth prospects of its workers within the service category. Increasingly, water utilities, including wastewater and recycling facilities, face waves of retirements of long-term employees.

In this sector, outsourcing rather than employee-hiring is dramatically increasing environmental health and safety services employment patterns. Outsourcing in other client categories is also occurring but to a lesser extent than is the case in water utilities.

Air quality work is a sector also ex-

FEDFILE

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DEP gives green light to two Everglades projects

Staff report

Two projects aimed at restoring the Everglades have cleared another hurdle.

The Florida Department of Environmental Protection said the U.S. Army Corps of Engineers can start construction on the projects: the Canal 111 South Dade project and the Modified Water Deliveries to the Everglades National Park project.

Both are part of the Comprehensive Everglades Restoration Plan.

The first will restore the ecosystem in Taylor Slough and the eastern panhandle of Everglades National Park affected by the building of the flood control project in the C-111 basin.

The second project will provide flood mitigation to an existing residential area in the East Everglades called the 8.5 Square Mile Area.

The work includes construction of several levees, flow-ways and weirs; removal of culverts; partial demolition of water control structures; road removal; and levee and weir degradations.

The work is expected to be completed by the end of 2017.

Florida Notes

Brevard landfill hits snag. Plans to build a landfill near the border of Brevard and Osceola counties recently hit a major roadblock.

Two large Central Florida landowners—Deseret Ranches of Florida and Deep Park Ranch Ltd.—filed administrative challenges after the Florida Department of Environmental Protection said it intends to issue permits for the landfill.

Brevard County proposed building the landfill along U.S. 192, east of the Osceola-Brevard County line.

The landowners said the project would impact water quality in the area as well as their agricultural and cattle operations.

Brevard County solid waste officials said there is a need for a new solid waste management facility.

DOE money for FSU. The federal government will provide Florida State University with $10 million for researching better ways to clean up federal wastes.

The money from the U.S. Department of Energy will fund the creation of an Energy Frontier Research Center that will focus on developing technologies for recycling nuclear fuel and cleaning up Cold War-era weapons production sites.

Nuclear waste remains dangerously radioactive for thousands of years after it is no longer useful in a commercial reactor.

The resulting waste disposal problem has become a major challenge for policy makers.

Best managed city. The city of St. Petersburg has been named as the best managed city in Florida.

The Washington, DC-based personal finance website WalletHub.com compared the country's 150 largest cities based on six factors: financial stability, education, health, safety, economy and infrastructure and pollution.

St. Pete came in 48th in the country and number one in Florida.

The city fared well in economy and infrastructure. It beat out Tampa, Orlando, Fort Lauderdale and Miami, all of which were in the bottom 50.

Florida recycling rates. Recycling rates in Florida continue to climb.

The state's recycling rate is now 54 percent, up four percent from last year, according to 2015 data just released by the Florida Department of Environmental Protection.

Last year, recycled municipal solid waste increased by nearly nine percent, from 12.6 million tons to 13.7 million tons.

In addition, the operation of waste-to-energy facilities and the conversion of landfill gas to energy production created 3.4 million megawatt hours of electricity in 2015.

Leading the way was Pinellas County with a recycling rate of 89 percent, followed by Palm Beach and Hillsborough counties with 72 percent, Lee County with 69 percent and Pasco County with 65 percent.

SLR health impacts. A new report highlights communities in South Florida with the greatest risk for adverse health effects from rising sea levels.

The Florida Institute for Health Innovation, working closely with the South Florida Regional Planning Council and Florida Atlantic University's Center for Environmental Studies, mapped the areas most in danger of environmental sea level rise impacts, described associated public health risks and identified the region's communities most at risk to sea level rise health effects.

The research provides a basis for health-related climate change studies. It also includes a tool kit with recommendations for local decision makers.

Officials said the study is also the start of better detection and monitoring of vector-borne illnesses such as the Zika virus.

Those who worked on the study said the most vulnerable people are the wealthier citizens that can afford to live close to the ocean.

The two-year study, titled Health and Sea-Level Rise: Impacts on South Florida, is aimed at making sure South Florida's coastal communities are improving efforts to withstand the effects of rising sea levels.

The study directly addresses multiple recommendations outlined in the 2012 Regional Climate Action Plan led by the Southeast Florida Regional Climate Change Compact.

People news. Clinton Howerton Jr. will replace Ramon Gavarrete as the next Highlands County engineer.

Howerton started at Polston Engineering in 1994 as a draftsman and worked as a graduate assistant at the University of Florida and University of Georgia.

He went back to Polston in 2000 and eventually became vice president.

James McConnell, EI, was promoted to assistant branch manager for the Pensacola branch office of Universal Engineering Services. He started with the firm in 2012 while finishing his bachelor's degree in civil engineering.

St. Johns River Accord agreement formally ends after a decade

Staff report

In 2005, the Lower St. Johns River around Jacksonville experienced a historically severe algal bloom. The bloom got the attention of officials from the city of Jacksonville, JEA, the St. Johns River Water Management District and the Florida Department of Environmental Protection.

In July, 2006, the agencies signed off on the River Accord agreement.

The River Accord was a 10-year cooperative agreement among the agencies to spent $700 million to provide funding for projects to reduce nutrient inputs and take other measures to cleanup the river.

The projects included upgrading wastewater treatment plants, converting septic tanks to sewer connections, and improving stormwater management efforts to reduce nutrient inflow.

The River Accord expired the end of July this year.

According to an article in the *Florida Times-Union*, the River Accord partnership ended up spending substantially less than the $700 million originally pledged.

JEA promised $200 million and spent $150 million to upgrade its wastewater treatment facilities. The utility spent $109 million to shutter six older water treatment plants and upgraded five regional plants.

Their nitrogen discharges to the St. Johns River dropped 38 percent, from 882 tons per year in 2006 to 550 tons estimated for 2016. In fact, JEA earns pollution credits annually for exceeding nutrient reduction goals.

The utility spent another $41 million expanding its wastewater reuse system that diverts its treated effluent to irrigation use rather than dumping it into the St. Johns River.

JEA's reuse rate rose from seven to 20 percent over the last decade. But that's still less than half of the statewide rate of 44 percent of wastewater reuse. It's also less than the River Accord target of 66 percent.

JEA is currently expanding sewer service and reuse water service in Northwest Jacksonville, so reuse water is on a trajectory to expand as real estate development regains the footing it lost during the recession.

Other River Accord partners also spent less money than expected. SJRWMD pledged $150 million but spent only $58 million, primarily as cost-share funding for JEA's wastewater treatment upgrades and reclaimed water projects. Part of that total was also spent in adjacent counties.

The city of Jacksonville, according to an estimate by the *Times-Union*, spent about $54 million for stormwater management and treatment related projects. It pledged $150 million.

The River Accord projected spending $200 million from city, state and federal funds to convert 21,000 failing septic tanks to centralized sewer connections. That appears to have been the least successful component of the effort with only 900 septic tank retirements—far short of the 21,000 goal.

Though the River Accord has ended, statewide basin management action plans have statute-established nutrient reduction goals that local governments, water management districts and DEP are working to meet in various ways.

Recently, the city of Jacksonville committed $30 million over the next five years to continue phasing out septic tanks, and converting the properties using them to sewer connections.

That might remove as many as 900 more failed septic tanks, ending their nutrient contribution potential to the river.

SJRWMD continues to fund a variety of wastewater treatment plant upgrades, and stormwater management and reuse projects to help meet BMAP goals in Northeast Florida.

Most stakeholders agree that, in spite of the funding gap, the river's water quality has improved over the past decade. And further improvements will be made to meet BMAP nutrient reduction goals.

Water quality improvements are effectively heading in the right direction, and the efforts and money spent under the River Accord deserve recognition for that progress.

More storage north of Lake O. As the St. Lucie River in Martin County experiences another historically-severe toxic algae bloom as a result of massive water releases from Lake Okeechobee, the U.S. Army Corps of Engineers proposed more water storage projects north of Lake Okeechobee to impound water before it reaches the lake.

Called the Lake Okeechobee Watershed Project, the proposed construction is a long-term solution. It may take at least three years just to develop a plan to provide sufficient storage to reduce Lake Okeechobee releases to the St. Lucie River to the east, and the Caloosahatchee River to the west.

When the plan is complete, it will require Congressional approval and then appropriation before construction can begin.

In related news, Florida has taken some short-term steps to reduce water releases from Lake Okeechobee.

In late June, Gov. Rick Scott declared a state of emergency in Martin, St. Lucie, Lee and Palm Beach counties.

The order directed the South Florida Water Management District to store additional water in the Kissimmee Chain of Lakes by closing locks, and "to explore every opportunity to increase water flowing south from Lake Okeechobee" and increase storage in dispersed water storage projects.

One of those DWS projects, the DuPuis Management Area east of Lake Okeechobee in Martin County, was specifically mentioned as a project to be accelerated.

In its Aug. 1, 2016, daily Lake Okeechobee update, DEP noted that the corps was maintaining near maximal level releases to the St. Lucie River.

Water deliveries heading south of Lake Okeechobee have also been increased recently in an attempt to lower Lake O's water levels, which currently stand at 14.63 feet, well above the historical 13.77 feet expected this time of year.

Florida officials could also exercise an option to buy U.S. Sugar's land before that option expires in October.

With that land, which could cost as much as $2 billion according to some estimates, state and federal agencies could establish a direct flow-way and treatment marsh between Lake Okeechobee and Water Conservation Area III.

That would restore historic water flows from Central Florida to Florida Bay, with the option of safely storing it as needed.

Tavares stormwater. The city of Tavares held a groundbreaking in July on South Sinclair Avenue near the site of a planned stormwater pond park, the aesthetic centerpiece and a major functional component of the Ruby Street Stormwater and Beautification Project.

Tavares' stormwater management project will affect much of the eastern side of the city adjoining Lake Dora, the lake the stormwater management project will benefit.

The $2.6 million project is expected to be complete by mid-2017.

Both city officials and local business owners are striving to complete the project with the least disruption to downtown businesses as possible.

Tavares officials are planning to use social media and other communication tools to inform the public and business owners about the status of the project in an effort to ensure that businesses continue profitable operation during the next 14 months.

Construction is not scheduled to begin until after Labor Day. During July and August, engineering reviews, staging and preparation work will be the most visible signs of the project.

When the project is complete, the downtown will have a new eight-acre park around the stormwater pond and much improved drainage in the eastern part of town adjacent to Lake Dora.

Leak-resistant manhole covers. The city of St. Augustine is in the planning and review stage of a project to replace leaking manholes to significantly reduce its wastewater treatment system overflow issues during periods of high rain.

Over the past several years, St. Augustine's sewer system has overflowed during heavy rain events in part because manhole covers in flooded streets leak excessive water into the city's sewage system pipelines.

The sewage system lacks the capacity

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to treat several million gallons of additional water, resulting in sewage overflows to surface waters, a permit violation the Florida Department of Protection takes seriously.

In addition to reducing infiltration from streets into the wastewater system, the upgrades will keep trash and debris out of St. Augustine's wastewater conveyance pipes.

The manhole upgrade involves the installation of rainwater collection "dishes" that will catch water seeping into manholes.

St. Augustine City Utilities plans to outfit about 246 of its approximately 2,100 manholes.

DEP recently approved the project. The city prepared its planning documents in house. Jacksonville-based JEA, which has considerable experience installing these type of manholes, is reviewing the plans for St. Augustine.

Work will begin when the review is complete. City officials would like the project to be finished by January. Project cost is estimated to be $10,095.

The manhole upgrade meets some of the requirements of a consent agreement signed last year between DEP and the city of St. Augustine.

The goal of the consent agreement is to decrease the number of St. Augustine wastewater system overflows due to flooding. It is only one part of a larger coordinated program to upgrade lift stations and reduce inflow and infiltration.

ERC approves water standards. In the final week of July, the state Environmental Regulation Commission approved the Florida Department of Environmental Protection's Class I and Class III water standards for 39 new chemicals.

As a result, Florida now has standards for 92 chemicals.

These standards apply to Class I drinking water sources and the newly established Class I-treated water, as well as Class III waters used for fishing and recreation.

Establishing water contaminant standards is mandated by the Clean Water Act. But states have responsibility for choosing many of the chemicals and setting standards within broader EPA guidelines.

The law mandates periodic reviews that may add chemicals or modify contaminant concentration standards that cannot be exceeded in order to protect human health.

DEP had not updated any of its human health standards since 1992. In late May, it released the final rule including the new standards.

As a final step in the rulemaking process, the ERC held a public hearing in Tallahassee. At the end of the meeting, the commission voted 3-2 to approve the new rule.

The rule met with opposition from some activists who demanded stricter standards. At issue was DEP's use of the Monte Carlo simulation to estimate likely health outcomes.

For 13 chemicals, Monte Carlo simulation results led to looser standards than had previously been established.

Opponents were particularly opposed to loosening the standard for benzene, a known carcinogen. Some said that doing so would facilitate fracking in Florida.

Opponents preferred DEP to maintain its previous lower standards even if Monte Carlo simulations indicated they could be increased and remain protective of human health.

DEP Deputy Secretary Drew Bartlett noted that consistency was essential to make the new standards defensible in court.

In addition, he defended the methodology by noting that DEP had been developing it for over a decade.

It has been used to set standards for mercury exposure in a way that met EPA approval, and was consistent with a consent agreement for regulating that element in water and seafood.

Titusville nutrient reductions. The city of Titusville recently completed planting of littoral zones at three city-maintained ponds after being awarded a grant by the Florida Department of Environmental Protection.

The project will help reduce nutrients entering the North Indian River Lagoon Basin.

Aquatic plants in the littoral zone can improve water quality by removing excess nutrients like phosphorus and nitrogen from stormwater runoff.

This helps improve water clarity and prevent algal blooms.

The native plants also stabilize the pond banks to prevent erosion and provide habitat for wildlife.

The pond retrofit, a first for the city, will be closely monitored to determine if similar projects should be implemented in the future.

Funding came from a U.S. Environmental Protection Agency Section 319 Nonpoint Source Management Program grant and the city of Titusville's stormwater utility program.

Smart meters. The St. Johns River Water Management District is partnering with the city of Ocoee to help fund smart meter technology that aims to reduce water use and streamline other water conservation efforts.

Ocoee is using the funds to replace traditional water meters with smart meters.

The smart meters pair with technology that provides real-time water usage reports, alerting users to leaks, high water use and irrigation issues.

Installation of 900 smart meters is nearly complete and when finished, the project will have replaced nearly 10,000 traditional meters.

The goal of the project is to reduce water use through customer awareness.

Environmental groups file suit to stop oil, gas exploration in Collier County

By PRAKASH GANDHI

A major proposal to explore for oil and gas in an environmentally sensitive region of Southwest Florida has triggered a fierce backlash from environmental activists.

Some environmental groups want to stop the plan to explore for oil and gas in the Big Cypress National Preserve and have gone to court to halt the project.

"This is a major industrial operation in one of the most sensitive and biodiverse wetlands environments in North America," said Matthew Schwartz, executive director of the South Florida Wildlands Association, one of several groups fighting the proposed project by Texas-based Burnett Oil Co.

"When you look at the details of what they are proposing to do, it is almost insane that they did not do an environmental impact statement before embarking on this project," he said.

Burnett's plan calls for driving trucks through roadless parts of the preserve and pressing steel plates against the ground to create seismic signals that would be analyzed for geologic formations that could hold oil or gas.

The South Florida Wildlands Association, the Natural Resources Defense Council, the Center for Biological Diversity, the National Parks Conservation Association, the Conservancy of Southwest Florida and Earthworks filed the lawsuit in federal court in late July.

The suit accuses the National Park Service of noncompliance with the National Environmental Policy Act, the Administrative Procedures Act and its own rules by not adequately considering the environment when it approved a plan by Burnett Oil to explore for oil and gas across more than 110 square miles of the swampy preserve in eastern Collier County.

The groups have also filed a notice of intent with the National Park Service and the U.S. Fish and Wildlife Service to sue the agencies over the plan's impact to endangered species, including the Florida panther. The activists said that the Big Cypress ecosystem is essential to the health of nearby coastal estuaries.

Big Cypress provides nearly half of the water that flows into Everglades National Park and recharges important underground drinking water sources.

This includes parts of the Biscayne Aquifer, which provides most of the fresh water for homes and agriculture in southeast Florida.

In addition, the groups said the preserve is an economic generator for the state and a popular destination for outdoor recreation. Nearly 1.2 million people visited Big Cypress last year and spent almost $90 million in and around surrounding communities.

Burnett Oil officials did not return calls for comment in August.

But the firm has said its plans have been thoroughly vetted by the National Park Service and federal regulators issued a finding in May that their plans would have "no significant impact".

A federal environmental review in 2015 found that the testing's impact on wildlife and habitat would be "adverse but short term."

However, environmental groups claim the review was not thorough enough.

The groups said the extreme noise and disturbance from seismic survey activities in the area could be catastrophic for animals such as the Florida panther and other native wildlife.

"An environmental assessment was done that concluded there would be no significant impacts," Schwartz said. "But I don't think this is true. The company is bringing monster trucks into this beautiful, environmentally sensitive area. You will have an impact to the soil, damage to the vegetation and the spreading of invasive plants."

Schwartz said that Burnett Oil's plans are more technologically advanced and bigger in scope than what the preserve has experienced before.

"These vehicles have damaged the plants, landscape and wildlife. We have had several lawsuits against them over the impacts of these vehicles," he said. "But the trucks they are proposing to use for this new project are much bigger, much heavier. There is a huge potential for disturbance to wildlife not to mention the effects of fumes and noise. The list goes on and on.

"They need a lot more information about the impacts of their proposal and they need to look at alternatives that are not as (harmful) to the environment."

Schwartz said the exploration will almost certainly find oil and that groups are worried about what that would mean for new extraction wells in the preserve.

Drilling operations would require a separate permitting process.

Wakulla commissioners pass resolutions opposing pipeline, effluent dumping

By ROY LAUGHLIN

In mid-August, the Wakulla County Board of County Commissioners approved two resolutions to protect the Big Bend region's Gulf waters and estuaries.

The first opposes pipeline construction and permitting in adjacent Taylor County.

At issue is a pending U.S. Army Corps of Engineers permit to allow Georgia-Pacific's Foley Cellulose paper mill to construct a pipeline from its Taylor County facility to an outfall approximately a mile from the mouth of the Fenholloway River.

It is seen by many as a choice between jobs and clean water. In this case, the board chose clean water.

The commissioners then passed a second resolution sponsored by Commissioner Ralph Thomas asking the Florida Legislature to pass a bill to reduce effluent dumping in state waters. Both votes were unanimous—and unexpected.

During an earlier board meeting, commissioners were leaning toward approving a referendum for November's ballot. It would have asked voters to approve a resolution asking the corps to reject permits for construction and effluent release.

The planned pipeline will allow 40 million gallons a day of the malodorous and dioxin-containing effluent from the mill to bypass most of the Fenholloway River in Taylor County.

The proposed pipeline's outfall will be just a mile from Fenholloway River's mouth on the Gulf of Mexico. The new pipeline will likely benefit the Fenholloway River's water quality in Taylor County but may impact adjacent waterbodies.

The mouth of the Fenholloway is about 20 miles from Wakulla County's shoreline. Wakulla County residents see the Taylor County cellulose plant's wastes as a threat to the county's fishery and ongoing efforts to create an oyster industry.

They, and perhaps other adjacent Gulf Coast county residents, expect the contaminants to visit their Gulf waters.

The issue has a long history. In 1947, the Florida Legislature designated the Fenholloway as "industrial river," stripping it of water quality protections.

Their intention was to provide jobs in a county with 25 percent of its population living below the poverty line.

In 1954, Procter & Gamble built a paper mill that today provides jobs to 13 percent of Taylor County's residents. It also

WAKULLA
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Technical Session Agenda

Day One, Thursday, Oct. 6, 2016

Opening Session

9:00: **A Word from our Founder**
Nick Albergo, PE, DEE, Senior Engineer, GHD, Tampa

Keynote Address from the Conference Chair
Jim Langenbach, PE, BCEE, Sr. Principal, Geosyntec Consultants, Titusville

9:30: **Notes from the (Brown)Field: Limiting Consultant Exposure to Malpractice Risk at Contaminated Redevelopment Sites**
Michael Goldstein, Esq., Managing Partner
The Goldstein Environmental Law Firm PA, Miami

The dramatic expansion of the brownfields redevelopment marketplace is being driven by large, traditional developers who, even though historically risk averse, are increasingly forced to acquire contaminated sites as a result of a rapidly diminishing inventory of clean land in infill locations. While this creates more financial opportunity for environmental consultants, especially in Florida—one of the top brownfield markets in the country—it also carries significant malpractice risk for environmental professionals that are not familiar with the many ways in which development and construction activities at contaminated redevelopment sites can influence and alter traditional means and methods of conducting site investigations and cleanups. Michael Goldstein, one of the leading brownfield practitioners in the state and an environmental attorney for over 24 years, will analyze where specifically these malpractice risks exist, provide the legal basis for why they exist, present recommendations for minimizing such risk, and suggest strategies for converting such risk into a platform for creating new business opportunity. This presentation will specifically cover those assessment and remediation aspects of Chapter 62-780, Florida Administrative Code; Chapter 24, Miami-Dade County Code; and Chapter 27, Broward County Code, that most commonly impact and influence redevelopment activities at brownfield sites.

10:00 Break

Session 2: Sustained Release Technology Applications

10:30 **CSIA Evaluation of Slow Release Permanganant Cylinders**
Greg Smith, Independent Env. Remediation Consultant Chicago, IL
Yi Wang, PhD, Director
Pace CSIA Center of Excellence, Pittsburgh, PA

An automotive parts manufacturer located in Brazil had experienced releases of tetrachloroethene and 1,1,1-trichloroethane to soil and groundwater beneath the plant. The presence of suites of daughter compounds indicated that both biotic and abiotic hydrogenolysis was actively breaking down the contaminants in groundwater. The manufacturing plant is located on saprolite soils overlying bedrock. In-situ permanganate oxidation was the remediation option of choice. Oxidation was applied as a series of injections at two locations between 2006 and 2010.

In 2012, the focus of the remediation changed from groundwater treatment through oxidation at the sources to one focusing on prevention of off-site migration. To this end, the permanganate injections were replaced by Slow Release Permanganate Cylinders. SRPC is $KMnO_4$ encased in paraffin, inserted into conventional monitoring wells. As the paraffin dissolves, $KMnO_4$ is slowly released into the groundwater to oxidize double carbon-bond organic compounds, such as PCE. However, $KMnO_4$ is not a suitable oxidant for single carbon-bond organic compounds, such as TCA. Thus, the breakdown of the ethane and ethene compounds would be the result of more than one mechanism.

Aerobic oxidation and anaerobic degradation can be differentiated by using compound specific isotope analysis for carbon. Helsen, et al., (2007) observed enrichment factors averaging approximately -28‰ for fractionation as a result of permanganate oxidation of PCE, while fractionation during reductive dehalogenation of PCE had been observed by Hunkeler, et al., (2008) to result in enrichment factors of -17.60‰ to -0.5 ‰.

At the subject industrial site, oxidation had much more negative enrichment factors ranged from -224.84‰ to -58.36‰, while dehalogenation to form TCE from PCE had enrichment factors of -30.21‰ to -4.77‰. With the greater than expected range of isotope enrichment factors, SRPC oxidation was readily discernible from reductive dehalogenation processes. Relict fracture features in the saprolite, representing preferential groundwater flow pathways, made it difficult to confidently determine rates of natural attenuation from the CSIA data set.

11:00 **Controlled Release Environmental Reactants – A Green and Sustainable Approach to In-Situ Remediation**
Lindsay Swearingen, PhD, Managing Partner, Specialty Earth Sciences, New Albany, IN
Sung-Woo Lee, PhD, Env. Engineer, Specialty Earth Sciences, New Albany, IN

The environmental science community has an interest in identifying viable and sustainable remedial solutions for groundwater contaminant plumes that reduce carbon footprint, minimize waste generation, and limit energy inputs required for remediation implementation, operations and ongoing maintenance. DOE and DOD sites in particular 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 more efficient and user-friendly in-situ remediation implementation. The result is a passive approach to ground water remediation that addresses the common challenges encountered with traditional liquid injection applications, such as 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 over long periods of time.

Sustained and controlled release reactant materials can be applied to the subsurface in a number of forms and methods. Multiple remediation practitioners have applied sustained and controlled-release reactants at sites across the U.S. and Canada. ESTCP Project ER-201324 is currently underway which is a slow-release chemical oxidant field demonstration for the remediation of 1,4-dioxane plumes. Site examples will be presented including site selection, implementation design, cost and monitoring data.

11:30 **Highly Successful ERD Pilot via Simple Additive Delivery System Lead to Full-Scale Biostimulation Strategy for Destruction of Residual cVOCs**
Kent Armstrong, President, TerraStryke Products LLC, Andover, NH

A former dry cleaner site experienced chlorinated volatile organic compound impacts to soil and groundwater. Contaminants-of-concern included tetrachloroethylene (PCE) and associated daughter products at concentrations above Ministry of Environmental & Climate Change Table 3 Site Condition Standards.

In October 2011, the consultant of record completed a pilot study evaluating the efficacy of TerraStryke® biostimulant ERDenhanced™ to enhance reductive dechlorination by native microbials under actual biogeochemical conditions.

The amendment was applied via passive release sock deployment units suspended vertically in saturated screened interval of existing two-inch groundwater monitoring well. Four replacement events were performed during evaluation, the last at week 20 of a 26-week evaluation. Baseline monitoring and sampling/analytical testing was performed prior to additive deployment. Four post-deployment performance monitoring/testing events were completed, the final event in week 26.

Pilot results confirmed rapid electron acceptor scavenging, expedited residual mass solubilization, and enhanced cVOC reductive dechlorination by native dehalorespiring bacteria. Specifically, PCE decreased 46.9% by week 8, increased 233.3% in week 14 (additive enhanced co-solvent effect), then decreased 89.6% in week-26. Total cVOCs decreased 49.6%, increased 282.6%, then decreased 77.4%. Parent/parent-daughter molar ratio decreased from 100% to 29.1%, a 70.9% reduction.

Monitoring/geochemical data provided a secondary line of evidence for enhanced reductive dechlorination.

In July 2013, MOECC approved a full-scale strategy combining source and ERDenhanced™ biostimulation. An injection gallery was installed in the excavation footprint. March and July 2014, 990kg and 840kg ERDenhanced™ was gravity fed into gallery using 1,100 liters make-up water. Five rounds of groundwater monitoring/sampling were completed between March 2014 and October 2015. 19-months post deployment, additive influence was observed at MW-2, MW-3, MW-6—15-20 meters downgradient of gallery. PCE decreased 99.9% at MW-2, 95.0% at MW-3, and 97.9% at MW-6. Total cVOC decreased 89.7% at MW-2, 75.8% at MW-3, and 88.1% at MW-6. Molar parent fractions realized were 99.0% at MW-2, 87.7% at MW-3), and 90.0% at MW-6.

12:00 **Day One Luncheon**
Robert Knight, PhD, Director
Howard T. Odum Florida Springs Institute, High Springs
Luncheon Sponsor: **Advanced Environmental Laboratories**

Session 3: Combined Remedies for Enhanced Outcomes

1:30 **Large Diameter Auger Excavation and Enhanced Bioremediation using CHITOREM® at the former Dixie Cleaners in Jacksonville**
Jesse Brown, PE, Associate
Golder Associates Inc., Jacksonville, FL

The former Dixie Cleaners site is located at the north end of Lakeshore Plaza Shopping Center, northeast of the intersection of San Juan Avenue and Blanding Boulevard in Jacksonville, FL. The cleaners occupied the site from 1956 to 1995. Chlorinated solvents were released to the surficial groundwater underneath the dry cleaning building and through the sanitary sewer lift station. A groundwater plume consisting of high tetrachloroethene (PCE) and trichloroethene (TCE) concentrations extended over an area of approximately one acre. The most significant PCE impacts in soils and dense non-aqueous phase liquid were identified at a depth of approximately 18 feet below ground surface, following the contour of the stormwater drain along the northeast corner of the building. It appears that, historically, waste may have been disposed of outside the back door, where it then drained onto the asphalt and into a concrete culvert. The site lithology consists of silty fine grained sand from the surface to a depth of approximately 18 feet bgs, clayey fine grained sand from approximately 18 to 30 feet bgs, limestone from approximately 30 to 32 feet, and a stiff clay unit below 32 feet.

Previous remedial activities conducted at the site included the injection of Hydrogen Release Compound, HRC-X®, and Bio-Dechlor Inoculum. The initial HRC® and HRC-X® treatments were successful in achieving greater than 99 percent mass reduction in the shallow and the deep intervals. However, elevated PCE and TCE concentrations persisted in the intermediate interval located close to the sewer lift station. Golder used an edible oil carbon source, EOS®, below the building along with a shallow source removal to address this area. Golder also injected ammonium bicarbonate in 2006 to raise the pH of the intermediate aquifer. To address the increasing groundwater contaminant concentrations in the shallow and intermediate intervals, an additional injection of EOS® and AquaBupH™ was conducted in 2009. During the injection process an area of DNAPL was identified and further delineated in 2010 along the onsite storm drain at the back of the property. In 2011, Golder developed an interim source removal work plan to address the area of identified DNAPL upon available state funding.

To address the DNAPL source area present along the contour of the stormwater drain, Golder conducted a large diameter auger excavation in January 2016. A total of 18 LDA boreholes were drilled to depths ranging from 17 to 30 bgs. Each borehole was backfilled with flowable fill. Field screening using an organic vapor analyzer was used to assist in segregating excavated soils into roll-off containers for temporary storage. Composite soil samples were collected from each container and submitted to a laboratory for waste characterization purposes. Based on the lab results, a total of 345.19 tons of high level hazardous waste and 61.05 tons of low level hazardous waste was transported to U.S. Ecology's facility in Belleville, MI. A total of 125.15 tons of nonhazardous waste was transported to the Omni Waste facility in St. Cloud, FL.

Injection wells were constructed downgradient of the perimeter LDA boreholes. During their construction, a mixture of gravel and approximately 330 pounds of CHITOREM® was placed around the screened section of each well. CHITOREM® utilizes crushed crustacean shells as a carbon substrate that promotes anaerobic degradation. Following the LDA source removal, the storm drain was replaced and the site was restored to match pre-construction conditions.

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Day 1

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From Page 7

1:50 **A Combined Remedy Approach to Address a Trichloroethene Source Zone at a Legacy Hydraulic Containment Site**
Joseph Bartlett, EI, Env. Engineer, Geosyntec Consultants, Titusville

Historic releases of trichloroethene, TCE, resulted in the contamination of the surficial aquifer at the Precision Fabricating & Cleaning Co. site in Cocoa, FL. Detailed investigations revealed the presence of onsite source areas and an associated downgradient dissolved plume. Remedial measures implemented at the site in 2002 included a hydraulic containment system to provide flux control at the PFC property line with downgradient dissolved plume monitoring.

After successfully operating and optimizing the system for over a decade, a combined remedies approach, which included an enhanced in-situ bioremediation strategy used in conjunction with the existing hydraulic containment system, was prepared with the goal of reducing the onsite TCE source zone and facilitating the accelerated shutdown of the hydraulic containment system.

The bioremediation design was implemented in October 2015 and included injection of Terra System's SRS-FRL® slow release electron donor and SiREM Laboratories KB-1® dechlorinating bacteria in the vicinity of a known release area which had been historically investigated by University of Guelph researchers. Immediately prior to injection activities the hydraulic containment system was shut down. Following an initial five-day shut-down period, the extraction system was restarted and operated for a three-day period with an objective of enhancing electron donor and microbial culture transport and distribution within the treatment area and toward the downgradient recovery wells. Following the transport period, the system was shut down for three months to promote biological degradation processes. The system was then restarted following this period in order to maintain hydraulic containment capabilities.

The combined remedy approach, utilizing the existing hydraulic containment system in conjunction with the focused bioremediation source zone reduction, has proven to be successful in documenting significant ongoing mass reductions. The presentation will provide up-to-date performance monitoring results associated with remedy implementation in addition to strategies and considerations for optimizing existing treatment trains using combined remedy approaches.

2:10 **Combining Adsorption and Bioremediation Technologies for In-Situ Groundwater Remediation**
David Alden, PE, Technical Assoc., Tersus Environmental, Wake Forest, NC

Laboratory studies have shown the potential to treat groundwater in situ by using a mixture of activated carbon, aluminum hydroxide and kaolin clay. This combination of materials can immobilize a range of amphoteric metals and organics, including petroleum hydrocarbon constituents. Combining this formulation with an appropriate mixture of amendments should minimize interventions by incorporating both adsorption and biostimulation techniques to manage groundwater plumes and destroy constituents of concern. Current activities include assessing pilot scale effects and implementation effectiveness.

The presentation will include results and lessons learned from laboratory work and the latest field implementation experiences. This dual function approach, which immediately binds contaminants and provides electron acceptors and micronutrients for biodegradation of organics, may provide both short term risk management and a remediation method for contaminated groundwater.

2:30 **Successfully Integrating Surfactants into ChemOx Technologies**
Dan Socci, CEO, EthicalChem, South Windsor, CT

Use of surfactants in remediation can significantly improve chemical oxidation results when optimally selected and applied based on site conditions. The idea of surfactant use in remediation however is often met with questions, uncertainty, and reluctance due to concerns of contaminant liberation and offsite contaminant mobilization. Drawing from experience optimizing and implementing surfactant enhanced in-situ technologies, Surfactant-enhanced In-Situ Chemical Oxidation® and Surfactant Enhanced Product Recovery™, with data points from a successful coal tar clean up in the New York City area and a petroleum LNAPL site in Texas as well as laboratory data, this presentation provides guidance on surfactant application, and addresses the most common concerns regarding this remedial option while also presenting its advantages. Information will be presented based on site experience as well as laboratory data that addresses many frequently asked questions about surfactant use with oxidants in remediation. Case studies will be presented, demonstrating S-ISCO remedies can achieve complete or near complete contamination removal, eliminating rebound and the need for follow-up treatments.

2:50 **A Multi-Site Performance Review of Slow Release Electron Donor and Bioaugmentation Co-Application Strategy**
Steven Sittler, PG, Senior Project Mgr., KERAMIDA Inc, Indianapolis, IN

This presentation will include performance data and cost analysis from multiple commercial sites throughout Indiana in which an electron donor and bioaugmentation co-application strategy was successfully implemented. As part of the multi-site review, a discussion on the consistent strategy for success which was implemented at these sites will be shared with the audience. Site challenges, conceptual site model development, baseline analysis and design and implementation of this electron donor/bioaugmentation co-application strategy will be discussed in detail. Site specific comparisons between the co-application strategy and separate injections will be presented. In a few examples, a combined remedies approach involving in-situ chemical oxidation followed by the electron donor/bioaugmentation strategy will be highlighted as well.

In recent years, technological advancements have allowed for a transition towards a co-application of controlled-release electron donors and bioaugmentation cultures of dehalococcoides, DHC. These advancements, such as pH neutral electron donors and a better understanding of the viability of DHC in this environment have allowed many to move away from the old way of thinking of waiting to bioagument. The result is a more aggressive approach with a significant increase in enhanced reductive dechlorination rates. Data suggests that this co-application approach can rapidly reduce PCE/TCE concentrations in groundwater followed by short-term increases in daughter products—cis-1, 2-dichloroethene, trans-1, 2-dichloroethene, and vinyl chloride. Sustained reductive dechlorination as a result of the slow release electron donor along with the increased degradation rates afforded by direct injection of a microbial culture are leading to complete degradation of the target constituents, thereby facilitating closure following the post-injection monitoring period.

The rapid success of this strategy will be highlighted in multiple data sets showing complete PCE/TCE reduction within three to 12 months with daughter products persisting for three to six months in most cases. Long term performance data showing sustained reduction of daughter products will also be presented. A lessons learned section will also be presented in which the need for small focused, supplemental injections was implemented quickly to minimize the time to cleanup goal attainment and avoid unnecessary monitoring. In conclusion, a comprehensive cost analysis with comparison to other traditional remediation technologies will be presented.

3:10 **Combining Technologies to Reach Site Closure**
Emily Crownover, PhD, R&D Engineer, TRS Group Inc., Longview, WA

Electrical resistance heating is a well-established, robust and rapid remediation technology. Primarily due to cost considerations, remediation practitioners generally apply ERH in the source zone to volatilize and treat volatile organic compounds. As ERH can maintain fairly uniform temperatures in the subsurface and as elevated temperatures increase reaction rates, there has been significant interest in applying ERH at a reduced cost to provide a plume-wide solution.

Moderately increasing temperature, 20-30 degrees Celsius, the subsurface matrix will increase biotic and abiotic reaction rates and will increase the dissolution rates of sorbed contaminants and non-aqueous phase liquids, making them bio-available. Field results, as well as published research, elucidate the production of short-chain, volatile fatty acids from the naturally occurring organic, non-soluble carbon already distributed throughout the treatment volume. The newly formed, dissolved organic carbon provides electron donors, supporting the biodegradation of chlorinated volatile organic compounds. Further, elevated temperatures help create redox conditions appropriate for anaerobic biodegradation. Keeping temperatures below those that produce steam eliminates the need for vapor capture and treatment, substantially reducing costs.

This strategy is currently being applied at an EPA Superfund site and data will be presented along with the principals of heat enhanced plume attenuation.

3:30 Break

Concurrent Sessions

Session 4A: New for 2016 - "Speed Talks"
New Products and New Approaches to Product Delivery

4:00
1) **Electrokinetic Enhanced Bioremediation to Effectively Deliver Amendments to Low Permeability Materials at a Florida DNAPL Site**
Sandra Dworatzek, Senior Manager, SiREM, Guelph, ON, Canada
2) **Replaceable Treatment Cartridges for Groundwater Remediation**
W. Joseph Alexander, PG, Principal, Ai-Remedial Systems LLC, Chapel Hill, NC
3) **Materials and Methods to Address Contaminated Ground Water to Surface Water Interaction: Case studies of sites with petroleum, PCBs, DNAPLs and LNAPLs, chlorinated solvents, arsenic and other contaminants.**
John Collins, COO/General Manager, AquaBlok, Toledo, OH
4) **Overburden and Bedrock Remediation Using BOS 200® at Former Retail Petroleum Sites**
Mike Mazzarese, Senior Engineer, AST Environmental Inc., Golden, CO
5) **Combining In-Situ Remediation Technologies to Achieve Site-Specific Standards**
Stephanie Turkot, Asst. Proj. Mgr., Geo-Cleanse International Inc., Matawan, NJ
6) **Using Klozur® KP (Potassium Persulfate) as an Extended Release Oxidant and Permeable Reactive Barrier**
Brant Smith, PhD, Technical Applications Mgr., PeroxyChem, Philadelphia, PA
7) **Controlled Discrete Treatment Using Horizontal Well Systems Under Tanks, Roads, Utilities, Buildings and Non-Responsible Owner Properties**
Lance Robinson, PE, Principal Research and Design Eng., EN Rx Inc., Parrish, FL
8) **Horizontal Directional Drilling and Well Installation at Small Sites**
David Bardsley, PE, BD Manager, Directed Technologies Drilling, Bellefonte, PA

Continued on Page 16

DEP springs restoration program announces 35 projects for 16 springs

By ROY LAUGHLIN

The Florida Department of Environmental Protection identified 16 springs to receive restoration funding amounting to more than $56 million in state funding.

The complete DEP project list outlined 35 projects on the 16 springs—some received funding for two or more projects.

The DEP share of the springs funding comes from the 2016 Water Bill signed into law early this year.

Two springs, Kings Bay and the Ichetucknee Springs Group, are the multiple project category leaders with five separate projects funded for each. Volusia Blue Springs followed with four separate projects.

Three projects each are proposed for Fanning and Wakulla springs. Remaining springs will have one or two restoration projects conducted with this year's budgeted funding.

In terms of categories of restoration efforts, septic-to-sewer upgrades led the list with 10 projects approved for funding. Alternative water treatment plant upgrades followed with five projects.

Apparently state officials buy into the idea that septage and sewage represent the predominant springshed nutrient sources, more so than many local governments looking to solve similar nutrient enrichment problems in coastal lagoons.

Many springs face water quantity as well as water quality impairments. Four of the projects focus on increasing groundwater recharge, and two on stormwater management.

Another three address reclaimed water that in some areas, including Volusia Blue Springs, is part of a general strategy to increase water availability in the springshed so that groundwater is not withdrawn from aquifers feeding the springs.

In agricultural areas, funded projects include alternate water supply efforts and land purchases.

Land purchases convert high fertilizer/high water use agriculture to lower impact uses such as timber growth.

A category specified as "Other" in the list will fund projects such as shoreline stabilization in spring runs and muck removal in Kings Bay and the Pot Spring Restoration Project.

In the Suwannee River Water Management District, two agriculture-focused projects are a bit more forward-looking.

One seeks proposals from landowners and other entities for projects to reduce nutrients in groundwater that contribute to spring flow. Some of those projects will be selected for up to $1 million in funding.

Another project will work with dairy farmers to improve wastewater treatment associated with their operations.

The projects funded this year include spring restoration efforts that have been underway for at least the last couple years.

DEP's funding comes from the 2016 Water Act and is for the 2016–2017 fiscal year. The price range over all projects' total costs is broad. The lowest cost project with a $166,000 price tag will connect the Orange Blossom KOA RV Park sewer system to the city of Apopka central sewer system.

The majority of projects are in the $1-$6 million range.

The Volusia Advanced Wastewater Treatment Plant that helps protect Volusia Blue Springs' water quality and supply tops the list for total cost at over $12 million.

The multiyear project received $2 million in this year's round of funding, substantially less than the project with the highest funding this year.

The Fanning Springs Wastewater Collection System Extension Phase III project will receive at least $6.5 million this year, the largest expenditure for a single project announced this year.

Matching funds usually represent a substantial part of total project costs. Typically, DEP contributes the largest share of funding, followed by local government and water management district contributions.

To summarize, in addition to the money DEP is proposing to spend, matching funds will add an additional $33.2 million to the overall cost tally. The total value of the 35 restoration projects associated with the springs projects will come in just shy of $100 million.

If this spending level continues for more than a decade as anticipated in the 2016 Water Bill, there could be significant improvement to some of Florida's most high-profile springs.

Florida Springs Council weighs in on funding

The Florida Springs Council gave mixed reviews on this year's DEP springs funding proposals.

In this year's funding cycle, DEP is using some of the strategies recommended by FSC last year, they wrote in a public letter.

Last year, FSC recommended that DEP buyout high water use/high nutrient release farmers, and pay for conservation easements or subsidize them to convert to low impact agriculture.

"Funding springs restoration still has much room for improvement," they noted in the letter.

They said that in the calculation of costs and benefits provided by DEP, one project was slated to remove 66,000 pounds of nitrogen for $1 mil-

COUNCIL
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St. Joseph's Bay program marks seagrass beds for protection from boaters

Staff report

With funding from the Deepwater Horizon Natural Resource Damage Assessment program fine, the Florida Department of Environmental Protection installed a buoy system in St. Joseph's Bay.

DEP placed 45 non-navigational buoys lettered with "Caution Shallow Seagrass Area" along the margins of deeper water channels in seagrass beds.

The buoys are intended to help boaters avoid running aground in seagrass beds when glare and poor lighting conditions makes visual depth information unreliable.

Propeller scarring occurs in seagrass beds when motor boats prop dredge to get out of shallow water. Seagrass can take up to a decade to regrow over scarred areas.

Scarred areas in grass beds are low value habitat for many sports and commercial fish species. Scallops are an economically valuable species in the area—one justification for ensuring seagrass bed habitat quality.

The project included preparation of a boating and angling guide that maps the locations of the buoys and provides critical habitat information in Gulf county waters.

The same information will be placed in kiosks at Gulf County boat ramps. The cost of the planning, materials, placement, monitoring and administration for this project was $2.692 million.

The project scope includes much more than buoy placement, even though they are its most visible aspect.

"The project is intended to engage environmental professionals for assessment of the damage, development of documentation for implementation of the recovery and limited oversight of implementation activities, recovery … and possible monitoring of recovery," said Heather Thomas, Gulf Coast public affairs manager for DEP.

The project is one of several funded by BP fine payments from the oil spill.

Cleanup effort on Douglas Park in Miami finally underway

By PRAKASH GANDHI

City of Miami officials started the long-awaited cleanup of Douglas Park, one of seven parks that has been closed due to soil contamination.

The park sits on 10 acres near Coral Gables and has been closed since September 2013 when tests showed high levels of metals including arsenic, lead, iron and copper in the park soil.

Residents have been battling for years to cleanup the park, complaining that kids were breaking into the park and playing in the contaminated soil.

Their prayers were answered after city officials recently announced the start of the decontamination work.

"The first priority of the project is to make this park safe," said Jeovanny Rodriguez, PE, director of capital improvements and transportation for the city of Miami. "To make it safe, what we need to do is to eliminate the potential of contact between any users of the park and the soil material that's in this park."

The soil in 112 city parks was tested. Eventually seven parks were closed, partially or totally, for decontamination.

Four of the parks have been cleaned up and a fifth is now undergoing work. It took more than two years to start work because the city had to obtain permits from Miami-Dade County's Department of Environmental Resources Management.

At Douglas Park, the contamination was linked to a former incinerator known as Old Smokey, west of Coconut Grove.

The cleanup calls for removing up to a foot of topsoil, installing a waterproof liner and then refilling the area with clean fill.

The drainage system will also be rebuilt, the parking lot will be repaired and sidewalks will get new lighting.

In a second phase, Douglas Park will get a new community center by October 2017. The cost of the cleanup and decontamination at Douglas Park will total about $8 million.

Speaking at the ceremony marking the start of the work, Miami City Commissioner Ken Russell said the most important thing is that the cleanup is done right—even if it takes longer.

"Because of the contaminants that are here, we have to take it seriously," he said. "This is, I believe, one of the first parks where we are putting in an impervious liner to really create protection for our groundwater and for the community.

"That engineering took a lot more time, but the project is going to be done right."

Concerns about the presence of toxins and contaminants in the parks started in 2011, when the city found contaminated soil in a fire department training facility built over the old Coconut Grove incinerator.

County regulators ordered the city to determine the cause of the contamination and eliminate it. It took Miami officials two years to complete a report that showed high levels of arsenic and other metals. The city then began to test soils within a one-mile radius of the old incinerator.

An August 2013 test revealed Douglas Park's soil was potentially carcinogenic.

The city closed the park that November and hired an environmental remediation firm to direct the cleanup.

Environmental groups push Turkey Point cooling canal issue into federal court

By BLANCHE HARDY, PG

Florida Power and Light Co. agreed to a Florida Department of Environmental Protection consent order in late June requiring the utility to improve the operation of its Turkey Point nuclear power generation facility cooling canal system.

The order followed a dropped legal action by Miami-Dade County and a series of investigations indicating noncompliance with the facility's National Pollutant Discharge Elimination System permit resulting in groundwater impacts.

The order requires FPL to halt a hypersaline plume caused by the cooling canals within three years and to retract the plume within ten years, update and expand its monitoring network, perform restoration projects, and monitor for and prevent impacts to Biscayne Bay.

In what plaintiffs are calling a "vote of no confidence," the Southern Alliance for Clean Energy and Tropical Audubon Society filed suit in the U.S. District Court of Southern Florida on July 12 asking the court to order FPL to address violations of the Clean Water Act for allowing the system's canal cooling system to pollute Biscayne Bay and the Biscayne Aquifer.

The executed DEP consent order aside, the new lawsuit states that "neither EPA nor DEP ... is diligently pursing a civil or criminal action in a court of the United States or a state to redress the violations of the CWA by defendant FPL."

"The public should know that SACE is not an environmental organization," said FPL Spokesperson Peter Robbins. "It is an anti-utility political group, plain and simple. It has a demonstrated record of attacking electric utilities with misleading claims. Nothing it says can be trusted.

"SACE's lawsuit will very likely cause delays and increase costs of our proposed environmental improvements, forcing countless hours of depositions and other activity that will divert resources from the solutions to this situation."

It should be noted that SACE is a strong solar energy advocate with a political action arm, the SACE Action Fund, tasked with the goal of making clean energy solutions to climate change a top priority.

They have entered into other energy-related lawsuits including actions involving agencies and utilities such as the U.S. Department of Defense and Duke Energy.

Robbins said that efforts to address environmental concerns associated with the plant's cooling canal system are already underway.

"The canal system, which the federal government required FPL to build, has seen improvements in both overall health and efficiency in recent years," he said. "FPL is completing a project to add up to 14 million gallons a day of brackish water from (a part of) the Floridan Aquifer that is not a source of drinking water.

"Adding this water will enable the overall water quality in the canals to be more consistent despite variations with seasonal rainfall totals," he continued. "FPL has taken several actions to restore design flow distribution and improve the heat transfer performance of the cooling canal system, including improvements in water quality.

"Current analysis indicates the efficiency of the cooling canal system has increased from 55 percent to near 80 percent in the past two years."

The lawsuit points to a direct hydrologic connection between the canals, groundwater and Biscayne Bay, and requests the court to direct FPL to cease discharging water into the bay through the cooling canals.

The group suggested installing cooling towers to serve the existing nuclear plant.

But Robbins said that the recent SACE-funded engineering report has serious flaws and underestimates the cost and time needed to construct cooling towers. FPL will not pursue that option.

"We have finalized our path forward with both the state (DEP) and Miami-Dade County," he said. "We intend to begin work as soon as possible."

Storage areas south of Lake O would provide alternative to river releases

By ROY LAUGHLIN

Senator Joe Negron, R-Stuart, whose district includes communities hard hit by the recent algal blooms in the St. Lucie River and southern Indian River, proposed a plan to fund and build water storage areas south of Lake Okeechobee in the Everglades Agricultural Area.

Such a reservoir would serve as an alternative to continued water dumping to Florida's east and west coast tide waters or water storage north of the lake.

"Permanent storage south of Lake Okeechobee is unquestionably needed as part of the overall plan to solve this catastrophic problem, particularly given the very devastating effects the current toxic algal blooms are causing in both our estuaries and the Everglades," he said in a recent press release.

The plan, in contrast to the Gov. Rick Scott's call to build more reservoirs north of the lake, appears to be likelier to happen in a useful time frame.

"In terms of the technical side, the state of Florida had been moving on building exactly this reservoir," said Tom Van Lent, PhD, vice president of programs at the Everglades Foundation.

U.S. Sugar's offer to sell land to the state led to a hiatus with planning and construction because the tract U.S. Sugar wanted to sell had more advantages for restoration, but a much higher price tag to be paid at once.

"In 2008, there was a willing seller," Van Lent said. "Now they (the seller) changed their minds."

Although Florida did not buy, or even consider buying U.S. Sugar's land, plans for the Everglades restoration subtly shifted.

The land that had been slated for reservoir construction, according to Van Lent, was used instead for stormwater treatment areas in the EAA.

Florida, which has the responsibility under a 1995 consent agreement to buy land for the footprint of any project for Everglades restoration, will apparently not exercise the option to buy the land before October, 2016, when the offer expires.

Sen. Negron's new plan seems to have a higher probability of success.

"It is essential for Everglades restoration," Van Lent said. "It (a reservoir) is in the plan. What he is proposing is that the state assume its responsibility. It is an eminently reasonable proposal."

Negron, in consultation with various experts and interested parties, identified two areas "optimal for new water storage."

One area straddles the Miami Canal and the Bolles Canal. The second, southwest of the first, is adjacent to an existing STA, canals and the A-1 flow equalization basins.

The areas identified cover 60,000 acres, and could store up to 120 billion gallons of water.

Both are currently agricultural parcels located in Palm Beach County. The county currently assesses about $1.3 million annually in taxes from the land.

A single reservoir may not be sufficient to completely redirect excess water from tidewaters other than Florida Bay. Since November, 2015, outflows from Lake Okeechobee to the St. Lucie River were 192 billion gallons, and to the Caloosahatchee River, 408 billion gallons, according to the U.S Army Corps of Engineers.

Reservoirs south of Lake Okeechobee would allow water to be released southward. At this point, there is no way to directly release water from Lake Okeechobee to the Everglades.

New reservoirs would provide the capability to make appropriate water releases to Everglades National Park and Florida Bay.

In 2015, a University of Florida technical study of the Everglades Restoration Program's progress endorsed construction of 1 to 1.4 million acre feet of water storage more than the existing plan calls for.

Negron estimated a cost of up to $2.5 billion to acquire property and construct the reservoir. He proposed to earmark $100 million annually from Amendment 1 documentary stamp tax revenue for environmental conservation to repay the project's bonding.

He also endorsed seeking matching funds from the federal government for land purchases and construction.

As president-elect of the Florida Senate, Negron has two years in front of him and almost two decades of legislative experience behind him to inform his efforts to successfully steer his plan through the state Legislature.

His plan is sure to be a priority in the 2017 legislative session.

But any legislation to make the plan a reality will face stiff opposition from sugar growers. In a *Palm Beach Post* article, spokespeople for the sugar companies expressed extreme disgruntlement with the plan.

The reservoir drama will play out over the next six months. But in reality, nothing that changes the current water storage situation could be operational for years.

The current South Florida Water Management District plan is to begin work designing an EAA reservoir no earlier than 2021.

If money becomes available in the summer of 2017, completion would move closer by no more than five years.

But for those communities faced by recurring algae super blooms, bringing some relief five years earlier would be notable progress where Everglades restoration progress, begun formally in 1995, has been measured in decade increments so far.

DEP, activists work on Suwannee River BMAP

By PRAKASH GANDHI

State environmental officials are working closely with two environmental groups on a cleanup plan that they believe will improve the ailing Suwannee River and its springs.

The environmental groups said the state's basin management action plan does not comply with state law.

In response to these fears, the Florida Department of Environmental Protection granted the Florida Springs Council and the Suwannee-St. Johns Group Sierra Club a six-month extension of the deadline to file a legal challenge against the BMAP for the Middle and Lower Suwannee River.

The three parties will use that time to work out a plan to reduce nitrate pollution in the river to the maximum acceptable level of 0.35 milligrams per liter within two decades.

At some points along the river, nitrate levels need to be cut by up to 92 percent to hit the target pollution level, said DEP officials.

The basin management action plan for the Lower and Middle Suwannee River Basin encompasses an area of more than one million acres and includes eastern Dixie, eastern Madison, western Hamilton, northeast and eastern Lafayette, western Levy, western Gilchrist counties and most of Suwannee County.

The Florida portion of the Withlacoochee Basin and agricultural springs are also included in the plan area, based on high nitrogen levels that flow into the Suwannee Basin at the convergence of the Withlacoochee and Suwannee.

The area includes 62 first and second magnitude springs, including seven Outstanding Florida Springs. In addition, there are 113 lesser magnitude springs in the area.

Dee Ann Miller, a spokesperson for DEP, said that the Withlacoochee River has

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sensors, recently used data from the new array to flesh out the new hypothesis.

At a July seminar at Florida Atlantic University's Harbor Branch Oceanographic Institute, Walsh presented an analysis of simultaneously measured nutrient and physical data including tide level, water flow, salinity, water color and chlorophyll data.

All were collected since January, 2016, by the expanded LOBO network.

He showed that in the St. Lucie River, particularly in the North Fork, nitrogen and phosphorus levels become elevated to their highest point only as high water releases from Lake O block low nutrient ocean tidal flows into the St. Lucie River.

Also notable is that nutrients in Lake O inflows, compared on the basis of concentration, are substantially lower than the nutrient levels attained in the North Fork of the St. Lucie River when tidal flushing occurs.

Without tidal flushing, he said, Lake Okeechobee dilutes the nutrients. It does not add to them.

Walsh said that his conclusions are based only on comparison of nutrient concentrations in the water from the three sources—Lake Okeechobee, tidal inflow and St. Lucie River inflow.

LaPointe noted that on the basis of estimates of mass loadings, nutrient inputs from the St. Lucie River's watershed dominate in that comparison as well.

Taking a closer look at nutrient mobilization from the St. Lucie watershed, high levels of stormwater runoff following this winter's rainfall was the dominant nutrient pathway initiating and sustaining the recent algal bloom.

The freshwater inflows from all sources were so substantial that Walsh characterized the North Fork of the St. Lucie River as transforming into a freshwater lake, behind the dam formed by exceptional Lake Okeechobee freshwater releases.

Prior research: Septage dominant nutrient source

LaPointe and his colleague's 2005-2006 study adds one more significant characterization of nitrogen and phosphorus sources that cause algal blooms in the St. Lucie River—septic tank effluent dominates the runoff-delivered nutrients.

The researchers' carbon and nitrogen isotope studies showed substantial shifts to heavier isotopes in carbon and nitrogen compounds in the St. Lucie River and throughout the Indian River Lagoon, a fingerprint of preferential biological utilization and volatilization compounds containing lighter isotopes of these elements.

The complex interaction of nutrients, currents, salinity and freshwater inflow volumes leaves one more Lake Okeechobee contribution to be mentioned—the canopy forming cyanobacteria responsible for the films and algal mats that so uniquely engaged the nation's gag reflex originated from Lake Okeechobee.

Two cyanobacteria dominated Lake Okeechobee's early summer bloom: *Microcystis* and *Anabena*. Both of these freshwater cyanobacteria flourish under simultaneously high phosphorus and nitrogen regimes.

Conditions in Lake Okeechobee in late spring and early summer were conducive to blooms. In the high nutrient regimes in the St. Lucie River, the bloom exploded to record proportions.

Current status

The St. Lucie River algae bloom was still occurring in mid-August, but less prolifically than in late June and early July.

Debora Drum, manager of the Ecosystem Restoration & Management Division in the Martin County Engineering Department, suggested that July's heat and mini-drought may have played a role.

Perhaps reduced freshwater releases from Lake Okeechobee are also contributing.

In June, the U.S. Army Corps of Engineers reduced freshwater releases from 1,800 cubic feet per second to 1,170 cfs, and in mid-July, further reduced them to a weekly average 650 cfs.

The corps adopted a pulsed water release schedule with releases above 650 for a day or two each week, followed by releases well below 650 cfs on other days.

The goal is to restore some level of tidal flushing. It will also increase salinity in the lower St. Lucie River and flush algae out.

So far, that appeared to be working as intended in late July, but several days of heavy rains during the second week of August have again reduced salinity levels and raised Lake Okeechobee's level.

Further research to characterize net nutrient mass loadings may be helpful to manage nutrient sources in the St. Lucie River over the long term.

Nutrient concentration is known to define phytoplankton niche boundaries and influence episodic algal blooms.

St. Lucie River algal bloom:

New LOBO array flexes its muscle

Staff report

The convincing characterization of complex interactions of environmental factors to produce algal super blooms in the St. Lucie River depended in no small way on an array of continuously operating and reporting robotic sensors.

Researchers at the Florida Atlantic University Harbor Branch Oceanographic Institute's Indian River Lagoon Observatory Network, or IRLON, installed and maintain the sensors.

The array, completed in 2015, began operating in time to characterize this year's historically extreme algal bloom event.

Beyond its immediate utility during the recent bloom, IRLON's new sensor network shows the value of "live data" accessible simultaneously with its acquisition.

Sea-Bird Scientific's Land/Ocean Biogeochemical Observatory, or LOBO, transmits data back to servers at FAU-HBOI as soon as it's acquired. In seconds, the servers make it available to any user logged in. The live data is changing the environmental monitoring paradigm in Florida estuaries.

Each LOBO includes a wet chemistry module to measure phosphate and ten or so more sensors to obtain physical and chemical data. The data are collected simultaneously multiple times per hour with a 20-minute lag for phosphorus due to the incubation time required to develop the colorimetric reagent.

The result is a daily flow of data delivered wirelessly to servers at HBOI.

LOBO's star quality is not only due to its data collection capability. Sea-Bird includes data selection and graphing software to aid in visualizing the data.

The software, called LOBO-Viz, is based on software originally developed at the Monterey Bay Aquarium Research Institute. It allows researchers to watch environmental and ecological processes essentially in real time.

Ian Walsh, PhD, director of science in the Ocean Research Business Unit at Sea-Bird, noted the remarkable insights it provides about the St. Lucie River.

"One of the unappreciated aspects of getting data from the field is that you can reduce your costs because you can see the data coming in," he said. "You can anticipate when you need to service or replace.

"You're going to get failures, but the more critical the data, the more useful the live data."

The selection of LOBO sensors at HBIO was heavily influenced by their decade-long success at the Sanibel-Captiva Conservation Foundation, which established the River, Estuary and Coastal Observing Network.

In part, that network monitors the effect of Lake Okeechobee water released through the Caloosahatchee River.

The most appealing aspect of HBOI's

LOBO
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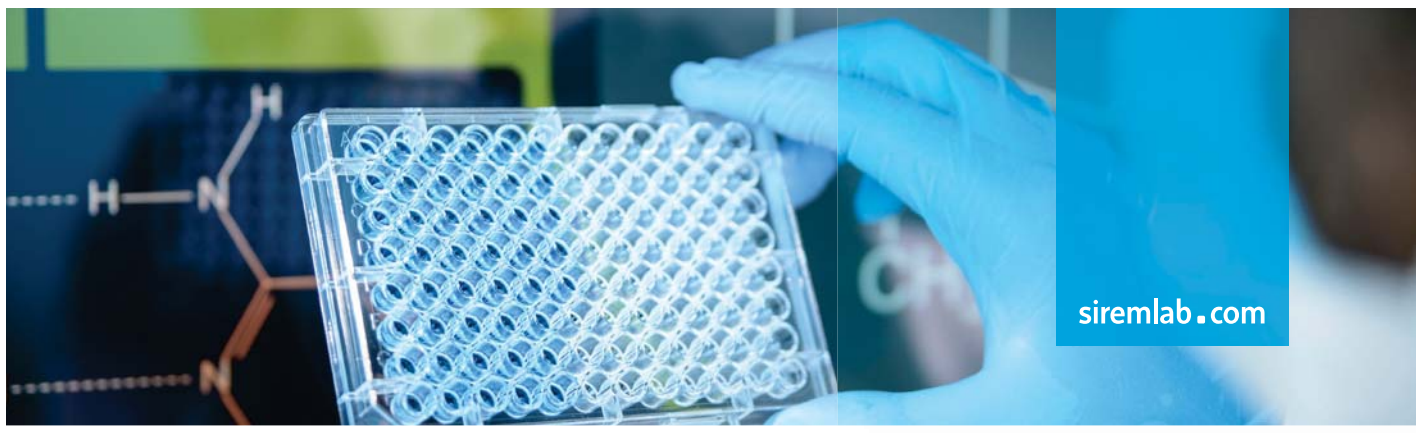

Researchers find antibiotic-resistant bacteria in St. Pete wastewater releases

By BLANCHE HARDY, PG

University of South Florida researchers discovered dangerous antibiotic-resistant bacteria in untreated wastewater that discharged at 250-500 gallons per minute into neighborhoods and into Boca Ciega Bay from a sewer line break in St. Petersburg.

USF's findings have been published in *Applied and Environmental Microbiology*. The results of the study raise significant public health concerns.

A strain of bacteria found in the water tested from the St. Pete spill is resistant to vancomycin, one of the antibiotics considered a "treatment of last resort" for infections that don't respond to other antibiotics.

"The vancomycin-resistant enterococci that we detected have previously only been detected when samples were taken directly from hospital sewage in this region," said Suzanne Young, a doctoral candidate in the Department of Integrative Biology at the University of South Florida. "Our findings showed that clinically relevant VRE and the genes that carry resistance can be released into the environment via untreated residential sewage."

In addition to being present in the discharged wastewater, the VRE bacteria persisted in the environment for some time.

"We detected the resistance genes in the environment up to 12 days after the spill event and then the signal stopped, so we have confidence that these VRE and resistance genes were released when the sewer line broke," said Young. "We tested the water and soil seven weeks after the event and after 12 days did not detect VRE or the gene that confers high level resistance to vancomycin, *vanA*."

USF researchers also found that the VRE bacteria present in the discharged wastewater contains a gene capable of transferring vancomycin resistance to other kinds of bacteria allowing for a much greater potential for increased antibiotic resistance.

"In sewage and in the environment, resistance can spread through a few different mechanisms," said Young. "One is horizontal gene transfer when resistance genes are carried on mobile genetic elements and can be easily passed between different species.

"Another is the concept of selective pressure, when antibiotics wipe out the susceptible bacteria, leaving a competition-free habitat in which the antibiotic resistant bacteria can multiply and proliferate."

The discovery of VRE in domestic wastewater suggests that more antibiotic use is contributing to the spread of resistance, she said.

"On another level, the use of antibiotics in animal agriculture can also contribute to the spread of resistance in similar ways, and there are additional risks to consider with food products for human consumption," she said.

Given the discovery of the VRE bacteria in the St. Pete wastewater discharge, USF scientists are concerned that the com-

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etation and killing or stressing numerous trees in some sections of the river," Rinaman said. "This loss will weaken the river's ability to naturally filter out pollution and negatively impact our fisheries due to loss of habitat."

Wetland impacts aren't confined to the St. Johns River proper. Riverkeeper information indicates the most significant impacts are expected to occur along the St. Johns, within the Ortega River and Julington, Durbin and Black creeks.

The Riverkeeper is also concerned with the uncertainty of the corps' wetland impact models, a situation the corps acknowledges. Actual conditions deviate from the model and lead to variation from the predicted future conditions and impacts.

"The models estimate the exact same impact to wetlands and submerged aquatic vegetation for every depth analyzed," she said.

In addition to wetland impacts, the residence time for water in the river may be increased, raising the possibility of blooms.

"The U.S. Environmental Protection Agency estimates that 4,309,677 cubic yards of rock may need to be removed (during the dredging), potentially exposing the surficial aquifer to saltwater intrusion," she noted.

Additionally, Riverkeeper information shows that the U.S. Fish and Wildlife Service and the Florida Fish and Wildlife Conservation Commission expressed concerns regarding potential impacts to threatened and endangered species from the blasting that will be done.

Material dredged from the area has failed to meet the ocean dumping criteria in the past. The EPA also noted that a potential for adverse effects on related aquatic environments exists.

"The impacts from dredging are expected to significantly exacerbate and expedite the inevitable effects of sea level rise," Rinaman said. "Unfortunately, the corps evaluates the effects of the minimum value for SLR and never considers either the intermediate or worst-case scenarios."

There are recent examples of adverse impacts resulting from other deep dredge projects in Florida.

"In Miami, during the dredging of Biscayne Bay, the corps refused to take responsibility for the devastating impacts to coral reefs due to an elevated level of turbidity during dredging," said Rinaman. "The corps' model woefully underestimated the turbidity levels.

"DEP wrote a 44-page warning letter to the corps in an effort to hold them accountable to the conditions of the permit. The corps recklessly plowed ahead, smothering more than 80 percent of the coral reef while citing its sovereign immunity."

The Riverkeeper noted that an independent expert peer review of the environmental impact statement for the proposed Jacksonville project raised significant concerns stating that the analysis of salinity results "provide an incomplete understanding of the impacts of channel enlargement."

In addition, the peer review noted that sediment modeling results "do not provide a reliable estimate of the annual sedimentation rates" and "are assumed to be unreliable indicators of future conditions."

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implementation is an easy-to-use graphing utility available to all users.

A user can select data by time range or location by using check-off boxes.

The data are available to the public through a portal on the HBOI home webpage at http://www.fau.edu/hboi/irlo/index.php.

The data presented online are not vetted. There are occasional "ringers," values that appear to be far out of line with adjacent data points in the time series. But overall, the number of outliers is surprisingly low.

In some cases, there are extended periods of unreported data for some factors, perhaps as a result of a measuring component being off-line until repaired.

Monitoring devices like LOBO, no matter how powerful or communicative they are, do not create science.

Walsh was quick to note that LaPointe and his collaborators defined the essentials of interactions between watershed nutrient sources, drainage and algal blooms in the Indian River Lagoon system using the data they gathered in 2005 and 2006

LaPointe's work formed the warp and weft of the tapestry on which the LOBO's live data filled in an image of far higher resolution.

New Manatee housing development on hold until assessments complete

By BLANCHE HARDY, PG

Manatee County's approval of a 142-unit housing development on the former Palmetto Palm View Golf Course has concerns with residents in the vicinity of the closed course.

They fear that years of chemical and pesticide application on the golf course have left the site contaminated and that the development of the property will disturb contaminants that will find their way onto surrounding properties.

Residents emphasized that many of the chemicals historically used on the golf course are now banned.

Manatee County doesn't require developers to evaluate proposed sites for potential hazardous or regulated materials. Generally, commercial properties are required to perform a Phase I environmental site assessment at a minimum to secure project financing.

If contamination is discovered, further assessment and pre-development remediation of the site is governed by the state or the county when it has been contracted by the state to do so.

An ESA was conducted on the Palmetto Palm View Golf Course by the developer and due to the site's history, an evaluation of potential impacts from the operation of the golf course is now underway.

Records indicated that operators of the golf course were required to address regulated material handling issues in the past.

An inspection of the facility by the Manatee County Environmental Protection Division in 2014 resulted in a citation for chemical storage and usage practices.

In response to the county's inspection, the site was cleaned up under county direction through the state's Operation Cleansweep program.

However, the Florida Department of Environmental Protection makes it clear that Operation Cleansweep does not involve state inspection or site-specific cleanup oversight.

"Operation Cleansweep provides farmers, nursery operators, golf course operators and pest control services with a one-time safe and economical way to dispose of their cancelled, suspended and unusable pesticides," said Jess Boyd, communications coordinator for DEP in Tallahassee. "This is a joint effort with the Florida Department of Agriculture and Consumer Services."

The department was provided with the results of a Phase 1 ESA and subsequent soil sampling data by the Palm View developer, Highland Homes.

"After reviewing the provided information, DEP has asked for additional details from the developer," said Boyd.

DEP's comments on the Phase 1 are currently focused on removal of one underground and three aboveground storage tanks.

"The groundwater at Palm View has not been tested to date," noted Boyd.

In the event contamination is detected or reported, "clean-up efforts would vary depending on both the type and level of contaminants found," Boyd said. "Contamination at golf courses varies depending on how long ago the course was operated and what pesticides were legal at that time."

Guidance materials provided by DEP indicate the most common concerns when undertaking golf course site assessment and remediation include the potential presence of pesticides, herbicides and fertilizers on the course.

Among these, arsenic is the most common contaminant.

Concerns in the maintenance areas include hazardous materials storage, underground and aboveground petroleum storage tanks, maintenance shop spills and pesticide and herbicide mix-load areas.

FEDFILE

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pected to see significant growth, driven by air toxics regulations, local regulations, advanced work for the Clean Power Plan and the retirement or transitioning of coal power plants.

Geographically, the report predicts the best growth prospects will occur in California, the Southeast U.S., and the Pacific Northwest.

Port of Miami dredging lawsuit. U.S. District Judge Fredrico Moreno agreed to reopen a lawsuit against the U.S. Army Corps of Engineers.

The reopened case focuses on the environmental damage to coral reefs and sea bottom communities caused by port channel dredging. The Miami-Dade Reef Guard Association requested reopening in June.

The association asked the court to determine if the corps violated the federal Endangered Species Act when dredging activities destroyed many more staghorn corals than the environmental impact statement had indicated.

Key to the reopening was that after the dredging ended, the National Marine Fisheries Service found extensive reef damage.

NMFS not only found that many more coral colonies were killed but that sediment had covered a far larger area than expected, approximately half a mile on either side of the channel.

Activists hope an updated verdict will influence dredging plans for a similar navigation channel dredging project to enlarge the access to Port Everglades in Broward County, about 20 miles north of Miami.

For that project, activists sued in October, 2014, asking the court to compel the corps to do a better job of protecting the reefs than had been done in Miami.

Activists filed another lawsuit in November, 2015, and mediation efforts followed.

Susan Jackson, a corps spokesperson in the Jacksonville District, said that the corps carried out the dredging to meet the terms of the Sept. 8, 2011, National Marine Fisheries Service biological opinion that allowed incidental taking of the coral.

"The corps continues to work with NMFS to assess the post-project condition of marine habitat within the project area," she said.

Corrosion of diesel USTs. In a recent report, EPA documented corrosion of metal tanks and of the metal components of fiberglass tanks used to store diesel fuel.

The EPA characterize the corrosion as "moderate or severe that could affect metal components...of underground tank systems."

Leaking underground storage tanks have historically been a leading cause of groundwater contamination by petroleum.

The EPA and state agencies drafted extensive and stringent rules to prevent groundwater contamination as a result.

The recent investigation noted that "corrosion inside USTs can cause equipment failure by preventing proper operation of detection and prevention equipment" and, if left unchecked, corrosion could cause system failures and releases leading to groundwater contamination.

The EPA researchers found that 35 of 42 USTs studied exhibited moderate or severe corrosion. Only 25 percent of the owners were aware of that corrosion prior to the internal inspection.

The EPA sent its findings to storage tank owners nationwide with recommendation that they perform a check inside their tank systems, and conduct further investigations of their tanks if corrosion is apparent.

The EPA noted that early mitigation and repair actions usually involve lower expenses than responding to contamination following releases.

SLR a threat to military sites. The U.S. operates 120 coastal military bases nationwide. Eighteen of them are at significant risk due to sea level rise, flooding during hurricanes and increased tidal flooding due to climate change.

Military bases on the U.S.' East Coast and Gulf Coast are most at risk.

The Naval Station Norfolk, the report predicts, will face 4.5 to nearly 7 feet of sea level rise by 2100.

By that time, eight of the 18 military installations closely studied could lose 25-50 percent of their land to rising seas.

In the Southeast U.S., the naval air station at Key West Florida and the Marine Corps Recruit Depot in South Carolina could lose 75-95 percent of their land in this century.

Faster rates of sea level rise after 2050, the report predicts, could lead to daily tidal flooding at some installations.

In addition, some sites could be hit by ten times more instances of flooding than at present.

Calendar

September

SEPT. 6-9 – Conference: 2016 Annual Conference of the Florida Chapter of the American Planning Association, Tampa, FL. Call (850) 201-3272 or visit www.floridaplanning.org.

SEPT. 8 – Conference: 9th Annual Region V Annual Water and Wastewater Expo, Fort Myers, FL. Presented by the Florida Section of the American Water Works Association. Call (407) 957-8448 or visit www.fsawwa.org.

SEPT. 9-10 – 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.

SEPT. 10 – Meeting: Quarterly Membership Meeting of the Florida Ground Water Association, Jupiter, FL. Call (850) 205-5641 or visit www.fgwa.org.

SEPT. 10 – Conference: American Institute of Professional Geologists National Conference, Santa Fe, NM. Visit www.aipg.org.

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

SEPT. 10-11 – 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.

SEPT. 11-14 – Symposium: 31st Annual WateReuse Symposium, Tampa, FL. Call (703) 548-0880 or visit watereuse.org.

SEPT. 12-13 – Exam: Backflow Prevention Recertification Exam, Lake Buena Vista, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

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

SEPT. 12 – Course: Asbestos Refresher: Project Design, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 12-16 – Course: Backflow Prevention Assembly Tester Training and Certification, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 12-13 – Course: Pumping Systems Operation and Maintenance, Orlando, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 13 – Course: Asbestos Refresher: Inspector, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 13 – 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.

SEPT. 14-16 – Course: Backflow Prevention Assembly Repair and Maintenance Training and Certification, Lake Buena Vista, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 14 – 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.

SEPT. 19-23 – 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.

SEPT. 19-21 – Course: Backflow Prevention Assembly Repair and Maintenance Training and Certification, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570.

SEPT. 20-22 – Course: Initial Training for Operators of 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.

SEPT. 20 – Course: Refresher Training for Experienced Solid Waste Operators and Spotters - 4 Hour, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 20-22 – Course: Initial Training for Operators of Landfills 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.

SEPT. 20 – Course: Refresher Training for Experienced Solid Waste Operators - 8 Hour, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 20-21 – Course: Refresher Training for Experienced Solid Waste Operators - 16 Hour, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 20-21 – Course: Initial Training for Transfer Station Operators and Materials Recovery Facilities - 16 Hour, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 20 – Course: Initial Training Course for Spotters at Landfills, C&D Sites and Transfer Stations - 8 Hour, Plant City, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 20-21 – Course: Effective Utility Leadership Practices, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 20-22 – Conference: 7th Annual E-Scrap 2016, New Orleans, LA. Presented by *Resource Recycling*. Call (503) 233-1305 of visit resource-recycling.com.

SEPT. 22-23 – Conference: 2016 Florida Association of Environmental Professionals Annual Conference, Bonita Springs, FL. Visit www.faep-fl.org..

SEPT. 26-30 – Course: 40-Hour OSHA HAZWOPER Training Course, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 28-30 – Course: 24-Hour OSHA HAZWOPER Training Course, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 28 – Course: 28-Hour OSHA HAZWOPER Annual Refresher, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 29-30 – Course: Water Reclamation and Treatment Processes, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

SEPT. 30 – Meeting: Technical Meeting of the Florida Section of the American Water Resources Association, Jacksonville, FL. Visit www.awraflorida.org.

October

OCT. 1-2 – 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.

OCT. 1-2 – 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.

OCT. 3-5 – Course: Asbestos Refresher: Inspector, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 4-7 – Course: Wastewater Class C Certification Review, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 5 – Charity Event: 7th Annual FRC Charity Golf Tournament, Ritz-Carlton Golf Club, Grande Lakes, Orlando, FL. Presented in association with the Florida Remediation Conference. Call (407) 671-7777 or visit www.enviro-net.com.

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

OCT. 6-7 – Conference: 2016 Florida Remediation Conference, Orlando, FL. Presented by National Technical Communications Co. Inc., publishers of the *Florida Specifier*. Call (407) 671-7777 or visit www.enviro-net.com.

OCT. 7-8 – Exam: Backflow Prevention Recertification Exam, Venice, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 11 – Course: DEP SOP's for Water Sampling and Meter Testing, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 13-14 – 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.

OCT. 14-22 – 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.

OCT. 17-21 – Course: Asbestos: Contractor/Supervisor, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 18-19 – Course: Refresher Training for Experienced Solid Waste Operators - 16 Hour, Tallahassee, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 18 – Course: Initial Training Course for Spotters at Landfills, C&D Sites and Transfer Stations - 8 Hour, Tallahassee, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 18-19 – Course: Initial Training for Transfer Station Operators and Materials Recovery Facilities, 16 Hour, Tallahassee, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 18-2 – Course: Initial Training for Operators of Landfills and C&D Sites - 24 Hour, Tallahassee, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

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The *Florida Specifier* welcomes columns, articles and letters to the editor on any subject or issue pertinent to the environmental, regulatory and technical areas the newspaper covers. We reserve the right to edit all submissions for newspaper style and publish submissions on a space-available basis only. The opinions expressed on this page are those of the authors.

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Session 4B: Petroleum Cleanup– When You Can't "Risk" it Away

4:00 **Multi-Phase Extraction with Enhanced Biostimulation Demonstrates Contaminant Reduction at Petroleum Site**
Matthew Crews, PE, Sr. Project Eng., Golder Associates Inc., Jacksonville

Multi-phase extraction with enhanced biostimulation using an oxygen injection system has been used to remediate a NAPL and dissolved-phase petroleum contaminant plume that has migrated offsite over 200 feet towards a residential area in Springer, NM. The MPE system was set to maximize NAPL recovery, minimize groundwater extraction and maintain the groundwater elevation during high vacuum MPE. The oxygen injection system is cycled to run concurrently with the MPE system, but within opposite areas of the site, such that oxygen has sufficient time to diffuse into the groundwater. Higher dissolved oxygen concentrations provide a concentration gradient to diffuse oxygen into small pore spaces. The result is the biodegradation of contaminant mass that would otherwise be unavailable for biodegradation or removal by extraction or volatilization methods. Because the resultant oxygen supply is greater than the total oxygen demand, this system creates the desired aerobic conditions for indigenous bacteria to break down hydrocarbons for a more efficient cleanup of the site.

After eight quarters of operation, approximately 54,000 pounds of petroleum contaminants have been removed, constituting approximately 97% of the mass in place Golder estimated prior to remedial action implementation. Enhanced biodegradation is estimated to account for approximately 53% of the total mass of hydrocarbons removed at the site to date. NAPL was effectively removed during the first six months of operation. Dissolved-phase contaminant concentrations have declined to levels near or below applicable cleanup target levels onsite and offsite, with the exception of residual contamination present below an active dispenser island.

4:20 **From Injection to In-Situ Soil Blending; Switching Application Technology Mid-Remediation**
Brantley Rudd, Vice President, Exo Tech Inc., Monroe, GA

Petroleum constituent contamination in groundwater was discovered at a state reimbursable site in Chatham County, GA, in 1995. Throughout the site history, a total of 12 monitoring wells were installed on site. Light non-aqueous phase liquid was discovered in only one well. The initial remedial approach was to perform an enhanced fluid recovery event to remove the free product and continue monitoring the remaining wells for free product. Following the extraction event, the LNAPL was removed and was not detected in the other wells. Exo Tech was contracted to reduce the dissolved BTEX that was present in four monitoring wells. Prior to the implementation of any remedial activities, the UST's were abandoned and removed from the site. The initial approach defined by Exo Tech consisted of installing 56 one-inch injection wells. Two subsequent injections would follow the installation of the wells. The first injection would consist of catalyzed hydrogen peroxide to desorb an LNAPL mass that was sorbed in the soil matrix. The second injection would consist of sodium persulfate to treat the dissolved phase over a longer period of time.

In February 2014, Exo Tech installed 56 injection wells. The injection wells were installed to an approximate depth of 15 feet bgs. During the installation of the injection wells, LNAPL was discovered in an area that has historically never exhibited LNAPL. It was determined to continue with the injection of CHP but to focus the efforts in the area of the LNAPL. Two consecutive injections of CHP occurred on-site. The CHP injections consisted of mixing a 7% solution and injecting it in the LNAPL area. After the second injection it appeared that there was more LNAPL sorbed in the soil matrix than anticipated. It was determined to evaluate our approach and find a more economical way to introduce the oxidant. With the amount of LNAPL that was assumed to be present and with the site availability, it was determined to perform in-situ blending to introduce the CHP. An area of approximately 1,950 square feet was delineated. This area covered the assumed LNAPL area and some areas of high dissolved. The blending was performed by first removing approximately five feet of overburden. After reaching the impacted zone, the iron activator was blended into the soils. While the iron was being introduced, the hydrogen peroxide was being prepared. The hydrogen peroxide was dissolved to an approximate ratio of 12.5% and pumped into the excavation where it was blended thoroughly until a complete homogenous mixture was achieved. Backfilling was performed concurrently and Exo Tech demobilized.

Following the CHP blending treatment, the site was allowed to rest and the groundwater was allowed to return to background elevation. Sampling events were performed on a quarterly basis. No presence of LNAPL was detected on site and a no further action was granted.

4:40 **Life Cycle Risk Management: A Strategic Approach for Focused LNAPL Remediation**
Manivannan Nagaiah, PE, Project Engineer, Langan, Fort Lauderdale

Remediation of light non-aqueous phase liquid to the "maximum extent practicable" at sites both large and small can often be associated with high costs and uncertain timelines. This presentation describes the application of a risk-based, strategic approach for focused LNAPL recovery at a 70-acre asphalt refinery in Savannah, GA. This approach is centered on the development of a robust conceptual site model and recoverability analysis through testing and evaluation of LNAPL transmissivity. Site-wide LNAPL accumulations resulting from historical releases exist in a complex geologic setting adjoining the Savannah River.

We initially developed an LNAPL conceptual site model based on prior activities and in consideration of existing and potential sources, pathways and receptors. Our evaluation of the LCSM identified data gaps to be addressed and led to implementation of LNAPL recoverability testing utilizing vacuum extraction and baildown test methods. We subsequently conducted pilot testing to further evaluate remedial technologies including multi-phase extraction and LNAPL skimming.

Based on the investigation and testing findings, we defined priority areas for remediation on a site-wide basis that align with the refinery goals and objectives. We developed a focused and phased recovery program that provides flexibility for remediation of LNAPL toward attainable end-points and is consistent with the Georgia Environmental Protection Division Voluntary Remediation Program.

The program's streamlined approach allows for continuing operations and site redevelopment as well as a significant savings to the refinery. The LNAPL recovery program is designed to provide flexibility, efficiency and responsiveness to address existing product, and to re-assess recovery needs based on delineation, monitoring, data evaluation and performance assessments. The recovery approaches were proposed using available infrastructure and off-the-shelf equipment and systems, resulting in cost savings.

The proposed five-year program has been approved by the Georgia EPD, and recovery implementation efforts are ongoing. In describing the program components, we will also present a brief overview of the ongoing investigation and site remediation activities.

5:00 **FRC Reception in Exhibit Hall**
Sponsored by **EN Rx Inc.**

FLORIDA REMEDIATION CONFERENCE

Day 2

Day Two, Friday, Oct. 7, 2016

Concurrent Sessions

Session 5A: Enhancing Your Foundation for Remedial Success

9:00 **Innovative Use of Technology at Former NAS Cecil Field, Jacksonville**
Kara F. Wimble, Project Manager EnSafe Inc., Jacksonville

EnSafe is conducting long-term monitoring at former NAS Cecil Field in Jacksonville and maximized multiple technological applications to optimize field and associated reporting activities. EnSafe's innovative use of technology minimized limitations on current property owners so they could further develop and manage the sites for reuse as an industrial park and aviation center.

We incorporated an innovative application of existing technology to setup a Microsoft Office365 SharePoint website for the geographically-dispersed Cecil Field Team to collaborate on documents and data, and managed field data by implementing ESRI's Collector for ArcGIS for use on smartphones and tablets to access geographical information system maps, collect data using electronic forms, and capture field photographs.

In addition, an application was created to automate the extraction of data from EQuIS to perform statistical analyses and trend graphing using customized macros within Microsoft Excel, reducing the labor effort by 90% over previous methods.

Finally, we introduced the Cecil Field web-based mapping tool originally built using ESRI's Flex Viewer and migrated to ESRI's new WebApp Builder for ArcGIS. This tool allowed non-GIS technical team members to present mapping information in real-time during team meetings to facilitate discussions and decision making.

The collective successes of the Cecil Field Partnering Team were recognized in 2014 by receiving the Fiscal Year 2013 Chief of Naval Operation, Secretary of Navy and Department of Defense Environmental Restoration Team Award, and in 2016 for the ACEC - Grand Award. EnSafe's innovative use of technology optimized the LTM program at former NAS Cecil Field in Jacksonville, FL, resulting in a cost savings of approximately $1M.

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9:30 **DNAPL Source Area Delineation Using MIP and HPT Technology at Space Launch Complex 16, Cape Canaveral Air Force Station, Florida**
Timothy Jellett, Senior Scientist, HydroGeoLogic Inc., Orlando
John Langett, GS-12, DAF, Project Manager, Patrick Installation Support Team
Brad Jackson, PG, CHMM, U.S. Army Corps of Engineers, Mobile, AL

The ability of dense non-aqueous phase liquid to migrate vertically and laterally makes subsurface delineation challenging and costly. Use of membrane interface probe and hydraulic profile tool technologies can reduce an 18- to 24-month field investigation to approximately 3 to 4 months and provide three-dimensional imagery of the source area.

This approach was used successfully for Space Launch Complex 16 at Cape Canaveral Air Force Station, FL. SLC-16 is an inactive missile launch site. Prior groundwater investigations had identified a DNAPL source area with trichloroethene concentrations as high as 1,000,000 micrograms per liter 1,200 feet west of SLC-16 and SLC-19.

MIP and HPT methodologies provided real-time data, qualitative information on variations in contaminant concentrations throughout the source area, and 3D images of the source area. The 3D images facilitated placement of the confirmation samples needed to delineate the contamination to the target concentration of 10,000 ug/L TCE.

10:00 **Design Verification Program: Lessons Learned from Pre-Application Assessments at In-Situ Remediation Sites**
Doug Davis, Technical Services Manager, Regenesis San Clemente, CA

This presentation will focus on pre-application design verification steps that directly improve existing design assumptions prior to field application. The goal of this program is to determine what "lower-cost" field-based methods might provide significant benefits into design and application method selection prior to in-situ application, thus resulting in improved remedial performance outcomes.

Over the past 20 years, application of remedial substrates has had an uneven track record in terms of performance. Generally speaking in-situ remedial performance is the result of multiple factors. This presentation will focus on the identification of aquifer characteristics that can be documented using traditional field methods and provide the most insight into the remedial design and application programs. Specifically this presentation will focus on those target treatment zone, TTZ, characteristics that directly affect application programs and ultimately remedial outcomes.

On most remediation sites, two of the more important TTZ characteristics are soil type and the positional relationship between the soil types. The deposition process of sediments has a critical bearing on COC mass storage and distribution as well as remedial reagent selection and application methods. To assist design and application teams, a set of routine pre-application "design verification" steps were developed and performed on select project sites. Using these steps to identify the relationship between COC mass storage and distribution units within TTZ has contributed to an overall improvement in application programs and is seen to be a key element in higher remedial success rates.

This presentation will discuss the use of a set of lower-cost traditional field-based logging techniques for remedial assessment that have been proven to provide information in design and application program prior to field mobilization. These steps were originally developed for in-house projects across the U.S. As part of this pre-application program, a series of design verification steps were performed to systematically identify TTZ characteristics that might either limit or enhance remedial performance. These characteristics often directly affect the application strategy and methods and, in some cases, remedial reagent selection. Included in these are the quantity of sand size particles present and the use of clear-water injection testing. This discussion will include a couple of case studies as well as data sets collected from over 30 sites across the US.

Understanding percentage of sand size particles present as well as the size sorting in the TTZ can drive application and performance results. As an example, consistent continuous core collection and use of soil particle settling tubes as part of the process of soil logging has assisted in better field accuracy in this area.

Monitoring aquifer response during pre-injection testing greatly increases the ability to predict a more accurate TTZ accommodation rate and volume. Monitoring aquifer response has provided valuable insight into TTZ limitations and improved the process of project infield adjustments.

Session 5B: Emerging Contaminants: Remediation of Perfluorinated Compounds

9:00 **Best Practices in Sample Collection, Sample Preparation and Analysis of Polyfluorinated Environmental Contaminants**
Tim Fitzpatrick, Bus. Dev. Manager, AXYS Analytical Services Ltd.

Per- and Polyfluorinated Alkyl Substances—PFAS or PFCs—such as perfluorooctanesulfonateand perfluorooctanoate are ubiquitous in the environment. The decades of PFAS use in aqueous film forming foams in airports and defense installations have led to groundwater and ecosystem contamination. They are thus targets of increased environmental monitoring, regulation and remediation.

The unique environmental and analytical behavior of these compounds and ever-decreasing action level concentrations necessitate the standardization of best practices for their quantitative analysis in multiple compartments including water, soil, sewage treatment plant discharges and biological matrices.

In this work, we present some of our best practices in the sampling and measurement of PFAS. Issues discussed include the role of isotope dilution and use of labeled standards for quantitation, mass spectrometry choices, role of benchmarking, reduction of laboratory background levels, sampling and sub-sampling techniques to avoid surfactant related heterogeneity, analyte stability and role of container materials, choices of whole water vs. filtered phase analysis, choice of analytes to monitor and more.

9:30 **Treatment of Emerging Contaminants of Concern with Activated Ozone**
William Kerfoot, PhD, Principal, Kerfoot Technologies Inc., Mashpee, MA

Perfluorinated compounds, for example PFOS and PFOA, and 1,4-dioxane have become emerging contaminants of concern in groundwater and soil. Numerous states have begun to develop desired not-to-exceed levels for the compounds in groundwater supplies foremost, and soil levels secondarily. The purpose of this talk is to present the developing regulatory guidance, present a brief overview of ozone chemistry to treat both compounds, and site examples of treatment.

Perfluorinated compounds have found broad use in fire-fighting foams, are persistent in soils and groundwater and have bioaccumulated, particularly in fish. Treatment of the compounds are difficult because the strong carbon-fluorine bond creates a thermally stable compound requiring an oxidation potential above 2.9 volts for successful attack. Nanobubble ozone coated with hydrogen peroxide as a Perozone®3.0 solution readily attacks and decomposes the perfluorooctanates. In permeable sandy soils, the ozone gas and liquid peroxide can be delivered through separate tubes to be combined below ground in special stainless steel laminar Spargepoints® that form coated nanobubble emulsions that are injected outwards through capillary pores. Kinetics of the reaction will be discussed, including production of fluorides and sulfate.

The compound 1,4 dioxane has been found with chlorinated solvent spill areas. Being highly water soluble, the associated plume may be larger than the initial TCA or related chlorinated compound plume. Twelve states have developed groundwater and/or soil target levels or remediation goals for the compound. It can be treated in-situ, or in-line treatment can be added to pump and treat systems.

10:00 **Treatment of Perfluoroalkyl and Polyfluoroalkyl Substances in Groundwater**
Gary M. Birk, PE, Managing Partner, Tersus Environmental, Wake Forest, NC

Per- and polyfluoroalkyl substances are surfactants and polymers that are widely distributed across the higher trophic levels and are found in air, soil and groundwater at sites across the U.S. 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 PFASs pose potential adverse effects for the environment and human health. They are persistent in the environment, among the strongest organic compounds and thus considered non-degradable.

Practitioners have difficulty remediating these compounds at a reasonable cost because PFAS tends to be highly soluble, does not favorably partition into the vapor phase, and does not adsorb well to granular activated carbon. To date, GAC has been the only technically feasible method to treat PFAS-aqueous media.

This talk will present a treatment train for ex-situ treatments of aqueous film-forming foam impacted water. In the pretreatment phase, PFASs are precipitated by metering the liquid surface active compound into a stirring tank. The amount of reagent can be adjusted to varying concentrations. The precipitation products are separated from the water as micro-flocks by simple processes such as sedimentation and filtration. The precipitants can be concentrated to a very high degree, which allows for very economical disposal as compared to GAC. Post-treatment of the remaining residual contaminants is performed by a downstream activated carbon and activated carbon/aluminum hydroxide/kaolin filter. Due to the significant reduction in the PFAS-contaminated water in the initial precipitation stage—up to 90%—the PFAS contaminant load reaching the absorbent filter is lowered, which leads to a significant extension of the absorbers lifetime, again significantly lowering operating costs.

The presentation will also provide results of the effectiveness of an activated carbon/aluminum hydroxide/Kaolin mixture to treat PFASs. Studies have concluded that the adsorption

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capacity of the mixture for the smaller chain fluorinated substances PFBA and PFBS is vastly superior to that of GAC. This is likely due to the presence of the noncarbon components within the mixture creating unique physical chemical interactions with the smaller chain PFAS compounds.

10:30 Break

Concurrent Sessions

List of 2016 Florida Remediation Conference Exhibitors and Sponsors

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FRx Inc.	US Environmental Rental
FTS Analytical Services	USP Technologies
Geo-Solutions	Viridian America
Geoprobe Systems	Waste Connections of Florida
GeoSearch	Waste Management

Session 6A: Plume Management Using Carbon Injectables

11:00 **Multi-Site Performance Review of Liquid Activated Carbon for Groundwater Treatment**
Chad Northington, Southeast District Technical Mgr., Regenesis, Tallahassee, FL

There is growing interest in the use of carbon injectables to expedite groundwater cleanup through coupling contaminant destruction with sorption. While an appreciation of the theoretical benefits of this approach is widespread, so is a natural caution among experienced remediation practitioners, as is understandable with any new technology. Among questions related to effective practical application of the technology are concerns regarding subsurface distribution in the field, applicability in low-permeability or heterogeneous formations, and short and long term performance.

This presentation will examine evidence from the field exploring these and other concerns. Data will be drawn from more than 20 field applications, variously addressing chlorinated solvent and hydrocarbon impacted sites and encompassing a variety of geological settings within both the United States and Europe. Contaminants investigated range from chlorinated ethenes and ethanes to aromatic and aliphatic hydrocarbons and PAHs. Sites considered include legacy MNA sites, drycleaners, industrial sites, post-industrial development sites and gas stations. Field data will be presented describing performance against remediation goals, performance validation and also lessons learned with regard to material placement, site characterization and the importance of application-feasibility pre-testing.

11:30 **Activated Carbon: A Pilot Study and Full-Scale Application in South Carolina**
Matthew Valentine, PG, LRS, Principal, Woodard & Curran, Pittsburgh, PA

A pilot study was conducted in two areas near the leading edge of a long, narrow chlorinated volatile organic compound plume located in south-central South Carolina. The pilot study included the application of an in-situ, liquid activated carbon solution that purports to accelerate biodegradation and shorten timeframes for achieving remedial objectives. The cVOC plume extends over 1,700 feet beyond its identified source. Approximately 80 percent of the contaminant mass is found in a Coastal Plain sediment aquifer that is comprised of a relatively low-permeability silt and very fine- grained sand. The impacted zone is present approximately 20 to 40 feet below ground surface. Both overlying and underlying zones are impacted to a lesser degree in the source area but unimpacted near the leading edge of the plume. A residential area is located less than 1,000 feet from the leading edge of the plume.

Enhanced biodegradation and monitored natural attenuation are effective, widely-used remediation tools, but the timeframe for treatment by these methods can be on the order of months to years. The results of a remedial alternatives evaluation recommended accelerated biodegradation using an innovative, in-situ LAC solution. The remediation agent consists of highly sorptive, micron scale activated carbon particles stabilized to transport widely through an aquifer upon injection. The stabilized colloids deposit on soil surfaces, forming a biomatrix that retains contaminants and accelerates their degradation.

Prior to implementing a full-scale remedial effort, two pilot studies were conducted to evaluate the effectiveness of the approach near monitoring wells with higher and lower total cVOC concentrations. The pilot-scale tests consisted of a remedy that coupled the LAC with a controlled release electron donor and bioaugmentation culture to promote enhanced reductive dechlorination. The performance monitoring phase indicated that total cVOC concentrations decreased by 91 percent at the high concentration well and by 100 percent in the lower concentration well.

Based on the positive results of the pilot tests, the technology was implemented as the long-term remedial solution for the site at the downgradient portion of the contaminant plume. The full-scale application involved injecting the LAC solution in three passive-diffusion barriers that transect the downgradient plume. Combined with ongoing source-reduction activities, this remedial alternative should effectively prevent the plume from migrating further downgradient, which has been a concern of both the state and federal regulatory agencies. The protective effects of the remedial approach theorized to last many years will be evaluated through ongoing performance and long term groundwater monitoring. Results from the first six months of performance monitoring will be available prior to the conference and will be presented.

Session 6B: Modern Iron Applications

11:00 **What Your Mother Never Told You About Iron**
John Haselow, PhD, PE, President, Redox Tech, Cary, NC

Ever since researchers at the University of Waterloo observed differences in halocarbon concentrations in cast iron wells, zero valent iron has been used extensively in the soil and groundwater remediation business. Most of the early applications of ZVI employed

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recycled granular cast iron in barrier walls. This type of iron is known as “regrind” iron. The regrind iron was typically coarse and around 200 to 500 micron. Some regrind material was also known to have trace amount of grease and cutting oils, but more recently regrind suppliers have installed wash processes to minimize the amount of undesirable organic material. As the ZVI technology matured, different materials were tested and deployed.

Atomized ZVI, which is typically made from virgin iron ore, emerged as a cost-effective alternative to regrind ZVI. Injection applicators favored the atomized ZVI for greater reactivity and consistency. Atomized ZVI is available in wide range of particle sizes, but typical mean particles sizes for injection are around 50 to 100 micron

The next advancement in ZVI was nano-scale ZVI which is known for its high reactivity, but unfortunately, also its high price. There has been some use of nano-scale ZVI but it has not gained widespread acceptance. BASF has been producing carbonyl iron powder (CIP) since 1925 but it has only recently been touted for its perceived ease of injection. Some vendors are recommending CIP for injection through well screens, where ZVI has typically be “fracked” or jetted into formations. CIP is known for its high purity and small particle sizes with a narrow distribution. CIP particles are typically in the 1 to 5 micron range.

North American Höganäs recently began providing a very high surface area ZVI with high surface area and hydrogen generation capacity. Despite development of ZVI technology over the past two decades, data did not exist on the relationship between surface area and hydrogen generation capacity as well as reaction rates with target contaminants. This presentation provides an overview of the evolution of ZVI technology as well as recent reactivity and hydrogen generation testing results.

11:30 **The Effect of Emulsified Zero Valent Iron on Trichloroethene in the Presence of Chlorofluorocarbon 113**

Les Porterfield, PE, Director of Florida Operations, TEA Inc., Santa Rosa Beach, FL

It has been widely reported that 1,1,2-trichloro-1,2,2-trifluoroethene, or CFC-113, in groundwater can be inhibitory to the anaerobic biodegradation of chlorinated ethenes. Emulsified Zero Valent Iron, EZVI, has been shown to be effective at degrading trichloroethene as dense nonaqueous phase liquids. A field evaluation was conducted on the effects of EZVI and other amendments on TCE degradation in the presence of CFC-113 in shallow groundwater.

The approach involved assessing post-remediation monitoring results from the implementation of a remediation injection scheme with multiple reagents that included EZVI for DNAPL treatment, vegetable oil and KB-1® bacteria culture as remediation amendments to enhance the biogeochemistry of the subsurface and accelerate the reductive dechlorination reactions. EZVI was injected to treat the residual DNAPL source in the subsurface; KB-1® bacteria culture was injected to bioaugment the existing dechlorinating bacteria, and vegetable oil was injected to provide additional carbon for the microbial populations. A detailed review of the groundwater monitoring system results was used to assess the effectiveness of the TCE treatment and to evaluate the potential inhibitory effects of CFC-113.

The results indicate that the inhibition of TCE dechlorination by CFC-113 when treated with EZVI in an anaerobic reductive environment did not occur. The EZVI treatment for the TCE DNAPL and the addition of the KB-1® bacteria culture was successful in treating the TCE with no perceived inhibition, and also resulted in the simultaneous reduction in CFC-113.

These results are being used in an ongoing laboratory treatability study with subsequent supporting field data using EZVI to remediate a DNAPL source, also containing free product levels of CFC-113, with KB-1® Plus culture capable of degrading CFC-113 and TCE. Results from the field application and laboratory evaluation will be presented and lessons learned discussed.

12:00 **Day Two Luncheon**

2016 FRC Charity Introduction: Second Harvest Food Bank of Central Florida
Luncheon Sponsor: **The Goldstein Environmental Law Firm**

Session 7: Regulatory Panel Discussion:

1:30 **Important Changes to Chapter 62.780, F.A.C., and Updates to the Petroleum Restoration Program**

Moderator: Joe Applegate, Geosyntec Consultants, Tallahassee
Panelists: Steve Hilfiker, President
Environmental Risk Management Inc., Fort Myers
Florida Department of Environmental Protection representatives TBD

3:00 Break

Session 8: Management of Groundwater to Surface Water Discharges

3:30 **A Novel Approach to Assess and Quantify Mass Flux of Groundwater Discharge into Surface Water**

Paul Favara, PE, Global Practice Director, Vice President, CH2M, Gainesville, FL

Discharge of contaminated groundwater to surface water occurs at many project sites. Due to a lack of cost-effective tools and methods to quantify mass-flux, cleanup objectives for groundwater are typically very conservative resulting in unnecessary treatment costs. There is a need for more cost-effective tools to better assess the mass-flux of groundwater migrating into surface water boundaries and natural attenuation along the flow path of groundwater as it migrates through the groundwater transition zone. Over the past several years, a sediment-bed passive flux meter has been developed to provide cost effective and reliable mass-flux measurements.

The SBPFM builds off of the significant research on passive flux meters previously performed. The main design challenge in developing the SBPFM was converting the PFM, which measures horizontal flux in groundwater, to a vertical configuration to assess groundwater discharging through the groundwater transition zone into surface water. The SBPFM was designed to be capable of passively and directly measuring local contaminant and water fluxes and provide more accurate information on the temporal mass flux distribution through the sediments in order to better design site remedial and closure strategies. Once laboratory testing of the SBPFM was completed, the flux meter was deployed at several sites. The field deployments were designed to assess ease of deployment as well as information that could be used to determine how mass flux could be interpreted from the deployments.

This presentation will address the results of laboratory testing completed in designing the SBPFM, which led to the final configuration and field test results. The field deployments of the SBPFM showed that the flux meters could be easily deployed near shore and could provide results for both tidal and non-tidal waters. Additionally, it was found that both activated carbon and ion-exchange resins could be used to measure a broad range of contaminants. The deployment results demonstrate that higher quality flux measurements could be achieved since the SBPFM results represents an average flux over an approximate two-week period, as compared to “point-in-time” measurements typically used in the industry. An economic assessment of a flux meter deployment compared to other sophisticated sediment flux tools also demonstrate similar benefits and an approximate 50% cost savings.

4:00 **Angled Injection of BOS 100® to Mitigate PCE Intrusion into a Stream**

Mike Mazzarese, Senior Engineer, AST Environmental Inc., Golden, CO

BOS 100® was injected adjacent to and beneath a stream using a direct push angle drilling technique to successfully create a PRB and limit PCE flux from the upgradient source area into the stream.

The Superfund site is a former textiles facility where tetrachloroethylene was used in drycleaning operations. Approximately one-half mile downgradient of the source, PCE was discharging into a stream through the saprolitic formation. Based upon stream bank and bed soil sampling and groundwater modeling, it was determined that the PCE was upwelling into the stream from partially weathered rock as deep as 65 feet below ground surface. The project objective was to determine if a Trap and Treat® BOS 100® permeable reactive barrier could be effectively angle drilled in the wooded and sloped area on the upgradient side of the stream to intersect the plume and reduce or eliminate the contaminant mass flux into the stream.

In the source areas, reductions of 90% to 98% have been observed. The observations made at micro wells and stream bed piezometers demonstrate that effective distribution of the BOS 100® was achieved during the pilot test injections. The analytical data from 12 of 15 micro wells installed in the PRB displayed significant contaminant mass reductions following the pilot test. The eight streambed piezometers located directly downgradient of the PRB have exhibited decreases ranging from 88% to 100% and have illustrated time-trends consistent with the expected mechanics of a PRB. The full scale angled injection was implemented in the fall of 2015. Data from the pilot test and full scale will be presented.

4:30 **Column Studies for Design Optimization of Field Pilot and Full Scale Denitrifying Permeable Reactive Barriers**

Michael Lee, PhD, VP Research and Development, Terra Systems, Inc. Claymont, DE

Many of Florida’s sensitive surface waters are impacted with nitrate from septic tank discharges and infiltration of urban and agricultural fertilizers. Sustainable technologies like permeable reactive barriers are being evaluated as non-traditional treatment alternatives for nitrate impacted groundwaters. Terra Systems Inc. has performed a column study to both evaluate the nitrate treatment capability of emulsified vegetable oil PRBs and determine critical PRB design parameters using nitrate-contaminated sandy soils and groundwater from a site on Cape Cod, MA.

The column study allowed for comparison of biological nitrate reduction effectiveness of different EVO formulations and EVO loadings. The columns were operated at groundwater flow rates of one foot per day which is representative of many areas in Florida.

The column study determined time to reach complete nitrate removal, removal mass and rate of primary and secondary contaminants, buffer requirements, initial radius of influence of the injected emulsion, and projected emulsion migration distance and rate. Complete nitrate reduction continued even as total organic carbon levels in column effluents fell to between 2.3 and 3.0 mg/L by day 298. Nitrate began to increase after about 340 days when TOC fell below 2 mg/L. The column study shows that EVO effectively stimulates naturally occurring denitrifying bacteria in septic tank-impacted soils and groundwater for sustained nitrate removal while providing multiple parameters for design optimization of field pilot and full scale EVO PRBs.

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SUWANNEE

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elevated nitrogen concentrations and some Withlacoochee Springs have elevated nitrate levels.

She said the total maximum daily load adopted in 2012 established the target of a monthly average of 0.35 milligrams per liter of nitrate to be protective of the aquatic flora or fauna in the Lower and Middle Suwannee River and associated springs.

The Lower and Middle Suwannee River BMAP will be implemented through a five, ten and 15-year schedule with milestones to achieve the TMDL within 20 years of adoption.

Innovative BMPs and restoration projects will continue to be evaluated and implemented as practical.

Through these projects, officials expect to reduce nutrient levels in the Withlacoochee, Lower and Middle Suwannee River and associated springs by 75 percent.

Agricultural businesses such as dairies, cattle ranches and chicken farms are significant sources of nitrate pollution.

Once the BMAP is finalized, these operations will have to implement best management practices that reduce the levels of fertilizer, animal waste and other pollutants entering local waterbodies.

COUNCIL

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lion; another would remove only 318 pounds for $1.27 million.

Going forward, they encouraged the agency to do "the serious work of assessing whether claims of efficacy on earlier projects are being met and, if not, why not. Sound management demands this sort of assessment, but there is no indication from DEP's press materials that this process is underway."

FSC also asked DEP to conduct an assessment of expected trends in water and fertilizer use that will affect strategies for springs restoration.

In addition, the letter expressed concern that efforts made in the coming years will be overwhelmed by expected population growth and increasing agricultural demands for water.

They wrote that the billion dollars budgeted under the 2016 Water Bill might not even be sufficient to maintain Florida springs' status quo.

The letter encouraged legislators and DEP administrators to maintain the perspective that the springs restoration program's ultimate goal is, after all, springs restoration.

WAKULLA

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releases 40 million gallons per day of effluent that has nearly destroyed the Fenholloway River's ecology.

Since the Clean Water Act of 1972, local activists and regulators have been working to implement a plan to make the river safe for fishing and swimming again.

In 1999, Georgia-Pacific received a permit to build and operate a pipeline to carry water to the mouth of the Fenholloway.

In 2014, the U.S. Environmental Protection Agency and Georgia-Pacific came to an agreement that set limits on the concentration of chemicals the paper mill could release in its effluent.

Proponents of the pipeline said that it will restore freshwater conditions to resemble those before the cellulose mill went into operation.

However, opponents of the new plan, now including Wakulla County Commissioners, consider the plan one that will improve water quality in the Fenholloway River by dispersing contaminants to waters in adjacent counties.

With the commissioners resolution in hand, environmental activists hope other nearby counties will pass similar resolutions that might influence the corps to reject the pipeline permit.

If the permit is approved, a lawsuit would be the next level on which to oppose the pipeline permit.

Dollar-to-dollar expenditures vis-à-vis pound-to-pound nutrient removal comparisons of efforts are just one tool that need to be used.

They strongly encouraged comparison "with other policy options that are likely to be far more effective in the long run in restoring springs."

The alternative options included "sensible conservation measures the state has been loathe to consider such as dialing back existing consumptive use permits, charging moderate fees for water use, or mandating fertilizer restrictions in areas with unconfined soil."

These, the letter said, may be the substantive changes necessary to accomplish true and lasting springs restoration.

BACTERIA

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bination of aging sewer infrastructure and the growing frequency and intensity of event-related stormwater flooding may result in an increase in the likelihood of more spills capable of spreading dangerous, drug-resistant bacteria in populated areas.

"The spill studied in this research happened in a drainage ditch, an area with little-to-no human contact," Young said. "The adjacent water bodies were also tested for VRE but the sewage did not reach these more high contact areas.

"However, when sewage spills occur near beaches or other areas where people come into contact with the water, there are well-known risks for gastrointestinal infection."

These could be more hazardous due to antibiotic resistance, if infections cannot be treated with standard antibiotic therapy.

"This is of particular concern to high risk populations, including the elderly, the very young and those who are immunocompromised."

USF scientists echo an increasingly repeated warning: The more antibiotics we consume, the more antibiotics enter the sewer system.

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