

# Outlook

"Your project. Our passion."

## DOES GROUNDWATER IMPACT SURFACE WATER MANAGEMENT?

*Our team is studying the dynamic interactions between groundwater and surface water management systems and are finding that not all sites are created equal.*

As our appreciation of the unique Florida hydrology and associated natural systems continues to expand, coupled groundwater-surface water dynamics have gained increased attention in the regulatory sphere. With the advent of total maximum daily loads (TMDLs), impaired waters classification and EPA numeric nutrient requirements for pollutants of concern, understanding how sites discharge surface water has become a growing concern for property owners, environmental professionals and regulators, alike. The ability of a property owner to have a firm grasp of how these interactions function will give them a leg-up on securing workable permits and complying with environmental regulations, as well as properly managing their project site through sustainable development.

The ongoing Long Term Discharge Study began in 2006 as a collaborative effort by the Florida Department of Environmental Protection (FDEP), the Bonita Bay Group and Johnson Engineering to evaluate the behavior of stormwater management systems over extended time periods as it relates

to total inflows and outflows. Six project sites were selected for the study and equipped with on-site rain gauges and datalogger/pressure transducers (devices used to measure water levels) at the outfall structures. This data has been used to calculate flows and associated nutrient loadings from the systems. The study has recently added a component to assess the effects of groundwater interactions on the stormwater management systems. Observations made during previous years of monitoring have shown that the amount of discharge from a study site depends not only on the rainfall received, but on other site-specific conditions, such as hydrogeology.

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Our team uses monitoring wells to study groundwater entering and leaving two Bonita Bay golf course communities.

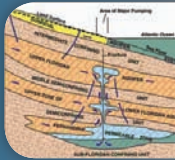
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**Kevin Winter, our new Chairman of the Board**



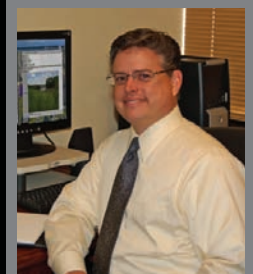
## PEOPLE & PROJECTS: ON THE MOVE



**Phil Chang, P.E.** joins us as the new project manager for our Pasco County office. His experience includes managing multi-million dollar CIP roadway and pedestrian facilities.



**Steven Hayes, Jr.** joins our water resources group as an environmental scientist. He will be performing water quality testing on various communities throughout Florida.

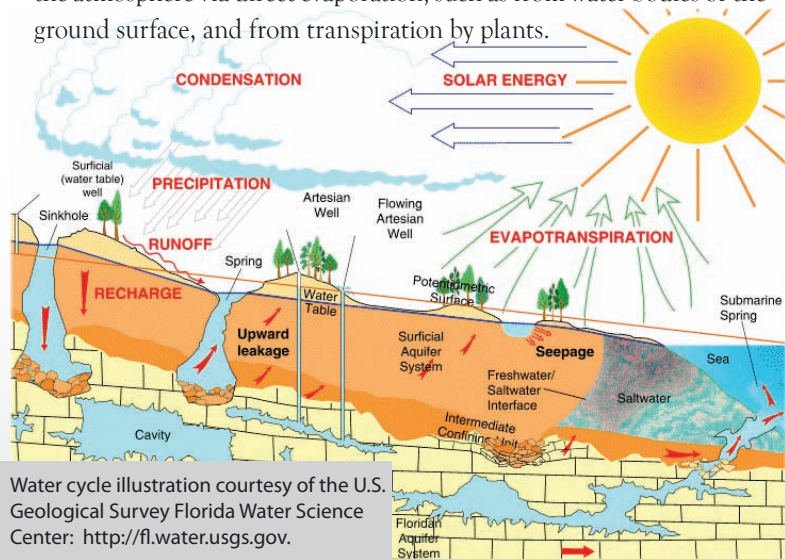


**Jared Brown, P.E.** joins us as the new project manager for our Collier County office. Jared has 12 years experience managing land development projects from concept to construction.



During the first full year of monitoring in 2007, which represented the height of a multi-year drought, discharge only occurred at two of the six project sites, with no discharge through the outfall structures for the entire year from the four other project sites. Incidentally, the site receiving the highest rainfall amount was not one of the sites that discharged. Similar overall trends continued during the 2008 through 2010 monitoring periods, although more discharge events did occur due to higher rainfall amounts. Generally, the study sites tend to fall into either high or low discharge frequency categories. Sites in southern Lee and northern Collier Counties, in particular, discharge very infrequently, which suggests that groundwater interactions may play an important role in system function. Discussions with the FDEP and Bonita Bay Group regarding these discharge behaviors explored the benefits of adding a groundwater monitoring component to the study in order to assess the impacts of groundwater interactions.

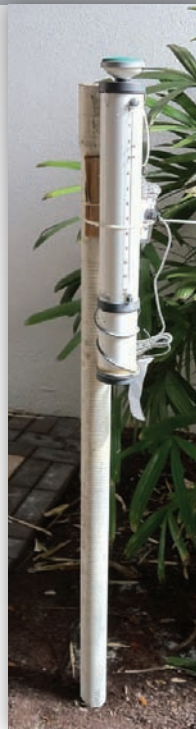
The groundwater monitoring program, implemented in the spring of 2011, will develop site-specific data to be used in conjunction with existing and ongoing rainfall, surface water quality and discharge data collected within the study basins. The groundwater monitoring program will allow for a quantification of the volumes of groundwater moving into and out of the study basins, and the associated water quality. The groundwater monitoring program will also measure evapotranspiration (ET) directly at the study sites, something rarely done in this area. Evapotranspiration refers to the combination of water transmitted to the atmosphere via direct evaporation, such as from water bodies or the ground surface, and from transpiration by plants.



Two Bonita Bay communities in Fort Myers, The Verandah and Shadow Wood Preserve, were selected to represent the low and high discharge groups, respectively. Each site has been instrumented with a network of monitor wells and an ET gauge, in addition to the existing rainfall gauges and water level measuring devices on the outfall structures. Water levels at the monitor wells will be measured and compared to water levels in the stormwater lakes and lake discharge behavior. The monitor wells will also be sampled quarterly for a suite of water quality parameters of concern, similar to those collected from the lakes. Johnson Engineering will perform site-specific testing to determine aquifer characteristics and calculate the volume of groundwater entering and leaving the stormwater management lakes and moving between the water table aquifer and deeper aquifers underlying the project sites.

Using this data, Johnson Engineering will establish water budgets for each site. Typical water budgets are calculated by measuring components such as rainfall, irrigation usage and run-off, and attributing whatever deficit remains to ET—potentially up to 85% of losses from the water budget. Introduction of the ET gauge will enable Johnson Engineering to measure ET losses directly, which will serve as a check on other parts of the water budget and provide information on site-specific conditions. In addition to calculating water budgets for a study area, use of an ET gauge can also help residential developments, agricultural operations and golf courses better control their irrigation practices and make sure their projects have adequate irrigation allocations.

Ultimately, better understanding the dynamic interactions of surface water and groundwater will facilitate better stormwater management system design—for everything from water quality treatment to aesthetic considerations. Enhanced knowledge of how stormwater management lakes may function at a given site can also aid in selection of irrigation sources and strategies, such as whether to use recharge wells to supplement irrigation withdrawals from lakes, as if so, which well designs and locations will provide the most efficient and cost-effective use of the water. ■



ET gauges and dataloggers are used to measure evapotranspiration.

## RESTORATION OF STORMWATER POND BANKS

Over the past three to four decades, thousands of stormwater ponds have been designed, permitted and constructed throughout Southwest Florida. Over time, regulations have changed and these ponds have been constructed with varying slopes for a variety of purposes, the most common slope being a four horizontal to one vertical (4:1). In some locations, time, weather and some maintenance practices have not been friendly to the slopes, as they now exhibit erosion in one or more forms.

Erosion can eventually cause safety hazards and also results in the facility being out of compliance with one or more permits. The operational entity will then consider methods available and applicable to restore function, improve safety and bring the facility into compliance with the permit(s).

Several of these methods are available, including replacing the eroded material with new soil, excavating soil from within the pond, placing geo-synthetic product or placing some type of hardening material over the bank needing restoration. Each of these has its own advantages and disadvantages including whether or not a permit is required or if the method is even allowed.

Restoration involving the hauling of new soil material and covering it with sod gives the contractor the advantage of knowing the soil material being used since it was specifically chosen for the project. The challenge and associated cost is to move the material to the site in trucks and then to the pond bank, which may be behind occupied houses. Along the way, there may be several items damaged, which require repair or replacement, such as trees, shrubs and grass between homes and along the pond bank. Irrigation lines and heads are often damaged and require repair. Bringing new soil to the site also does nothing to restore the lost treatment volume in the pond, as defined by various methods, including the Harper method, from the material deposited there by the erosion.



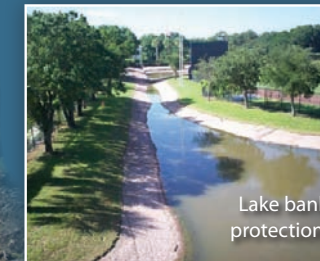
A completed bank restoration.

Another method involves excavating material from within the pond where the erosion occurred, restoring the pond bank and its treatment volume. Material can be extracted by use of a large excavator with a long boom, dragline or some form of a dredge. This would be a mixture of materials eroded from the bank and may need special attention to stabilize and make it suitable for placement on the banks. Pumping the eroded material into a geo-fabric enclosure decreases the turbidity experienced in the pond over excavation by backhoe or dragline.

In addition to reestablishing the slope and stabilizing the bank, there is some desire to improve upon the original construction, either by adding geo-synthetic fabrics or other products or to harden with rip-rap. Some regulatory agencies limit the amount of hardening. Another challenge is each agency's definitions of what is hardening and what is not.



Typical pond erosion along the bank of golf course community.



Lake bank protection.

Our team has the experience working with these challenges and the permit process associated with each, to help determine the method that will work best with the specific bank. For more information, contact David Robson at 863.612.4056 or drobson@johnsoneng.com. ■

## ESSENTIALS ON OBTAINING AN ERP AND WATER QUALITY TRADING

For the second consecutive year, Church Roberts, the director of our environmental market group, was invited to participate in panel discussions at the Marco Island Environmental Permitting Summer School and the American Water Resource Association (AWRA) Annual Meeting.

Church presented on the "Essentials on Obtaining an ERP" at the Marco Island Environmental Permitting Summer School. His focus was on natural resource issues involving wetlands, fish, wildlife, and listed species, elimination and reduction of wetland impacts, mitigation, secondary impacts, cumulative impacts and the new rules addressing wetland issues associated with water use permitting.

At the AWRA annual meeting, Church presented on water quality trading, with an emphasis on opportunities for the Caloosahatchee River. Water quality trading is a market based tool, which would allow dischargers to determine the most cost-effective way to reduce pollutants. Church emphasized that it would encourage conservation and add value to privately-owned ecologically sensitive land.

Contact Church directly with questions regarding these or other environmental topics at 239.461.2464 or croberts@johnsoneng.com. ■

## CLEANING UP CARRELL CANAL

It's hard to believe a year has passed since Johnson Engineering adopted Carrell Canal as part of the City of Fort Myers' Adopt-A-Canal program. The program's intent is to decrease the amount of litter that flows through the City's municipal separate storm sewer system, ultimately affecting the Caloosahatchee River.

In early August, employees gathered for their 4<sup>th</sup> quarterly cleaning of the canal. We're pleased to see that the appearance of the canal was much different than we found it a year ago. During our first clean up, volunteers collected 42 bags of debris. Since then, less than half that amount has been found in the one mile stretch of canal.

We made this commitment because of our desire to give back to the community. To date, we have removed an impressive 6,500 gallons of trash from the Carrell Canal. Our employees will continue to clean the canal quarterly for the next year and are hopeful to find that the amount of trash reduces each time, knowing that every effort leads to a cleaner and healthier place to live. ■





## JOHNSON ENGINEERING HAS A NEW CHAIRMAN OF THE BOARD OF DIRECTORS

Kevin Winter, P.E., has been with Johnson Engineering for 24 years and is currently the head of the company's land development group. Effective July 2011, the company elected Kevin as the new Chairman of the Board of Directors. In March 2012, current chairman and company president Steve Morrison will pass on the presidency torch and thus begins his transition of leadership.

Originally from Iowa, Kevin is married with two sons, both in high school. He joined Johnson Engineering in September 1986 as a civil engineer with responsibilities for all phases of development, utility, drainage and road design. He became a partner of the firm in 1992 and began to focus his efforts on land development projects.

Kevin's leadership has served us well, as he has been the firm's project manager for many well known projects, including the Southwest Florida International Airport (RSW) Expansion, Page Field Commons at Page Field Airport and Gulf Coast Town Center, as well as the old and new Boston Red Sox Spring Training Facilities in Fort Myers.

Kevin is spearheading the Board's efforts to develop a strategic plan that will renew the company's goals and methods of operation. Client satisfaction is our utmost priority and through this change, our ability to serve our clients will be enhanced with the new plan set into action.

Contact Kevin with any questions at 239.461.2473 or [kwinter@johnsoneng.com](mailto:kwinter@johnsoneng.com). ■



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