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FOR SANITARY, STORM AND WATER SYSTEM MAINTENANCE PROFESSIONALS

September 2013

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Tim McIntire
Mechanical Supervisor
Lake Arrowhead, Calif.

BALANCING ACT

Lake Arrowhead
overcomes unforgiving
terrain and fluctuating
demand

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underground
understood

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Scott Nocero, Assistant Superintendent
Franklin Township (NJ) Sewerage Authority

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INSIDE:

ANNUAL BUYER'S GUIDE/
STORMWATER MANAGEMENT



ON THE COVER:

Tim McIntire, Lake Arrowhead Community Services District mechanical supervisor, poses in front of a trio of centrifugal pumps used at the Orchard Bay Lift Station. Wastewater is fed from a wet well, then pumped at 125 psi over one mile with an elevation change of about 200 feet. (Photography by Collin Chappelle)



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MUNICIPAL SEWER & WATER

FOR SANITARY, STORM AND WATER
SYSTEM MAINTENANCE PROFESSIONALS

Published monthly by:

 COLE Publishing

1720 Maple Lake Dam Rd., PO Box 220,
Three Lakes WI 54562



www.mswmag.com

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Office hours Mon.-Fri., 7:30 a.m.-5 p.m. CST

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EDITORIAL CORRESPONDENCE: Send to Editor, Municipal Sewer & Water, P.O. Box 220, Three Lakes, WI, 54562 or email editor@mswmag.com.

REPRINTS AND BACK ISSUES: Visit www.mswmag.com for options and pricing. To order reprints, call Jeff Lane at 800-257-7222 (715-546-3346) or email jeffl@colepublishing.com. To order back issues, call Nicole at 800-257-7222 (715-546-3346) or email nicolel@colepublishing.com.

CIRCULATION: 2012 average circulation was 40,581 copies per month (U.S. and international distribution).

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SHARE THE MESSAGE

Your customers — and lawmakers — need to understand the consequences of failing to invest in water infrastructure now

FROM THE EDITOR

Luke Laggis



Amid all the ongoing talk of the \$16 trillion national deficit, the soft economy and high unemployment rates, there comes another number that should stand out to the people of this industry: \$384 billion.

The U.S. EPA's fifth Drinking Water Infrastructure Needs Survey and Assessment, the results of which were released this spring, show that \$384 billion in improvements are needed for the nation's drinking water infrastructure through 2030 for systems to continue providing safe drinking water to 297 million Americans.

The survey identified investments needed in 73,400 water systems across the country over the next 20 years for thousands of miles of pipe and thousands of treatment plants, storage tanks and water distribution systems.

In a press release announcing the findings, EPA Acting Administrator Bob Perciasepe said the survey shows that the nation's water systems have entered a rehabilitation and replacement era in which much of the existing infrastructure has reached or is approaching the end of its useful life. "This is a major issue that must be addressed so that American families continue to have the access they need to clean and healthy water sources," he said.

The assessment shows that \$247.5 billion is needed to replace or refurbish aging or deteriorating distribution lines, and another \$72.5 billion is needed in the area of treatment to construct, expand or rehabilitate infrastructure to reduce contamination. Storage needs account for another \$39.5 billion, and \$20.5 billion is required for the construction and rehabilitation of intake structures, wells and spring collectors.

To say it's a major investment would be a gross understatement, but it's absolutely necessary. Water infrastructure is one of the most basic and sustaining foundational elements of our society, and while you're well aware of it, far too many people in the general populace are oblivious to the consequences of failing to make this investment now.

The economic impacts make the benefits of this investment even more obvious. The U.S. Department of Commerce Bureau of Economic Analysis estimates that for every dollar spent on water infrastructure, about \$2.62 is generated in the private economy. And for every job added to the water workforce, close to four jobs are added to the national economy.

Water infrastructure is one of the most basic and sustaining foundational elements of our society, and while you're well aware of it, far too many people in the general populace are oblivious to the consequences of failing to make this investment now.

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All of this is on top of the obvious: We all need clean, fresh water to survive, and failing to invest before our systems reach the point of complete failure will cost us significantly more than making improvements now. Yet, as is often the case in Washington, what is obviously right doesn't always gain substantial support. The water industry, itself comprised largely of municipal government agencies, doesn't have the influence of big lobbying groups. It hasn't experienced a seminal event that draws media attention and the subsequent support of spotlight-seeking politicians.

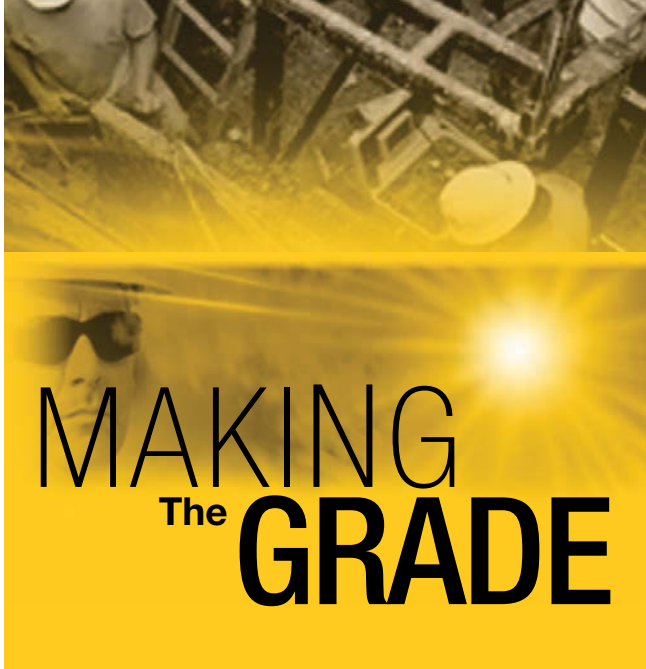
In addition to the indifference in Washington, you have to deal with unhappy customers any time you suggest a rate hike to help cover the cost of system improvements. Meanwhile, the price tag for repairs and improvements that will eventually be unavoidable continues to grow as the infrastructure degrades.

So maybe a report, even one as ominous as the EPA's new assessment, isn't enough. Maybe it will take the substantial failure of whole communities' water systems to get the attention that's needed to break this cycle. But maybe making the stories of your own communities' struggles known, clearly demonstrating how maintaining a system on a bare-bones budget is far more costly than proactive improvements, will eventually begin to have an impact, and it's something each of you can do.

There are steps you can take to begin building the support you need to make your systems stronger and more sustainable. Education and outreach can play a big role. They've been key to the success of the Orange County Stormwater Program, profiled in this month's issue, and they can help you inform the public and get them on your side before your next big project proposal.

So, even though your resources are scant, consider what your utility can do to make your customers aware of the impact thin budgets will have on the future of their water systems, and the rates they pay. Perhaps you can take some lessons from Orange County and begin to change those attitudes and perceptions.

Enjoy this month's issue. ♦



MAKING The GRADE

Part of a series of case studies chronicling various intricate sewer installations using the AXIS® guided boring system



Subdivision sheds septics for city sewer service

The process of converting the established septic systems of several homes within an Olathe, Kan., subdivision and connecting each residence to the city sewer network presented a unique combination of challenges for installation contractor Beemer Construction. First, the varying elevations of each home made the task of installing a new gravity-flow sewer all the more difficult. Second, was the rock — a hard granite formation with random layers of shale — situated directly beneath a thin layer of topsoil. And finally, consideration for maintaining the aesthetics of the meticulous landscapes was essential.

After surveying the terrain and revisiting the installation plan, project engineers identified several places along the route where digging depths — often exceeding 45 feet (13.7 m) — necessary to achieve the minute grades required for the gravity-flow sewer line to function properly, prohibited using the open cut method exclusively. So Beemer Construction tapped EJM Pipe Services, based in Lino Lakes, Minn., for assistance in devising an alternative for efficiently installing the HDPE sewer line, ranging from 8-inch (20.3 cm) diameter on the upper end to 15-inch (38.1 cm) toward the lower side; all housed within 24-inch (61 cm) casing.

CHANGING COURSE WITH AXIS

The amended recommendation specified a combination approach, incorporating the AXIS® guided boring system in addition to trenching.

Developed by Vermeer, the AXIS system is a pit-launched trenchless installation method engineered to achieve pinpoint, on-grade accuracy while eliminating some of the difficult steps associated with other techniques. The guidance system features a laser that determines the line and grade of the bore and allows for precision throughout the process, even in the rock conditions encountered in Olathe.

PEAKS AND VALLEYS

The rolling terrain presented extraordinary challenges. Described by Lynn Miki, project foreman with EJM, as a sloping hillside with a significant incline in elevation from launch to exit pits, the AXIS system was employed to tackle several pilot bores — up to 450 feet (137.2 m) in length — at grades ranging from 3.975 percent to just less than 1 percent. One of the bores necessitated preparing a launch pit at a depth of 47 feet (14.3 m) to accommodate the upward incline of the bore en route to the exit pit positioned some 30 feet (9.1 m) deep. Considerable shoring at this depth was required to ensure the walls surrounding the pit were secured.

“Boring this deep and in these rock-laden conditions, you want to make sure you get it done right the first time,” Miki says. “It’s not easy to move a 30-foot-deep (9.1 m) breakout hole over 10 feet (3 m) and retry. Having to go back after the fact is not only tricky, but expensive. The laser incorporated



into the drill head of the AXIS system projects onto a screen that has a scope similar to a rifle. Even the slightest veer up or down or right to left can be adjusted immediately.”

After pilot bores were completed, a separate crew followed behind, using an auger boring machine with disc cutter head to upsize the bore to the diameter necessary to accommodate the 24-inch (61 cm) HDPE housing. This procedure allowed the crew to jump ahead and keep the project moving forward.

“All the pilot bores were completed on target, on grade and on line,” Miki says. “There are always concerns when drilling through rock about noise and vibration; even causing cracks and damage to foundations. But noise is minimal with the AXIS system. The residents barely knew we were there and were elated to get hooked up to the city’s sewer without having to worry about septic pumping and maintenance hassles anymore. Everything worked really well.”



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EDITOR'S CHOICE

Find stories that make a difference for your utility at MSWmag.com

By Luke Laggis

We're posting valuable new content every day at MSWmag.com. In addition to everything you see on these pages, the site features a wealth of product and industry information, as well as blogs and original features you won't find in print. The following are just a few of the items you're missing if you're not visiting the website.



Proper Storm Drain and Catch Basin Cleaning

Storm drain and catch basin cleaning are critical components to keeping local waterways clear and in many areas regulated with defined performance measures. Best management practices should be incorporated into standard operating procedures to ensure that performance objectives and safety of the work crew performing the cleaning and the general public are met.

BLOG: Britain Removes Bus-Sized Lump of Fat From Sewer

Drain cleaning operators and municipal managers all have a story to tell about out-of-the-ordinary objects recovered from pipelines and sewers, but what about removing a bus-sized lump of fat? That's exactly what a Thames Water crew removed from a sewer last week in Surrey, England. The water utility serves 14 million customers and maintains 67 miles of sewers. The 15-ton lump of food fat and wet wipes has been dubbed the "fatberg."

Choosing Proper Nozzles for High-Pressure Waterjet Cleaning

Understanding nozzles and how they work is a key step to becoming a successful drain and pipeline cleaning operator. Knowing the proper use of each nozzle will ensure that you always select the right one for each job. It's important to note that it may take up to 10 different nozzles to successfully clean in 90 percent of the situations encountered.

There should be no guessing when selecting a nozzle for cleaning operations. Nozzles are designed for specific cleaning applications. If they are not used for their intended purposes, they won't be as effective.



Louisville Water Kicks Off Pumping Station Restoration and Water Works Museum

A project to restore the interior of one of Louisville's National Historic Landmarks began this year as Louisville (Ky.) Water Company kicked off a restoration project at its original pumping station. The project will renovate and restore the interior of pumping station No. 1, which was built between 1858 and 1860 on Zorn Avenue at River Road as part of the city's original Water Works. The site also features the city's iconic water tower, also a National Historic Landmark.

Outsourcing: What Makes a Private Water Contract Work?

What ingredients go into making a successful private water operation contract? When such a contract proceeds smoothly, neither side is likely to discuss a contract in detail. When conflict arises, the contract is largely defined only by points of disagreement.

"The most important feature of contracting out water services is an open process," says David Stokes, a policy analyst with Missouri's Show-Me Institute. "The public needs to know what's happening at every stage of the process, from introducing the concept to various stages of negotiations and the division of responsibilities."

Check out all these stories at www.mswmag.com/ec/2013/September

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FOCUS: STORM

RESOURCE PROTECTION

Oakland County (Mich.) implements a variety of actions to keep stormwater pollution from impacting the Great Lakes

By *Jim Force*

When storm clouds loom over southeastern Michigan, Jim Nash pays close attention.

That's because Nash, the Oakland County Water Resources Commissioner (OCWRC), devotes much of his professional time to improving the management of stormwater in this region directly north of Detroit. His organization is engaged in several stormwater control efforts, including the \$5.1 million Red Run Inter County Drain shoal removal and bank restoration project.

Nash points out that the streams in his jurisdiction drain into Lake St. Clair and Lake Erie, and contribute to nonpoint source pollution of these Great Lakes bodies. "Lake Erie

is green with algae in the summer," he notes. "It looks like a golf course. It's very disturbing."

In addition to controlling runoff in Oakland County, Nash and his agency are actively promoting a collaborative regional approach to stormwater management in southeast Michigan, and are planning a regional "stormwater summit" this fall (see sidebar).

Oakland County Water Resources Commissioner

Formed early in the 20th century, and known previously as the Oakland County Drain Commissioner's office, the OCWRC today is responsible for water supply, wastewater treatment and disposal, and drainage systems throughout a 900-

square-mile area that is home to 1.3 million people. Under authority granted by Michigan state law and the Oakland County Board of Commissioners, the OCWRC operates the wastewater treatment plants for the communities of Novi, Walled Lake and Commerce, monitors lake levels, operates community drinking-water wells, deals with soil erosion, and manages stormwater drainage systems. The Commissioner's office employs more than 250 people and manages an annual operating budget of approximately \$250 million.

Stormwater has been a troublesome issue for the county and all of southeast Michigan for decades. The four major watersheds drain to Lake St. Clair and to Lake Erie. It is estimated that runoff from impervious

"In Michigan, we are surrounded by 20 percent of the world's fresh water supply; we must be very careful how we use that water and what we allow to be put into it. Our economic, social and environmental future depends on the protection of our water supply and recreational waters."

Jim Nash

surfaces throughout the area exceeds a trillion gallons annually, flushing over three million pounds of phosphorus and 500 million pounds of

OPPOSITE PAGE: From left, community liaison Charles Tischer, pump maintenance supervisor Doug Stover, and retention treatment supervisor John Stange of the Oakland County Water Resource Commission walk through the tunnels leading to the intermediate structure of the underground concrete basin at the George W. Kuhn Retention Treatment Basin. (Photography by David Guralnick)



The Clinton River Watershed Red Run Drain near Ryan Road in Warren.

sediment to the Great Lakes. In 2011, a particularly wet year, spring rains overwhelmed combined sewer overflow relief facilities and caused CSO backups into the basements of area residents.

Nash, who was elected to his position in 2012, is working hard to successfully complete the region's numerous stormwater management projects and to lead the public in the search for longer-term solutions, some of which will involve behavioral changes.

"We're working on the issues," he says. "We need to clean this up."

He adds: "In Michigan, we are surrounded by 20 percent of the world's freshwater supply; we must be very careful how we use that water and what we allow to be put into it. Our economic, social and environ-

mental future depends on the protection of our water supply and recreational waters."

Stormwater infrastructure

One of the major infrastructure projects designed for stormwater control in Oakland County is the George W. Kuhn (GWK) underground retention treatment basin. Built in 1974 for around \$30 million, and upgraded in 2000 for \$147 million, it remains one of the largest combined sewer overflow facilities in the world. It is 2.2 miles long and can process up to 3 million gallons a minute.

Under normal conditions, the GWK Drainage District combined sewer flows to the Detroit metropolitan wastewater treatment plant for treatment. During wet weather, how-

ever, excess storm flow can be held in the GWK facility or treated and discharged to the Red Run stormwater channel.

Treatment consists of 16 fine screens (supplied by Headworks) and four emergency screens to remove large solids and rags, and disinfection of the overflow with storage of 150,000 gallons of sodium hypochlorite. Two auxiliary generators keep operations running in the event of a power outage, and odors are controlled by a state-of-the-art flushing system. A fiber optic network allows operators to monitor and control the system from a remote location.

While the GWK retention basin is a world-class structure, it is not

the only measure Oakland County is employing to control sanitary overflows. In Farmington Hills, four communities are cooperating to build a new \$46 million, 1.5-mile transport storage tunnel which will have the capacity to retain 3.7 million gallons of sanitary sewage. More sanitary sewage is being diverted to the Pontiac wastewater treatment plant, which has excess capacity as the population there has decreased in recent years. In cooperation with neighboring Macomb County, an interceptor that collapsed in 2009, creating a sinkhole, is being repaired.

Red Run improvements

Lastly, the OCWRC has recently completed improve-



PROFILE:

Oakland County (Mich.) Water Resources Commissioner

FOUNDED:	Early 20th century to manage county drainage issues. In 2008, the name changed from Oakland County Drain Commissioner's Office to Oakland County Water Resources Commissioner's Office (OCWRC).
INFRASTRUCTURE:	Manages three wastewater treatment plants, 190 total facilities, 2,000 grinder pumps, 36 lake level control structures and is part of 50 lake improvement boards
SERVICE AREA:	900 square miles
POPULATION SERVED:	Bills 47,000 households, impacts entire county population of 1.3 million people
NUMBER OF EMPLOYEES:	Over 250
OPERATIONS BUDGET:	\$250 million (annual)
WEBSITE:	www.oakgov.com/water

A REGIONAL APPROACH

A regional approach to stormwater control is the key, Oakland County Water Resources Commissioner Jim Nash believes. "For way too long, we have addressed the issue as individual drain commissions — each operating within its own silo," he says. "We need to get away from that. If we can tackle the issue as a regional authority, we'll be much more successful."

To that end, Nash and his staff are organizing a regional stormwater management summit this fall among the counties in the metropolitan Detroit area. The goal is to develop regional collaboration and a joint approach to mitigating stormwater damage.

"We will bring together all our counties, communities and watersheds, along with state and federal agencies, to look at the stormwater problems we face and how a regional approach can help solve them," Nash says.

By working together, Nash foresees a number of benefits in addition to the environmental impact. "We'll be able to achieve better bonding efficiencies, and pay less overall," he notes. "We'll be helped in a lot of areas if we can work together."

"If we can do this [attack stormwater issues] as a regional authority, we'll do much better than we did in the past."



Pump mechanic Larry Mills operates a **Bombardier SW48HY** to squeegee debris off the floor of the intermediate structure of the underground concrete basin.

“We need to look at how we capture stormwater, how we stop it from flowing [to the Great Lakes]. I’d like to see much more response from those who are responsible for creating runoff from our roofs, our parking lots and our impermeable surfaces.”

Jim Nash

“The previous channel had issues,” Nash says, noting that it was essentially a straight-line spillway. “The new channel meanders, so the flow can be slowed down.

“We’re also working with the National Oceanic and Atmospheric Administration (NOAA) to make it more of a recreational area, with pathways, trails and fishing piers.”

Nash adds that the project also involves a large amount of invasive species removal.

“It will become more of a natural area. We feel good about what’s happening there.”

Green solutions

Despite these improvements, Nash and others realize that controlling stormwater and preventing surface water pollution in southeast Michigan will take more than expen-

sive “gray” structures. In their minds, the longer-term solutions to the problem lies with “green” approaches and cooperation from the area’s water users.

“We need to look at how we capture stormwater,” Nash says, “how we stop it from flowing [to the Great Lakes]. I’d like to see much more response from those who are responsible for creating runoff from our roofs, our parking lots and our impermeable surfaces.”

The commissioner believes a long term plan may involve charging property owners a fee for run-

ments to the Red Run and Clinton River Drains. Red Run, which carries treated combined sewage overflows to the Clinton River, has provided stormwater relief since the early 1920s, when its riverbed was widened and deepened to enable it to carry more flow. It is a 3-mile-long open drain that has become the outlet for a number of combined sewer overflows, and is often overwhelmed by high, fast flows during storms.

The improvement project consisted of repairs to approximately 28 outfalls, and slope repairs at various locations using bio-engineering techniques. Engineering design

for the project is being provided by the Army Corps of Engineers. The estimated cost of the project is over \$5 million, covered by a grant from the Army Corps of Engineers.

Nash notes that rains last spring caused some slippage of the rebuilt north bank areas between Dequindre and Ryan Roads. “We are working with the Army Corps of Engineers to return to this area and make the necessary repairs.”

The Clinton River improvements are being designed to recreate a more natural course for the waterway, and make it more amenable to recreation.



The staff at the Oakland County Water Resources Commissioner includes, front row, from left, Justin Kudla, Earl Flick, Corey Sutton, Pete Comparoni, Mike Tower, Joe Carley and Ed Parker. Back row, Paul Schramm, Bryan Krukowski, Larry Mills, Scott Janeczek, Doug Stover, Alan Wirebaugh and John Stange.



Jim Nash, Water Resources Commissioner



The Clinton River Watershed Red Run Drain loops past Ryan Road in Warren.

“The state needs to get together with the agricultural community. We’re still using a lot of phosphorus [in fertilizer] even on phosphorus-rich soil. A lot of our communities have come to realize that we’re destroying our lakes with fish kills and algae blooms.”

Jim Nash

off, and creation of swales and other measures that allow runoff to seep back into the ground. In the future, runoff could be used for graywater, he suggests.

“The Southeast Michigan Council of Governments has performed a very good analysis of all the impermeable surfaces in our area,” Nash observes. “The study also indicated that of all the infrastructure issues we face, people felt that water and protecting water quality was most important. Some 65 to 75 percent of the respondents said they’d be willing to pay a little more to assure clean water in our region.”

Nash also thinks state regulations on phosphorus and nitrogen need to be more strongly enforced. “The state needs to get together with the agricultural community. We’re still using a lot of phosphorus [in fertilizer] even on phosphorus-rich soil. A lot of our communities have come to realize that we’re destroying our lakes with fish kills and algae blooms,” he says.

He remains hopeful about the future of stormwater control. “I get out a lot and talk with people,” he says, adding that people don’t like to see algae blooms, rivers on fire and beach closings, and when they do, they support clean water efforts.

“A regional approach is best,” he says. “Big gray infrastructure projects cost a lot of money. Low impact development is the long-term answer.” ♦

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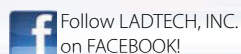
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FOCUS: STORM

WORKING ON MULTIPLE FRONTS

Low-impact development practices and public outreach enhance Orange County's stormwater management efforts

By Briana Jones



With 3.1 million residents and an annual rainfall of only about 13 inches, the Orange County (Calif.) Public Works — OC Watersheds Division understands stormwater management and public education go hand in hand when it comes to protecting local water resources.

Covering a relatively small land area of less than 1,000 square miles, the dense urban environment has a high level of imperviousness, which makes managing stormwater runoff and pollution a challenge.

Since its inception in 1990, the Orange County stormwater program has evolved considerably as data collection methods have advanced, public education needs have changed and NPDES permit requirements have strengthened.

“There are a lot of things that have changed since the beginning of the program, including expansion of the public education program, advancements in data collection, storage and analysis tools, and in particular the way land is developed or redeveloped in Orange County,” says Jenna Voss, environmental resource specialist for OC Watersheds.

While the U.S. EPA enforces the Clean Water Act requirements nationally, California has a State Water Resources Control Board and nine associated regional water quality control boards to ensure compliance.

As a municipal separate storm sewer system (MS4), Orange County must obtain and implement NPDES permits for the Santa Ana and San Diego Regional Water Quality Control Board regions. The stormwater program elements are developed

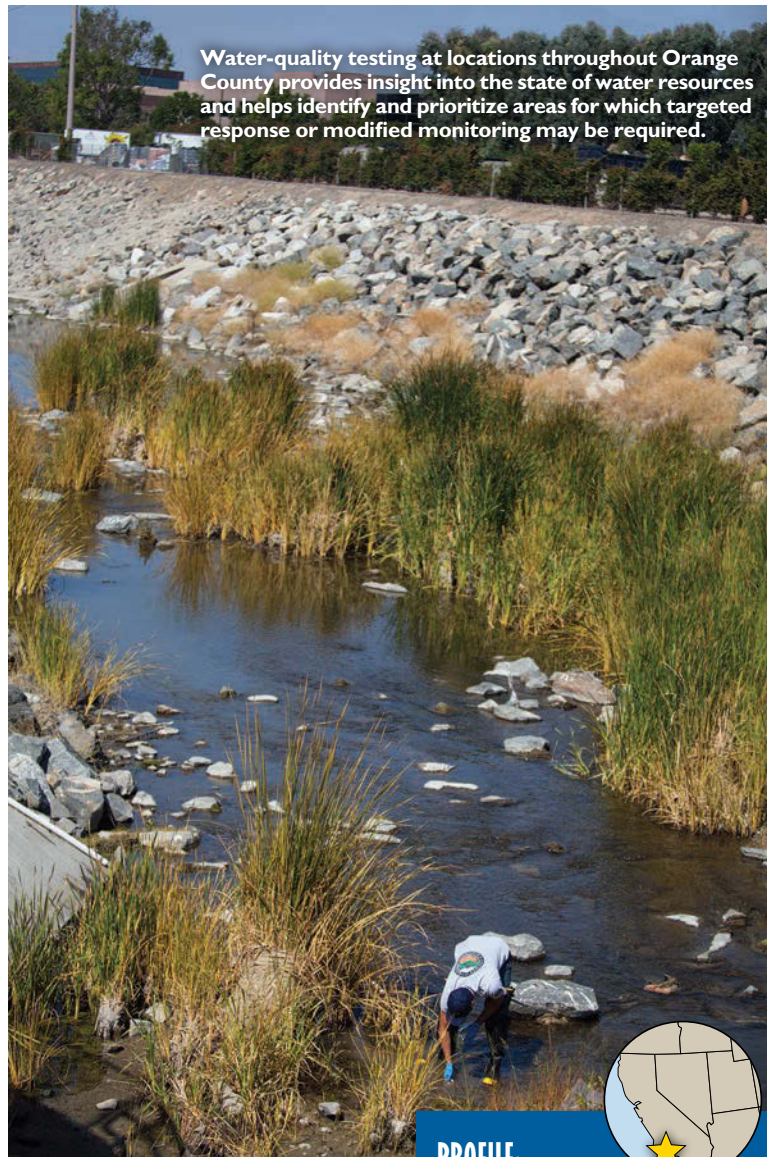
collaboratively and cooperatively through Orange County, the Orange County Flood Control District and the 34 incorporated cities. Orange County will begin working on the permit renewal process this year as the current fourth-term NPDES permits for the Santa Ana and San Diego Regions are up in May and December 2014, respectively.

Best laid plans

Orange County relies on structured and established best management practices (BMPs) to cost-effectively manage and improve the quality of stormwater runoff. The stormwater program has developed



Jenna Voss,
environmental
resource specialist



Water-quality testing at locations throughout Orange County provides insight into the state of water resources and helps identify and prioritize areas for which targeted response or modified monitoring may be required.



PROFILE:
Orange County,
Calif. Public Works,
OC Watersheds Division

POPULATION:
3.1 million

AREA SERVED:
681.4 square miles

ANNUAL RAINFALL:
13 inches (average)

ANNUAL BUDGET:
\$5.4 million

WEBSITE:
www.ocwatersheds.com



RIGHT: Justin Grewal and Joel Magsalin, environmental resource specialists, work together inside the Peter’s Canyon Wash channel to collect water and sediment samples. OPPOSITE PAGE: Grewal takes a water sample from the Central Irvine Channel, which runs parallel to Interstate 5. (Photography by Collin Chappelle)

a collection of programmatic documents to focus its program.

The Drainage Area Management Plan (DAMP) establishes the groundwork for Orange County to ensure it is in compliance with permit requirements. It is the foundation for land development and redevelopment project requirements, watershed planning, regulatory oversight of the built environment for water quality protection and educational outreach and assessment. “The DAMP is the primary policy and planning and implementation document for our stormwater program,” Voss says. “Each of the key pieces of our program has a section in this primary guidance document, including construction, municipal activities and public education.”

The Model Water Quality Management Plan (WQMP) is part of the land development and redevelopment program. It sets a process based on permit requirements that contractors must follow to ensure development projects or significant redevelopment projects address stormwater runoff and pollution. “If someone has a project of a certain size or that meets certain specifications, they have to utilize this model to put together their own project WQMP to address post-construction urban runoff and stormwater pollution,” Voss says.

Although OC Watersheds staff members assist with review of proj-

Environmental resource specialists Robert Rodarte (right photo) and Kacen Clapper (below) prepare response samples and discuss a simulated water pollution incident with students at the Junior Spill Responder booth at the 2013 Children’s Water Education Festival in Irvine, Calif.

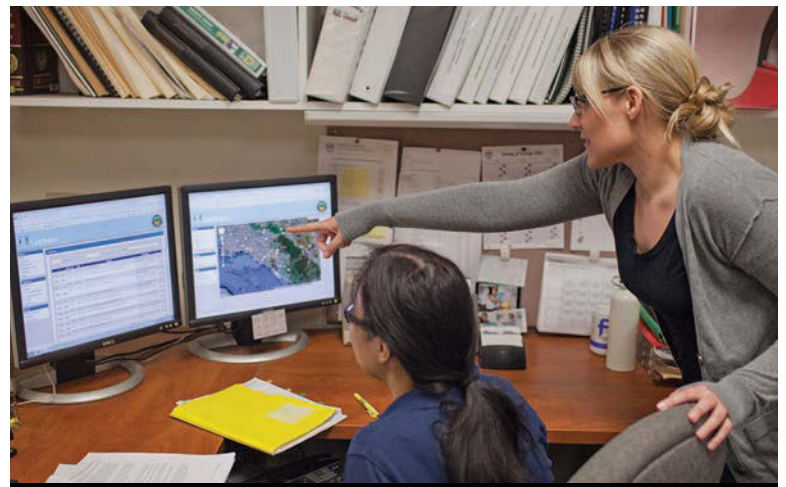
Orange County environmental resource specialists Jenna Voss, right, and Rita Abellar review data on the facility’s LabTrak software.

ect plans, each jurisdiction reviews the plans for projects within their city. “For example, if a developer comes to the county or one of the cities with a plan to expand their current facility, the jurisdiction staff will determine whether the project meets the qualifications for a significant redevelopment, which depends on requirements of the NPDES permits and includes specifications like the construction footprint, type of facility and where it is located within a watershed,” Voss says. “If the project meets the specifications of the permit, the applicant must submit a plan for how they’re going to implement BMPs to ensure that they are not causing impacts to the receiving waters.”

As NPDES permit requirements have changed in the last few years, emphasis has shifted from structural BMPs that treated the flow from the site, removed pollutants and allowed the treated flow to continue off site, to the use of low-impact development (LID) BMPs that prioritize



PHOTOS COURTESY OF ORANGE COUNTY WATER DISTRICT



MONITORING MAKES STRIDES

The Orange County (Calif.) Public Works — OC Watersheds Division stormwater management program has made great strides since it launched more than two decades ago. An effective flow monitoring and data management program complements the overarching stormwater efforts. A customized database puts data on the county’s network server giving everyone in the department access.

“Our program is unique in that we’ve developed our own database for all of our data called LabTrack,” says Jenna Voss, environmental resource specialist for OC Watersheds. “Over time we have accumulated a lot of useful data. It was built so we would have one central database to make data pulls simpler. You can select one data set from a certain day or you can look over time. It simplifies the process and it also has embedded in the tracking program several stages of quality assurance and quality control. A specific sequence of people enter and review data, which provides us much greater assurance to the accuracy.”

Developed by an independent consultant, LabTrack is a water quality data management system, says Rita Abellar, environmental resource specialist at OC Watersheds. “LabTrack is used for field and laboratory data coordination [through log sheet, chain of custody and field-sheet generation], electronic data importing, quality assurance and quality control protocols, data analysis and report generation for regulatory compliance and resource management.

“Specific functions include synchronization of field measurements with 400 to 500 external environmental laboratory data report submissions of chemistry, toxicity and biological integrity analysis data [producing in excess of 42,000 data points on a quarterly basis] and synchronization of the chemistry data with stage-discharge measurements by interfacing with a Hydstra hydrologic database [KISTERS].”

Everyone in the watershed department can use LabTrack but it’s not currently public, Voss says. “We’re looking into ways to make it accessible, but certainly people from the public couldn’t modify the data,” she says.

Marrying LabTrack and Hydstra makes the data collection and monitoring process streamlined. “LabTrack has been customized with the ability to access flow data from Hydstra so we can look at pollutant concentrations, but we can also look at it from a loading perspective based on the flow data from Hydstra,” Voss says. “That’s largely why we connect the two systems. It’s also especially important for storm season tracking.”

“Regular monitoring determines the overall integrity of the county’s water resources by assessing the biological, chemical and physical components of waterways. This has been an important tool for educating the public on activities that can lead to pollution and for responding to incidents that can have significant impacts to receiving waters.”

Jenna Voss

onsite infiltration, retention and treatment.

LID BMPs fall into four categories: infiltration, evapotranspiration and evaporation, harvest and use, and biotreatment. With the fourth-term MS4 permit requiring low-impact BMPs, new land development and redevelopment projects must include things like soil amendments, vegetated swales, cisterns, infiltration basins and permeable pavement wherever feasible.

“Developers must conduct a feasibility study to prove that infiltration is not possible on the site in order to use other BMPs,” Voss says. “The Model WQMP and accompanying technical guidance document specify how BMPs should be incorporated in site design to retain pollutants on site and reduce or eliminate the flow leaving the site. If it is feasible to use LID BMPs to retain stormwater on site, it can prevent pollution from entering the system through runoff.”

Both the DAMP and the Model WQMP ensure Orange County is meeting permit requirements for its stormwater management program. The plans also educate Orange County businesses and contractors on the importance of stormwater pollution prevention. “Education itself is a source-control BMP to address and stop pollution at the source,” Voss says.

Students become teachers

The Orange County stormwater program includes a monitoring element to establish a baseline for water quality and to collect data for comparison and trending over time. Water-quality testing at locations throughout the county provides insight into the state of water resources and to identify and prioritize areas for which targeted response or modified monitoring may be required.

“Regular monitoring determines the overall integrity of the county’s water resources by assessing the biological, chemical and physical components of waterways,” Voss says. Water quality monitoring can also indicate whether there is an active illegal discharge into the system that requires follow-up action. A 24-hour pollution response hotline makes it easy for the public to report suspected spills or pollution incidents. “This has been an important tool for educating the public on activities that can lead to pollution and for responding to incidents that can have significant impacts to receiving waters.”

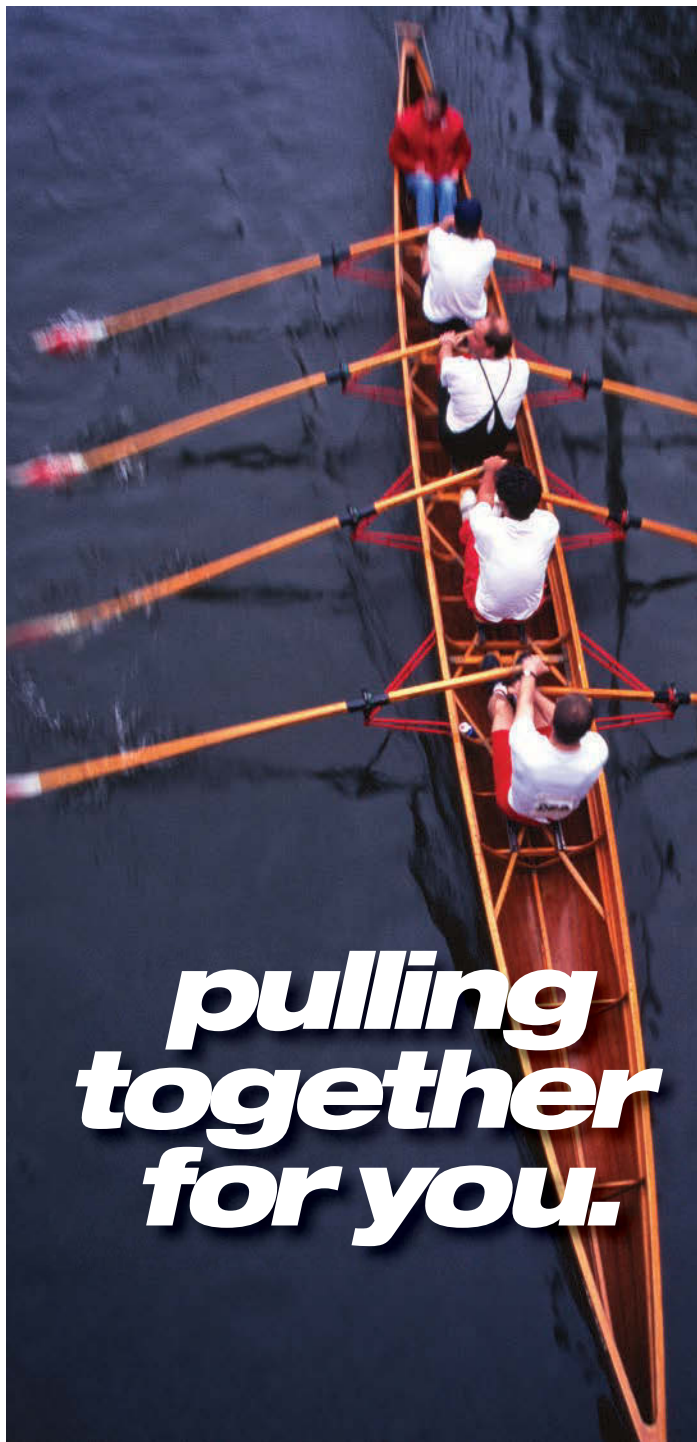
The stormwater program coordinates outreach through an extensive public education campaign called H₂OC. Developed in 2002, H₂OC includes educational materials and messaging to provide best practices for residents and businesses, and seeks to make the connection between preservation of water resources for future generations and simple day-to-day activities that residents can adopt. Outreach activities include presentations in classrooms and at local water festivals and events, creation of educational materials such as online BMP-specific brochures and development of collaborative outreach programming.

“The public education program is especially collaborative, as we have a committee comprising city representatives who review and approve all materials, messaging and outreach efforts,” Voss says. “This

collaboration defines our program and is integral to what we do to prevent stormwater pollution.”

Individual cities and districts can adapt the educational materials based on their specific needs. “As the principle permittee for H₂OC, we administer the countywide program, but as part of that, we work collaboratively with the cities to develop program materials,” Voss says.

In collaboration with the Discovery Science Center located in Santa Ana and the Municipal Water District of Orange County, H₂OC can target a greater audience to educate residents. “We support school programs or



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organizations that do school outreach because we can reach more kids that way,” Voss says. The county worked with the Discovery Science Center to put together a workbook that meets the science content standards for fifth-grade curriculum. “All 11,000 fifth-graders in that program will get the workbook this year.”

The success of the county’s stormwater management program depends on continued learning and ensuring that residents pass on the information to future generations. One way to do that is by turning the students into teachers.

“I worked on behalf of H₂OC with Chapman University in Orange to put together a program called the Watershed Education Ambassador Program,” Voss says. “Chapman wanted to connect their students to the issue of water and I wanted to expand our school outreach on a one-on-one basis, so we developed a program where the university students would become the teachers. As the coordinator of H₂OC, I trained a group of 10 Chapman students on how to give presentations about water pollution prevention, watersheds and the water cycle using an Enviroscope watershed model.” The students-turned-teachers took the information they learned into local fifth-grade classrooms last May. “They did a really good job and it was clear that both the college and elementary students learned about pollution prevention.”

Measuring success

Similar to recording water-quality data over time through monitoring, H₂OC has been able to track the success of public education program implementation for the past 10 years to document increases in stormwater awareness and willingness of residents to adopt “stormwater safe” behaviors such as sweeping a driveway instead of using a hose.

“We conduct biennial public awareness surveys that are large-scale scientific phone surveys,” Voss says. “We’ve been asking some of the same questions since the first survey in 2003 to document increases in knowledge and willingness to adopt BMPs.” A total of 1,500 registered voters are selected at random for each survey, 300 in each of the county’s five supervisorial districts.

The county pairs the data gathered from the surveys with informa-



The Orange County Watersheds Division management team includes, from left, front row: Luis Ruiz, Betty Ruano, Jenna Voss, Mary Anne Skorpanich, Christy Suppes, Jamie Habben, Rita Abellar and Mai Au. Second row: Kacen Clapper, Grant Sharp, Bryan Pastor, Jennifer Mitchell, Jim Swaneck, Jennifer Shook, Andrea Toscano, Ann Mesa and Suzan Given. Third row: Richard Boon, Beatrice Musacchia, Stuart Goong and Len Narel.

tion from other regular analyses. “The surveys give us an indication of knowledge and behavior,” Voss says. “Over time we’ve seen incremental but statistically significant increases in knowledge and changes in behavior. There is year-to-year variation, but it has been encouraging because it seems like there’s an overall increase in knowledge. We’ve noticed that the changes in behavior are really long term.”

Smaller focused phone surveys offer an opportunity for Orange County to pinpoint specific groups or targeted behaviors on which to focus its outreach efforts. “The goal is to see if there is a specific group of people who would be perfect to outreach to,” Voss says. “It helps us identify our target audiences. We want to be able to see on a more localized level that change is taking place.”

One of the targeted behaviors the county is focusing on based on a smaller survey is overwatering. “Several of those participants have said they were willing to provide us more information about their watering habits over a longer period,” Voss says. “We want to be able to track them individually to see changes in behavior.”

Structurally sound

While educating the public on stormwater pollution prevention is vital, managing stormwater runoff and implementing infrastructure for new land development and redevelopment is equally important—even with just 13 inches of annual rainfall.

And it’s evident from recent statistics that people are embracing new low-impact development systems. From 2011 to 2012, 9,500 acres of land development projects implemented low-impact BMPs throughout the county.

A housing development along the Santa Ana River in Orange County uses a large vegetated swale to intercept runoff from adjacent streets for infiltration. By incorporating practices such as swales, developments like this lessen the impacts of impervious area added through new development and significant redevelopment projects as defined by the Model WQMP.

Another example of stormwater management through the use of low-impact development is located in Mission Viejo. A vegetated swale engineered to simulate a dry creek bed the majority of the year accepts runoff during the wet season from

the parking lot adjacent to the city’s Norman P. Murray Community Center. Rock and plant features in the swale slow water runoff and encourage infiltration on site, thereby treating parking lot runoff and preventing pollution from reaching nearby Oso Creek during small storm events.

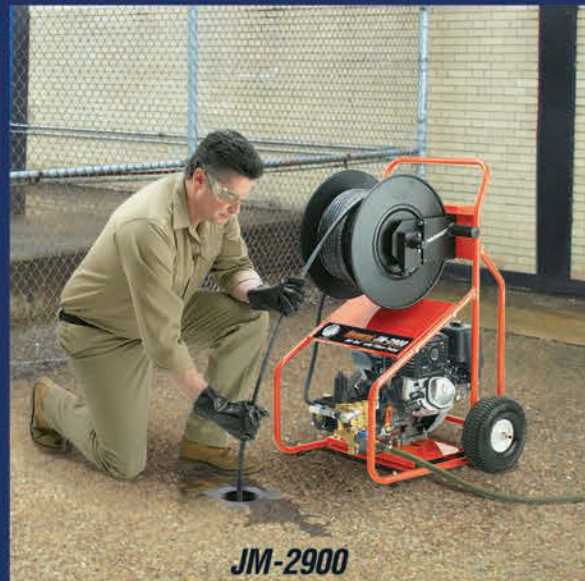
The county’s overall stormwater management program has matured since its inception, and with a team of 30, the OC Watersheds department has been very successful in achieving its goals.

“We divide and conquer,” Voss says. “The only way we can really affect change overall is to marry both the large-scale, structural BMPs or watershed management projects with education and individual changes in behavior.” ♦

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Similar to the HX-101, this option uses a replaceable single OC1H 1/4" NPT carbide nozzle at 0°. This option includes a 60" lance which gives extra reach for digging deep, focused holes. The included guard and collar system help protect the nozzle. The connecting point for this lance is 1/2" NPT male.



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THE ABCs OF CPP

Concrete pressure pipe has a long history, and continued refinements in production and installation have kept it a strong option for underground infrastructure

By Rick Deremiah, P.E.

Concrete pressure pipe has been a go-to material for water and wastewater projects for almost 90 years.

While it has one of the longest histories of any material, concrete pressure pipe (CPP) also claims one of the lowest rates of failure. By combining the structural properties of steel and concrete, CPP is highly corrosion resistant, has superior strength and does not require special bedding and backfill procedures. In addition, over the years the CPP industry has continued to make its products even more durable and refine its installation procedures to ensure the pipe stands up to internal and external pressures as well as more corrosive soils.

Pressure Pipe 101

The category of concrete pres-

sure pipe comprises two types of prestressed concrete cylinder pipe (PCCP) — L-301 and E-301 — as well as bar-wrapped concrete cylinder pipe, B-303.

PCCP starts with a concrete-lined steel cylinder (L-301 pipe) or a steel cylinder embedded in a concrete core cylinder (E-301 pipe). The structural core is helically wrapped with high-tensile-strength steel wire then coated with a layer of cement mortar to electrochemically protect the pipe against corrosion. The con-

struction combines the compressive strength of concrete with the high tensile strength of steel to form a robust structure suitable for high performance and a long life across

a wide range of loading conditions. The prestressing wire wrap places the steel cylinder or concrete core in a state of circumferential compression, allowing the pipe to withstand internal hydrostatic pressure and external loads.

L-301 pipe is available in diameters from 16 to 48 inches and laying lengths from 16 to 32 feet. It's suitable for water distribution and transmission lines, wastewater lines, treatment plant process lines and industrial process piping. E-301



Prestressed concrete embedded cylinder pipe combines the compressive strength of concrete with the high tensile strength of steel.

You can expect concrete pressure pipe to provide reliable service for decades. Some types of concrete pressure pipe have been in service for almost 90 years.

comes in 54- to 144-inch diameters and laying lengths from 12 to 24 feet. It's most commonly used for water distribution and transmission lines, wastewater lines, treatment plant process lines, industrial process piping and power plant cooling water systems.

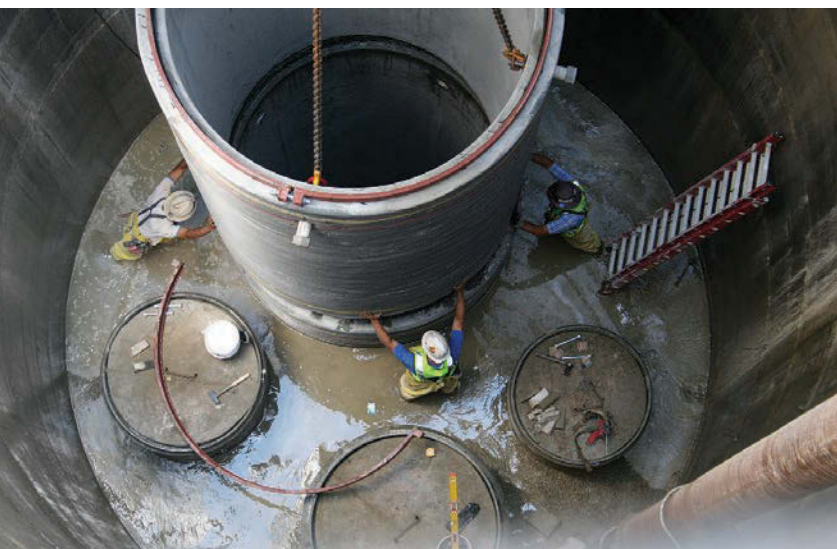
Bar-wrapped concrete cylinder pipe consists of a welded steel cylinder that is lined with mortar or concrete, helically wrapped with steel bar and then coated with a layer of mortar. This process combines the best of both materials — steel's strength and concrete's corrosion resistance and durability — into one strong, reliable pipe able to withstand significant internal water pressure as well as external loads. Bar-wrapped pipe's design also allows for easy modifications in the field, such as adding a manhole outlet and performing simple repairs. B-303, often specified for water transmission mains, distribution feeder mains, treatment plants, intake and discharge lines and plant pip-

ing, is available in diameters from 10 to 72 inches and lengths from 20 to 35 feet.

Long service life

You can expect concrete pressure pipe to provide reliable service for decades. Some types of concrete pressure pipe have been in service for almost 90 years. In fact, the recent technical paper "Numbers Don't Lie: PCCP Performance and Deterioration Based on a Statistical Review of a Decade of Condition Assessment Data," reported on the electromagnetic and acoustic inspections of 118,808 pipe sections (about 2.1 million feet). In that inspected group, only 3.9 percent had electromagnetic signatures consistent with prestressing wire break damage. Alternatively, it was stated that 96.1 percent of the pipe sections did not have any damage and could be considered in "like new" condition.

Once installed, concrete pressure pipe requires little maintenance



PHOTOS COURTESY OF HANSON PRESSURE PIPE

For the Harbor Siphons project in Milwaukee, crews installed seven diameters of L-301 and E-301 concrete pressure pipe in a vertical shaft 300 feet deep into the harbor, under the waterway, and then vertically up into the water reclamation facility.



At the City of Cincinnati's Richard Miller Water Treatment Plant, more than 600 feet of 78-inch-diameter E-301 PCCP was used to reroute twin lines from the plant's GAC treatment building to a new UV facility and then to existing clear well storage.

tion, an essential feature since the pipes were inaccessible once the installation process was completed. Along with the testable joints, PCCP was an ideal material for this application because of its ability to withstand the rigors of the installation and the resulting tunnel loads. ♦

About the Author

Rick Deremiah, P.E., is Technical Resources Engineering Manager for Hanson Pressure Pipe.

over its lifetime. Longevity does rely on proper installation — contractors should be familiar with and trained on CPP and work should be regularly inspected. Most important, installers should follow manufacturer's recommendations for handling and storage, installation, bedding placement and joint grouting. Care should be taken to avoid damage to the pipe's mortar coating before and during installation, including conducting a pre-installation inspection of the pipe and examining the trench for rocks and debris. After installation, the line should be marked and monitored, particularly if construction or directional drilling takes place nearby.


The pipe manufacturer is your best resource for ensuring proper installation and operation.

CPP at work in Milwaukee

Concrete pressure pipe is in service around the country, but the Harbor Siphons project in Milwaukee is a particularly unique display of the product's capabilities. As part of the Milwaukee Metropolitan Sewerage District's Overflow Reduction Plan, the Harbor Siphons project expanded the capacity of the district's interceptor system to deliver sewage flows equal to the capacity of the North Wastewater Treatment Plant. Harbor Siphons brings all sanitary sewage from the sanitary system associated with the Jones Island Water Reclamation Facility through the new PCCP under a siphon arrangement across the harbor via a "deep tunnel" elevation. The increase in capacity by gravity/pressure to the plant reduces sewer overflows and residential backups.

To reach the water reclamation facility, which is located on a peninsula, crews installed 96-inch pre-stressed concrete cylinder pipe vertically 300 feet deep into the harbor, under the harbor and then vertically into the plant. The shafts and tunnels hold both L-301 and E-301 concrete pressure pipe in seven diameters ranging from 42 to 96 inches. The project required multiple types of pipe, large quantities of custom-designed fittings, mechanically restrained testable joints and specially designed lifting lugs.

Installing the pipes down into the vertical shafts called for tremendous coordination and preplanning; Hanson's dual rubber o-ring testable joints allowed each joint to be air tested upon installa-

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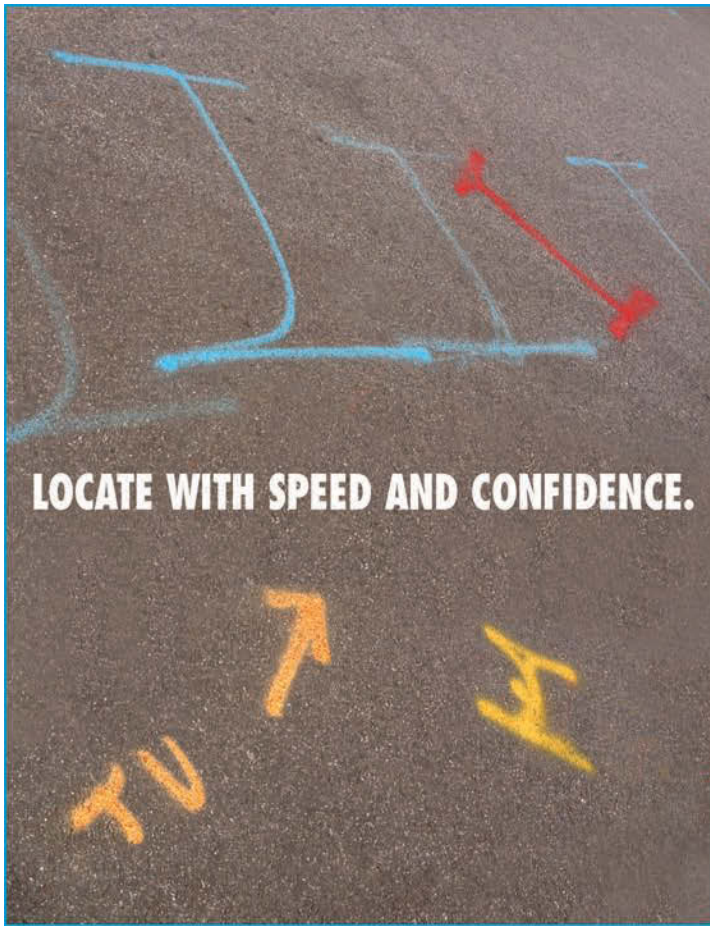
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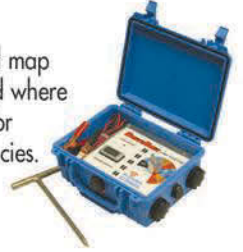
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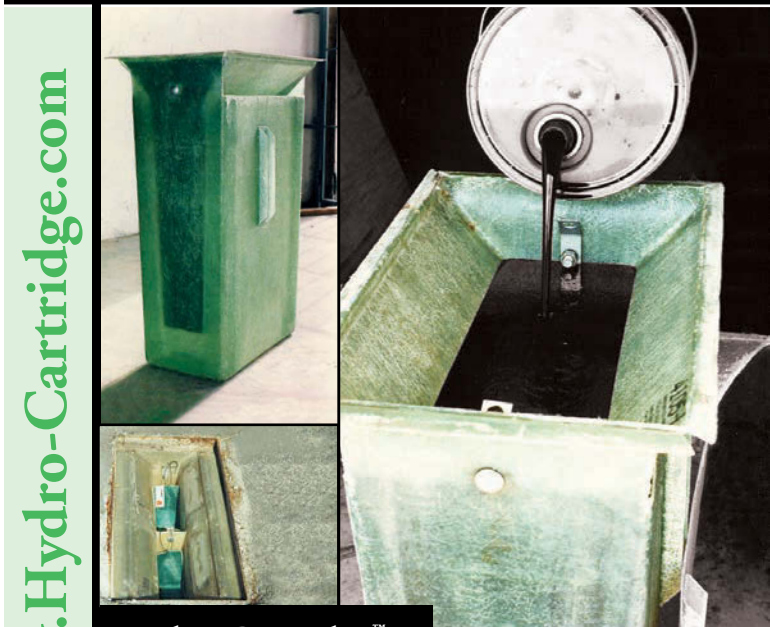
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A large, black and white portrait of Don Bennett, a middle-aged man with short, dark hair, looking directly at the camera with a serious expression. He is wearing a light-colored, high-visibility work jacket over a dark shirt. The background is slightly blurred, showing what appears to be the interior of a vehicle or a piece of machinery.

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SAFE AND POWERFUL

Yellow-tipped hydroexcavation nozzle gives Expo visitors a look at latest technology

By Ed Wodalski

This year's Pumper & Cleaner Environmental Expo was a learning experience as well as a sales opportunity for StoneAge, which introduced visitors to its new line of hydroexcavation jetting heads.

"We have big visions for our hydroexcavation tools," says Frank Ligori, dealer manager for StoneAge. "We researched and did our homework on our single- and triple-head nozzles and are introducing them today at the show. So far the response has been very positive."

The **Hydro-X** head is available in three models (HX-101, HX-103S, HX-200) for precise and accurate soil removal. Each tool delivers up to 5,000 psi, 12 gpm flows and is jetted to match pump pressure and flow.

"They have polished throats to get the water stream to compress better," he says. "We also have carbide tungsten tips inside with flow straighteners for a straighter, longer stream — basically a harder-hitting stream. Yet, while doing all that, we kept the nozzle at a reasonable weight so your arms and shoulders don't get as tired."



PHOTO BY ED WODALSKI

Frank Ligori, right, dealer manager for StoneAge, explains the performance and safety features of the new Hydro-X jetting head.

Ligori says the show visitors he spoke with use hydroexcavation primarily for digging deep wells, potholing and for cutting shallow and deep trenches.

"There are different types of hydroexcavation, everything from rotation to fixed, from angles to straights and different degrees. There are many applications," he says.

Designed to direct pump power in one direction for maximum digging, both the HX-101 single-head and HX-200 Hydro-X lance assembly have a replaceable single OCIH 1/4 NPT carbide nozzle at 0 degrees. The HX-103S triple straight-head assembly utilizes three AP2 Attack Tips (1/8-inch NPT). The head's online pattern enables operators to jet with a wider spray pattern for faster trenching.

All tools have a 1/2-inch NPT inlet connection for attachment to the operating wand.

One eye-catching feature of the hydroexcavation nozzle is its yellow urethane head, which helps guard against damage to buried cables and lines, as well as providing added operator safety.

"The yellow head is an indicator to see the end of the lance when you're [hydroexcavating] 10 or 15 feet down," Ligori says. "Yellow is the color we picked just because of easy visibility." The head is replaced by removing three bolts.

In talking to what he described as serious buyers, Ligori says he stayed busy at the show. "It's tough for us to gauge because we depend on sales through our dealers, but the people who attended the show were engaged." 866/795-1586; www.stoneagetools.com. ♦

"We have big visions for our hydroexcavation tools. We researched and did our homework on our single- and triple-head nozzles and are introducing them today at the show. So far the response has been very positive."

Frank Ligori



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BALANCING ACT

Faced with unforgiving terrain and wildly fluctuating demand for service, Lake Arrowhead CSD works hard to keep its system on an even keel

By Peter Kenter

California's Lake Arrowhead Community Services District is located in the San Bernardino Mountains, 90 miles east of Los Angeles. The resort area is the picture of tranquility on the surface, but its water and wastewater infrastructure requires a constant effort to maintain balance, the biggest challenge facing the system.

The topography of the area made it a perfect site for the construction of a dam and the creation of Lake Arrowhead, which sits optimally at 5,270 feet above sea level and provides the district with water. That same topography, however, has presented a challenge for the district's sewer system, which operates 20 lift stations to cover a topography ranging from 4,000 to 6,000 feet above sea level in an area covering only 58 square miles. About 40 percent of the district's service area slopes at greater than 30 percent grade.

The ebb and flow of tourists and seasonal residents also results in wide

fluctuations in demand on the system.

Tim McIntire has lived in the area for 50 years and worked for the district for more than 28. He's the mechanical maintenance supervisor, with responsibility for the equipment at the system's two water treatment and two wastewater treatment plants, lift stations and pumping stations. Assisting him is Doug Blackburn, responsible for electrical instrumentation maintenance and Alan Clanin, equipment mechanic.

"Those are our primary duties," says McIntire. "But there are only three of us, so when it comes time to pull a pump, we all pitch in."

Water drawn from artificial lake

The area has a colorful history (see sidebar), but the district is a fairly recent creation. It was formed in 1978 to purchase a privately owned water system serving the community of Arrowhead Woods, which surrounds Lake Arrowhead and also Deer Lodge Park. Water is drawn pri-

marily from Lake Arrowhead through a system that includes 18 water storage reservoirs, nine pressure tanks and 22 water pumping stations. The pipes and components in the water distribution system are in good shape, says McIntire, with very few leaks or breakages reported. "It's just the occasional pump issue, mostly on the electrical side," he says.

The district assumed control of wastewater services from San Bernardino County in 1983. This service area is slightly larger than its water coverage, including the communities of Twin Peaks, Rimforest, Skyforest, Crest Park, Blue Jay, Cedar Glen and Agua Fria.

System sewer pipes are made of a variety of materials ranging from asbestos concrete to concrete, steel and PVC. The pipes range in diameter from four to 42 inches.

"The sewer lines aren't in quite as good overall shape as the water pipes," says McIntire. "We have some inflow and infiltration [I&I] issues in the oldest sections."

The water system works hardest during the summer when the population swells from as few as 12,000 to as many as 30,000 people during summer weekends.

Seasonal population challenges operators

"Our water side operates at its peak in summer while our wastewater system is just cruising along," says McIntire.



PROFILE:
Lake Arrowhead
(Calif.) Community
Services District

YEAR UTILITY ESTABLISHED:
1978

CUSTOMERS SERVED:
7,800 water connections
and 11,000 wastewater
connections

AREA SERVED:
15 square miles

DEPARTMENT STAFF:
50

INFRASTRUCTURE:
209 miles of sewer pipe,
250 miles of water mains

**ANNUAL DEPARTMENT
OPERATING BUDGET:**
Sewage and wastewater: \$5.7
million; water: \$4.4 million

ASSOCIATIONS:
American Water Works
Association, California Water
Environment Association

WEBSITE:
www.lakearrowheadcsd.com

"Water rates had to rise significantly to cover our fixed costs. It's the catch-22 of water conservation, but we're finally reaching the point where water rates and costs are starting to come into balance."

Tim McIntire

“By applying these programs, we’ve brought the I&I down substantially. At the same time we’ve upsized our wastewater treatment plant to handle more inflow from winter precipitation. We still see some big numbers that go beyond our limit to treat, but we’re continuing to work to bring those numbers down.”

Tim McIntire



LACSD Mechanical Supervisor Tim McIntire remotely checks the status of the district’s 21 wastewater pumping stations before heading into the field. (Photography by Collin Chappelle)

McIntire. “In winter, we don’t provide irrigation to residents and with less than half the population living here, the demand plummets and we get low water flow. However, with 97 percent of precipitation falling between November and April, we’re hit hard with I&I from heavy rains and snowmelt. Going back and forth, it can drive us crazy.”

In 2003, the district embarked on an ambitious program to decrease its draw on the lake by half. Those initiatives include: improvements in water treatment plant efficiency, water conservation, development of groundwater resources and the use of supplemental water from the San Bernardino Valley Municipal Water District under the State Water Project.

In 2006, the State Water Resources Control Board issued an order that limited the district’s water rights to withdrawals up to 1,566 acre-feet per calendar year, commencing in 2008. Those limits would be further reduced any time the lake’s surface fell below 5,100 feet above sea level.

“We’re engaged in an aggressive water conservation effort, looking at every kind of usage,” says McIntire. “One big problem was that people were really overusing irrigation,

watering their properties even when they weren’t living here.”

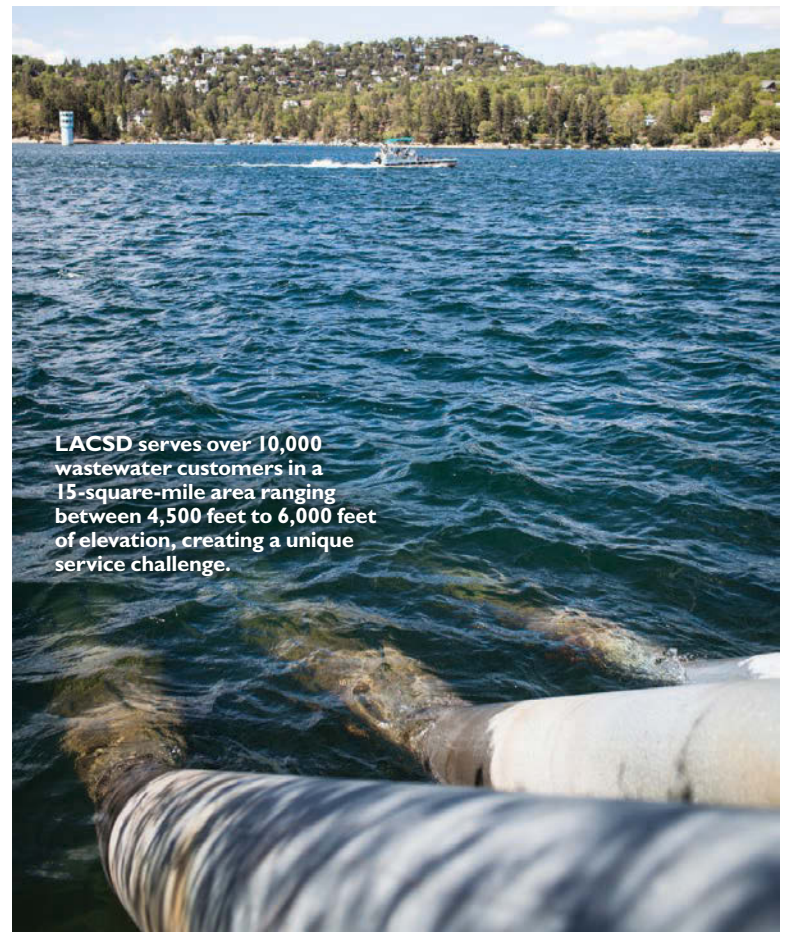
Irrigation is now only permitted on Monday, Wednesday and Friday during evenings and nights and prohibited from mid-October through April. Residents who overuse water are subjected to an efficiency audit and limitations have been put in place regarding landscape design. Treated wastewater is also used as graywater for local irrigation at the resort’s country club.

Balancing conservation and revenue

However, while the efforts have succeeded in reducing water usage, the district faced an equal shortfall in water revenue.

“Water rates had to rise significantly to cover our fixed costs,” says McIntire. “It’s the catch-22 of water conservation, but we’re finally reaching the point where water rates and costs are starting to come into balance.”

Reduction in water use has also reduced some of the strains on the wastewater system. However, the district uses other tools in its tool kit, first corralling I&I in traditional fashion by inspecting, maintaining,



LACSD serves over 10,000 wastewater customers in a 15-square-mile area ranging between 4,500 feet to 6,000 feet of elevation, creating a unique service challenge.

LAKE ARROWHEAD STARTED WITH A GAMBLE

The Lake Arrowhead Community Services District (LACSD) traces its origins to The Arrowhead Reservoir Company, established in 1891 to build a dam to supply irrigation water to the San Bernardino Valley. Its president was James Morris Gamble of Procter and Gamble fame.

Construction of a dam began in 1893. However, the prospects of producing hydroelectric power saw the property transferred to the Arrowhead Reservoir and Power Company in 1905.

The dam was completed in 1921, and measured 200 feet high, 720 feet long and 1,100 feet thick at the base. It featured a steel-reinforced concrete core wall, embedded 20 feet in bedrock. However, the company ceased operations that same year, when a court ruled in favor of ranchers on the north side of the mountain, preventing stored water from being delivered to customers outside of the area’s natural watershed.

The property was purchased later that year by the Arrowhead Lake Company, a corporation formed to develop the lake into a resort. By 1923 the company had built three hotels, a golf course, pavilion, outdoor movie theatre, restaurant and beach. It also established the Arrowhead Utility Company, which served 103 domestic water customers and built the area’s first sewer system.

“These systems were dug by hand, when there was just one small road into the community and one out,” says Tim McIntire, mechanical maintenance supervisor of the LACSD. “We’ve made significant upgrades since then, but some of our pumping stations are still located on the same sites as the originals.”

repairing and replacing sewer pipes. The district owns and operates a SuperVision closed circuit crawler camera by Envirosight, and a Vac-tor jetter and rodding machine.

Work on sewer pipes has included anything from relining to repair and replacement.

While the district once operated its own construction unit, contracting out larger construction jobs is more cost-effective, allowing maintenance crews to devote more attention to smaller repairs and routine care.

“By applying these programs, we’ve brought the I&I down substantially,” says McIntire. “At the same time we’ve upsized our wastewater treatment plant to handle more inflow from winter precipitation. We still see some big numbers that go beyond our limit to treat, but we’re continuing to work to bring those numbers down.”

Lift stations provide push

While the sewer system relies as much as possible on gravity, it’s the 20 lift stations that provide the extra push to move sewage to the system’s two wastewater treatment plants.

“The lift stations are designed to



Tim McIntire, center, leads a tight-knit crew including Doug Blackburn, left, electrical instrumentation technician, and Alan Clanin, equipment mechanic.

provide enough lift to let gravity take over for as long a distance as possible,” says McIntire. “The largest lift station, Grass Valley, manages an elevation of 200 feet, while the smaller stations range from 30 to 60 feet.”

Many of the larger lift stations operate under capacity, allowing for

population growth in the communities served. Grass Valley possesses a capacity to run at 4,500 gpm, but most often runs 24 hours a day at 600 gpm. The second biggest station, with a capacity of 1,500 gpm, runs at 450 gpm for about five hours per day.

The smaller lift stations operate on air injection, emptying tanks of 100 gallons every time an electronic valve indicates the tank is full.

Daily personal inspections

The system’s supervisory control and data acquisition (SCADA) sys-



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Alan Clanin uses an Automation Direct HMI that runs a SCADApack controller (Schneider Electric) to check the status of one of the 21 wastewater pumping stations.

tem provides electronic monitoring, but the lift stations are personally inspected each day.



The Cedar Glen Water Treatment Plant doubles as the small community's offices and general storage facility.

"It may be a short distance across the lake, but it's a 5- or 6-mile drive around the perimeter, so it's time consuming," says McIntire. "You can bet that when we get a report on a problem, the lift station in question is located on the wrong side of the lake."

The biggest threat to the main lift stations is "ragging" — when

hotel guests flush wet wipes that get stuck inside the pumps.

"With the hotel in full operation, it's a little city," says McIntire. "The only solution is to pull the pumps and remove the fabric manually."

The smaller air-injection lift stations require less maintenance, with staff attention limited largely to changing oil in compressors and cleaning electrodes on the level sensors.

The system also includes a series of individual homeowner lift stations in the tiny community of Rimforest.

"About 15 years ago we had a landslide that took out several houses and a section of our sewer system," recalls McIntire. "We lost gravity flow and had to decide whether to build a bridge and replace the line. Instead, we installed 10 personal lift stations — submersible pumps with 25 gpm capability. Even if another slide takes out more of the homes on the edge, the lift stations for the remaining homes will still be functional."

As the district continues to reduce its reliance on Lake Arrowhead, and moves to greater reliance on groundwater and outside water sources, the system will necessarily

become more complex. McIntire is in the process of hiring two additional maintenance staff members to handle that transition.

"We'll rely less and less on the lake for water," says McIntire. "But we'll find better ways to maintain the water and wastewater system. It's all about balance." ♦

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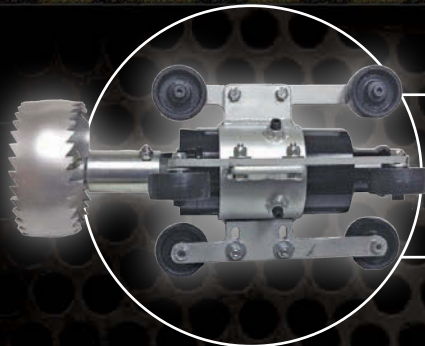
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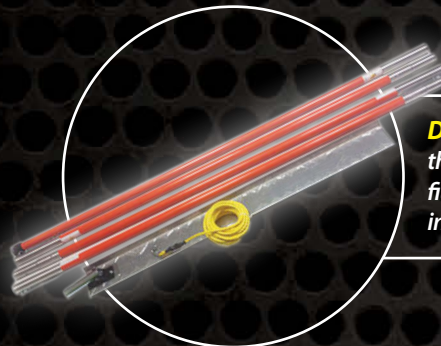
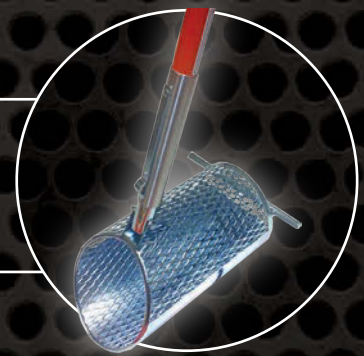
SOUTHLAND TOOL MFG. INC.

Building Innovative Tools for Municipalities



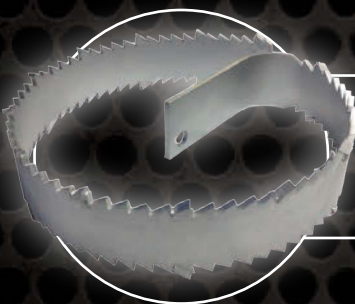
Puma Hydraulic Root Cutter Motor. This motor provides up to 215 lbs. of torque. Able to be used in 4" lines and up. Here it is pictured with adjustable wheeled skids from 8" to 10" and a concave saw in front. This motor is available in kits that can be adjusted to fit your size requirements.

Debris Grit Catcher Baskets. These are almost a must on every jetter. Don't let the debris flow down the line to cause a problem elsewhere. These Grit Catchers not only catch debris but also the fine sand and grit since they have covered bottom and half-moon back. Here is seen using our fiberglass pole system in any length you need.



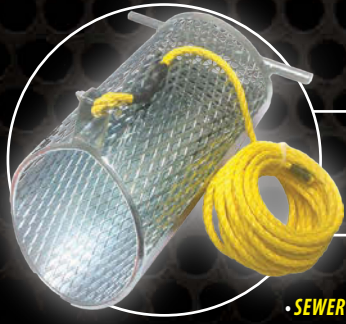
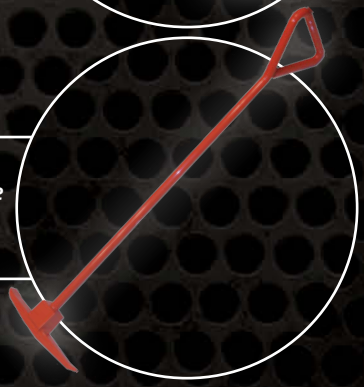
Drop Manhole Bridge Kit. The kit include the Drop Bridge that bridges the gap for your nozzle or camera over the drop hole. It comes with 24' of fiberglass poles that connect up easily. The bridge has a 25' rope to lift in into the pipe. Comes in widths of 5" or 6" and is 48" long.

Quick-Mount Fiberglass Pole Carriers. These carriers are a great way to store fiberglass poles on your truck. Can be used with poles, hooks and similar round handled tools. Made of cast aluminum and powder coated. The rubber uv protected flex-draw latches firmly holds the pole in place.



Carbide Tipped Root Saws. These saws have a carbide tip every 5th tooth on the front and every 10th on the back. Used for cutting out collapsed liners and super hard roots and grease. Available in any sizes from 4" to 20", concave or flat.

Pook. This patented design is the toughest on the market. One side is a pick to chip away asphalt and one side is a hook to flip open the manhole cover. Hence the name "POOK" a pick and a hook. Strong 3/4" handle. The whole unit is heat treated and powder coated safety orange.



Debris Basket with Rope. The baskets are lowered into place with a 25' rope. Eliminated the need for the poles and is easily retrieved at a 45° angle to avoid any spillage when lifted out of the invert.

Southland tools also carries a large inventory of other items including:
• SEWER RODS • DEBRIS BASKETS • GRABBERS • HANDY CLAMS • CORKSCREWS • AUGERS • NOZZLE EXTENSIONS • HYDRO CUTTERS • SPOONS • DEEP-VAC HOLDERS & more!

NEW TECHNOLOGY SLATED FOR WEFTEC 2013

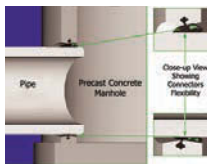
By Craig Mandli

WEFTEC, the Water Environment Federation's annual technical exhibition and conference, annually offers water-quality education and training to water and wastewater professionals from around the world. This year's event, slated for Oct. 5-9 in Chicago, promises to show off some of the finest new products on the market for municipal sewer and water professionals. Below is a smattering of some of the newest products that will be on display at this year's show.

WEFTEC PRODUCT PREVIEW

A-LOK Products

The design of the **A-LOK Premium** flexible rubber pipe-to-manhole connector ensures sealing pressure under differential loading or pipe deflection. Inside the connector a blend of fibers, binders, polymers and congealing agents create a dynamic fluid that maintains the watertight connection, preventing infiltration and exfiltration in wastewater and stormwater systems while meeting ASTM C-923 and F-2510. Installation is faster and easier since no grouting is required. Just bevel, lube, install and backfill. **800/822-2565; www.a-lok.com.**



AbTech Industries

The **Smart Sponge** from **AbTech Industries** features a molecular structure that's based on polymer technologies that are chemically selective to hydrocarbons. It fully encapsulates recovered oil, resulting in a more effective response that prevents absorbed oil from leaching. It can remove up to three times its own weight in hydrocarbons, and transforms them into a stable solid. It removes or reduces sheen, doesn't require modification to existing structures and meets or exceeds Stormwater Best Management Practices. **480/874-4000; www.abtechindustries.com.**



Adalet

Division 1 / Zone 1 **explosion-proof enclosures** from **Adalet** are constructed from stainless steel 316L. Designed for use in highly corrosive areas, they provide ideal construction material for offshore, petrochem or volatile industrial areas where environmental conditions require additional corrosion protection. Features include a watertight gasket and stainless steel cover bolts,



stainless steel hinge kit, mounting panel, removable lifting eye bolts, cover alignment device, cast-on mounting lugs and internal/external ground screws. A flat plate cover allows for additional working area for viewing windows and operating devices such as pushbuttons, selector switches and pilot lights. **216/267-9000; www.adalet.com**

ADS Environmental Services

The **IVP 250** from **Hydra-Stop, a Division of ADS Environmental Services**, is a 16-inch permanent, insertable gate valve offering increased strength, improved performance, and simplified installation and operation. It features a 2-inch-diameter stainless steel valve stem, interchangeable valve gate, thrust washers and double O-ring seal. It is rated for 250 psi working pressure and up to 375 psi test pressure. **800/538-7867; www.hydra-stop.com.**



Agru America

Sure Grip concrete protective liner from **Agru America** provides an economical and long-term corrosion prevention solution for the construction and rehabilitation of concrete containment and transmission systems. It features high backpressure and pullout resistance, and is low maintenance. It eliminates exfiltration and infiltration, protecting the environment. It also has a high chemical and mechanical resistance. **800/373-2478; www.agruamerica.com.**



Allied Moulded Products

POLYLIN polycarbonate enclosures from **Allied Moulded Products** come standard with multi-mounting capability, including an out-of-the-box mounting flange or adjustable mounting

feet, which adapt to various mounting configurations. They feature metallic or nonmetallic latches and molded-in latch keepers and mounting bosses, and a tongue-and-groove seal joint between cover and base. A clear polycarbonate cover is also available for instrumentation applications. Optional adjustable corner panel mounts for supporting an aluminum hinge front panel within the molded-in corner slots provide either flush positioning with the box top or adjustability down in the box 1.5 inches deep. **419/636-4217; www.alliedmoulded.com.**



AP/M Permaform/ConShield Technologies

The **CentriPipe** pipe lining system from **AP/M Permaform/ConShield Technologies** provides a cost-effective, no-dig solution for structural lining of culverts using a bi-directional spincaster to centrifugally compact a precision liner at the best design thickness for the size, shape and conditions of deteriorated pipe. It inhibits rust and is highly resistant to abrasion. It waterproofs, seals, structurally reinforces and protects round, arched and elliptical pipe. It is professionally applied through a global network of certified applicators. **800/662-6465; www.centripipe.com.**



Applied Felts

Felt **CIPP liners** from **Applied Felts** utilize a single-pass extruded process for coating to ensure that no pinholes are present. Additional tests are conducted to monitor coating uniformity, mass and weight distribution. Each roll is sampled and destructively tested, including density at various pressures, tensile strength and coating distribution. During production, the liners are continually checked to ensure they satisfy specifications. Finally, a sample is cut from each finished liner for testing across more criteria to make sure the circumference, density, length, coating integrity and weld strengths meet requirements. **276/656-1904; www.appliedfelts.com.**



Asahi/America Inc.

Asahi/America Inc.'s Chem Proline piping systems have been certified by NSF to NSF/ANSI Standard 61-G. Made from PE resin, pipe and fittings possess the greatest resistance to slow crack growth. It is a lower cost alternative to metal, fiberglass-reinforced plastic pipe and lined steel pipe. A complete system includes pipe, fittings and valves. Available in pipe sizes up to 12 inches, it is ideally suited for use in water treatment and chemical process applications using a variety of chemicals, including sodium hydroxide, sodium hypochlorite, caustic soda and low concentration acids. **800/343-3618; www.asahi-america.com.**



Avanti International

AV-100 from **Avanti International** is an ultra-low viscosity chemically reactive gel available as either granules or liquid. Having the same viscos-

ity as water, it can permeate anywhere water can travel and cures within a controllable time frame anywhere from 5 seconds to 10 hours. Once it cures, it creates an effective, long-lasting water barrier while providing superb soil stabilization. It is used to stop water infiltration in manholes, sanitary and storm sewer mainlines, joints, laterals, tunnels, mines and various other geotechnical applications and underground structures by stabilizing external substrate. **800/877-2570; www.avantigrout.com.**



Badger Meter

E-Series ultrasonic meters from **Badger Meter** are constructed from lead-free stainless steel and engineered polymer. They capture ultra-low flow measurements and offer a high level of metering accuracy. When used in conjunction with Advanced Metering Analytics (AMA) solutions, they provide the ability to convey information that can be helpful in detecting leaks or other alarm conditions, a feature not typically available through traditional mechanical meters. **800/876-3837; www.badgermeter.com.**



Contech Engineered Solutions

The **Magellan** decentralized wastewater treatment system from **Contech Engineered Solutions** is pre-engineered to treat 2,000 to 250,000 gpd. Single, multiple and containerized configurations meet site requirements for residential, commercial, industrial, restaurant or brewery. It features full engineering design support. **800/338-1122; www.conteches.com.**



Cretex Specialty Products

LSS Internal Manhole Chimney Seal from **Cretex Specialty Products** is a high-performance watertight mechanical seal installed on the frame and grade ring sections of sanitary sewer manholes. It prevents manhole frame-chimney inflow. During wet weather, inflow enters manholes through deteriorated or broken frame-chimney joints caused by frost heave, soil movement, traffic loading, thermal expansion and contraction of the surrounding pavement and poor or antiquated construction methods. The seal is available in four widths, allowing complete chimney coverage of up to 24 inches without the need for extension pieces. **800/345-3764; www.cretexseals.com.**



CUES Inc.

The **CUES Digital Universal Camera (DUC)** is a high resolution, digital CCTV, side-scanning camera designed for rapid and detailed condition assessment of a water or wastewater system. Inspect and assess 5,000 feet or more per day, increasing revenue while reducing expenses. The system produces a high-resolution digital video scan of internal pipe conditions in 6- to 60-inch pipe, and a flat



unfolded view of the pipe to facilitate rapid assignment of observations. An expanded flat unfolded view of the pipe is provided for measurement purposes. This low maintenance camera has no moving parts and is driven through the pipe without the need to stop or pan and tilt. **800/327-7791; www.cuesinc.com.**

Data Flow Systems

The **TAC II SCADA System** from **Data Flow Systems** features user-friendly HMI software, no-cost SCADA software licenses, a plug-and-play design, ease of integration, durability in harsh environmental conditions and a three-year lightning warranty. The system provides a true obsolescence-proof solution, in which all new products maintain a downward compatibility with all older versions, allowing a utility to maximize their investment in SCADA over the long term. **321/259-5009; www.dataflowsys.com.**



Duke's Root Control

Duke's Root Control is a full-service root control company dedicated to keeping sewer systems free of tree root growth. Through application of the company's herbicide, Razorooter II, over 2,000 U.S. municipalities have benefited from extended pipe life, reduced SSO occurrences and maximized asset value. They can customize a root-control program that integrates CMOM into each municipality's O&M plan. They only apply EPA-registered products that are shown to be non-cancer-causing with no negative impact to downstream treatment facilities. If a root-related stoppage occurs within two to three years after treatment, they will re-treat the line. **800/447-6687; www.dukes.com.**



EBAA Iron

The **Series 2100 MEGA-FLANGE** restrained flange adapter from **EBAA Iron** is a field-adaptable wedge-style restrained flanging system. It has a restraint ring and a gasket ring to give the maximum amount of flexibility during and after installation. It can be used on AWWA C900 and C905 PVC pipe, IPS O.D. (Class) PVC pipe, ductile iron pipe, steel pipe and HDPE pipe. It is available in 3- through 48-inch sizes. **800/433-1716; www.ebaa.com.**



Electro Scan

Electro Scan finds all defects in sewers that can't be seen by CCTV. Available as an add-on to CCTV trucks, it locates and measures all defects that leak, including an industry first of estimating a GPM by individual defect and pipe segment. It measures the variation of electric current that flows through defects in non-conductive pipes (e.g. asbestos cement, brick, clay, plastic, resin liner, reinforced concrete, etc.) from 6 to 60 inches in pipe diameter, and is able to certify point repairs, relining products and new pipe installations as leak free. **800/975-6149; www.electroscan.com.**



ePIPE

The **ePIPE Process** provides a cost-effective alternative to communication and customer pipe replacement for lead remediation in piping systems. It has the ability to line service pipe from the water main right up to the internal tap by blowing an epoxy resin in both directions from an adapter at the outside stop tap. Only one excavation is needed, and the maximum amount of time the pipes are off supply is three hours. **714/564-7600; www.epipeinfo.com.**



FCI - Fluid Components International

The **ST100** flowmeter from **FCI - Fluid Components International** features a wide choice of communication options, with 4-20 mA analog, frequency/pulse, alarm relays and fully approved digital communications: HART, Foundation Fieldbus, Modbus and Profibus. It combines flow-sensing performance with feature- and function-rich electronics. It includes plug-in card replacement that can be changed out by technicians in the field to adapt to a plant's changing network communication needs. **800/854-1993; www.fluidcomponents.com.**



Flowrox

The progressive cavity pump from **Flowrox** features shaft seal technology for use in demanding industrial slurry and waste pumping applications, especially with high viscous or shear sensitive liquids and sludges. The pumped medium continuously shifts spaces (progressing cavities) between the rotor and the stator, enabling nearly pulsation-free pumping. Features include a high flow rate and pressure, low life cycle costs and power consumption, long service intervals and fast maintenance. **410/636-2250; www.flowrox.us.**



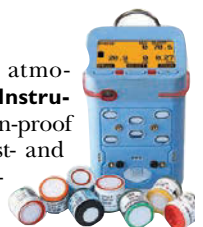
GF Piping Systems

The **Signet 4630** free-chlorine analyzer system from **GF Piping Systems** is designed to measure free chlorine in applications with stable pH, temperature and chlorine levels. Designed with amperometric-based sensing technology, it incorporates a clear flow cell, flow regulator, sensors, filter and rotameter in one compact unit for use in water distribution, ground and surface water, boiler feed water, graywater dechlorination, food and beverage, RO membrane protection and swimming pools. It is EPA 334.0 compliant and has reagent-free measuring, a built-in flow regulator, a panel that includes 100-240 VAC power supply, two 4-20 mA outputs, two mechanical relays and optional automatic pH/temperature compensation. **800/854-4090; www.gfpiping.com.**



GfG Instrumentation

The **G460** multi-sensor atmospheric monitor from **GfG Instrumentation** features a concussion-proof boot, along with a highly dust- and water-resistant housing. Completely automatic calibration, one-button operation, top-



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mounted display, interchangeable battery packs, a highly configurable smart sensor design and data logging and event logging are standard. Options include dual-range infrared combustible gas sensor, motorized pump operable in diffusion or sample draw mode and up to seven channels of detection. **800/959-0329; www.gfg-inc.com.**

Gorman-Rupp Pumps

Designed to deliver all the benefits of our sound-attenuated silent pumps, the **ReliaPrime** emergency bypass station from **Gorman-Rupp Pumps** operates on natural gas, making it quiet, efficient and environmentally friendly. It features a 6-inch Super T Series pump capable of passing a 3-inch spherical solid, and offers a sound-proof lightweight aluminum enclosure with lockable door panels that can be removed for maintenance of the pump or engine. It is a complete backup package, ready for hook-up in emergencies and power outages, primary pump repair and additional pumping capacity. **419/755-1011; www.grpumps.com.**



Hamilton Kent

The **Lifespan System** from **Hamilton Kent** is a watertight, corrosion-proof, rubber manhole frame with a locking cast iron or composite cover that prevents inflow into sanitary sewers through the top of the manhole. It can withstand 5 psi of water pressure, and is AASHTO H-25/HS-25 load certified, making it suited for low-lying and heavy-traffic areas. The frame weighs 55 pounds and comes with tapered risers for simple adjustment of the frame to match surface grade. The frame absorbs impact from vehicular traffic, protecting the underlying manhole and surrounding pavement. The locking cover deters unauthorized access and cover theft. **800/268-8479; www.hamiltonkent.com.**



The Hellan Strainer Company

Fluid strainers from **The Hellan Strainer Company** are offered in a variety of materials and sizes for all filtration applications. They capture the debris on the outside of the screen. The screen is then rotated against a scraper blade or brush to remove all debris. No disassembly is required during the 15-second cleaning cycle. All strainers are manufactured to ISO-9001 and meet all international codes (i.e., ASME, CE/ PED, Lloyds, MIL, etc.). **888/443-5526; www.hellanstrainer.com.**



HOBAS Pipe USA

Centrifugally cast, fiberglass-reinforced, polymer mortar pipe from **HOBAS Pipe USA** is inherently corrosion resistant and lasts 100 years or more, providing a very low life cycle cost. Key applications are sanitary and storm sewers, corrosive environments



and potable water. It features leak-free, push-together joints that reduce installation time and costs. Benefits include superior hydraulics, light weight, high strength and long, maintenance-free service life. Installation methods include open cut, sliplining, jacking, microtunneling, two-pass tunnel, casing carrier and above ground. Sizes range from 18 to 126 inches for both pressure and gravity applications. **800/856-7473; www.hobaspipes.com.**

ICS - PowerGrit

The **Utility** chainsaw from **ICS - PowerGrit** addresses operator safety with grinding technology that eliminates rotational kickback and offers improved operator positioning when cutting pipe. Utilized by public and private water and wastewater departments worldwide, it is designed to cut a variety of materials from ductile iron to plastic pipe with far less excavation. The ability to cut up to 24-inch pipe without changing position reduces the difficulty of the job. **800/797-4748; www.powergrit.com.**



International Paint-Devoe Coatings

Bar-Rust 234P from **International Paint-Devoe Coatings** is a solvent-free epoxy, low-temperature potable water tank lining system designed for low VOC compliance. The 100 percent solids, high-build system features a fast cure, 2:1 mixing ratio and single coat application capability, even in temperatures as low as 35 degrees F. It carries an NSF/ANSI 61 certification for potable water use and cures to a hard, high-gloss finish. It is applied with a plural airless sprayer directly to the water tank's carbon or stainless steel interior. **440/234-2900; www.international-pc.com.**



JWC Environmental

The **Vertical Auger Monster** screening system from **JWC Environmental** fits inside cramped pump stations and provides complete pump protection. It safely and easily screens, cleans and conveys rags and flushable wipes straight up and out of the sewer system, giving collection system managers an affordable way to remove debris before it clogs sewage pumps, and eliminates the wasted time and expense of de-ragging a pump. **800/331-2277; www.jwce.com.**



KriStar Enterprises

The **Bio-Mod** modular bioretention system from **KriStar Enterprises** is made of precast concrete and is designed for use with local agency bioretention cell designs. It is compatible for use with all types of filter soils, including non-proprietary low-flow (5-10 inches/hr) or high-flow soils, and may be used in conjunc-



tion with industry-standard retention/detention systems. **800/579-8819; www.kristar.com.**

Liqui-Force

Liqui-Force's PFM sewer lateral preparation system cleans the lateral for lining, removes debris and roots, measures and inspects it all without excavation. Entry through the manhole is all that is necessary, and the pipe is readied for lining in minutes. Large numbers of laterals can be completed in a day, and cleaning is done up the lateral to a distance of 150 feet. It is completely installed through the manhole as well, with an engineered seal that connects the lateral to the lined or unlined host pipe in minutes. **800/265-0863; www.liquiforce.com.**



Lucity Inc.

Lucity Mobile for Android-based tablets is a mobile app that delivers CMMS workflows, complete with personalized dashboards and views. Features include support of the company's Web asset and maintenance management modules, modification of live data using custom forms, utilization of existing ArcGIS for server map services and creation of requests, work orders and inspections from the map. **800/492-2468; www.lucity.com.**



McGard

The **FiberShield** lightweight locking manhole cover from **McGard** is constructed of a durable, fiber-reinforced polymer material with multiple security points. It is lightweight and easy to handle and transport. It eliminates the lifting and dropping injuries caused by heavy, cast iron manhole covers. Weighing 80 percent less than cast iron, it exceeds an H20 traffic rating. It is installed in seconds and removed without bending over. It requires a key to operate, and has no scrap value, eliminating theft. **888/888-9192; www.manholelocks.com.**



Mission Communications

The **Manhole Monitor** from **Mission Communications** is an in-sewer alarm and reporting system purpose-built for proactive sewer monitoring programs. Floats tipped by surcharges and high levels initiate notifications delivered by any combination of phone call, text message, email, fax and pager. Reliable, encrypted data is transmitted via fourth generation cellular radios. Reports compile trending data for management and compliance purposes that can be accessed by any Web-enabled device. The battery-operated device has a rugged and serviceable waterproof enclosure, designed and tested to IP68 specifications for submersion. Installation is fast and easy with an onboard LCD and quick connecting antenna and float terminations. **877/993-1911; www.123mc.com.**



(continued)

B-10
Rear Reel



NEW!
F-10
Front Reel



AQUATECH
Jet/Vacs
A Product of Hi-Vac® Corporation

The Difference Is **REEL!**™

Regardless of whether you prefer a rear reel design (Aquatech B-Series) or our new front reel design (Aquatech F-Series), Aquatech offers you the best of both worlds.

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Maximum Efficiency • Ergonomic Design • Global Sales & Support**

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Environmental Products for a Cleaner World



Scan for video on
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Moyno Inc.

The **InviziQ** pressure sewer system from **Moyno** is an alternative to conventional gravity sewage options. It utilizes grinding and pumping technology to efficiently and responsibly move sewage to treatment facilities, no matter the terrain, slope, environmental sensitivity of the area or complex topography of the region. **877/486-6966; www.inviziq.com.**



Orenco Systems

Pre-fabricated **fiberglass shelters** from **Orenco Systems** are strong, lightweight, super-insulated shelters that safely house equipment, chemicals, controls and workers. Standard sizes are 8 feet tall, 4 to 16 feet wide and up to 42 feet long. Features include structural foam-core fiberglass walls (2 to 4 inches thick), a weatherproof watertight structure, insulation value up to R24, chemical and corrosion resistance, a roof structure rated up to 100 psf and field or factory assembly. **800/348-9843; www.orenco.com.**



Phoenix Contact

The **PT-IQ** surge protection device from **Phoenix Contact** offers multi-stage remote monitoring, ideal for SCADA systems typical in water/wastewater systems. It provides proactive functional monitoring for signal interface surge protection devices. The system informs the user if a plug replacement is needed long before the components fail due to overload. This can prevent unnecessary service costs, while ensuring system availability and signal quality. **800/322-3225; www.phoenixcontact.com.**



PMC Engineering

The zero-maintenance sewage **lift station monitoring and control system** from **PMC Engineering** includes a stainless steel sink weight incorporating a removable VL2000 ceramic open-faced transmitter. This non-clogging design is ideal for treating effluent with increased FOG (fats, oils and greases). The transmitter is connected to the PMC TE11 termination enclosure via a fully molded/sealed Kevlar-reinforced cable of customer-specified length. The sealed enclosure incorporates the MP11 moisture protection component providing zero maintenance. **203/792-8686; www.pmc1.com.**



QUADEX Inc.

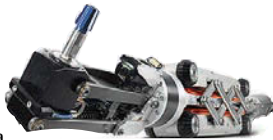
Interfit from **QUADEX Inc.** is a full main wrap (360-degree) cured-in-place lateral connection seal that is installed from the main



during live flow using the nearest manhole and without needing access to the homeowner's property. Made from non-shrinking components, it seals the annular space in the lined main, the connection and the first joint, typically eliminating 90 percent of private source infiltration without having to line the entire lateral. It mechanically anchors and bonds with concrete, PVC or vitrified clay house service lines, forming smooth, lipless transitions with the existing pipe or liners with minimal reduction in cross sectional area. **501/758-8628; www.interfitusa.com.**

RapidView IBAK North America

The **GATOR** series from **RapidView IBAK North America** is a single-point entry robot for pipeline cutting and grinding. It is capable of preparing pipelines for rehabilitation or reinstating laterals after lining operations. High-powered electric tools (up to 3.3 hp) are deployed from dependable platforms, which can center themselves in pipelines up to 24 inches in diameter. Onboard cameras monitor the worksite and the optional 4-axis cutting armature makes sure that you can easily reach anywhere in the pipeline to cut or grind. It is capable of cutting or grinding in a full 360-degree rotation while pneumatically "locked" in the pipeline. **800/656-4225; www.rapidview.com.**



Raven Lining Systems

Raven Lining Systems are 100 percent solids, ultra high-build epoxies used to protect against corrosion in new construction and to rebuild deteriorating infrastructures. They are moisture tolerant and environmentally friendly, providing continual support to those looking for long-term protection and infrastructure renewal. **800/324-2810; www.ravenlining.com.**



RootX

RootX is a proven root killer and can be easily integrated into a regular inspection and maintenance schedule. It puts the technician in control of the root-control program with an on-demand process, which works with existing sewer-cleaning equipment, instead of waiting for an outside service crew to arrive. It is cost-effective and proven. **800/844-4974; www.rootx.com.**



Rosemount Analytical

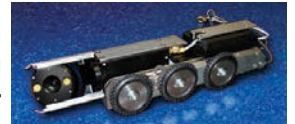
The **56** four-wire advanced liquid analyzer from **Rosemount Analytical** integrates tools, tips and troubleshooting to solve problems on site. Help screens allow users to clear faults and warnings with detailed instruc-



tions and troubleshooting in multiple languages. The data and event logger downloads process data and alarm conditions via USB 2.0 data port. A high-resolution full-color screen allows users to view process measurements and data trend graphs. It features PID and time-proportional capabilities, and HART and Profibus DP digital communications. It is compatible with a Smart Wireless THUM Adapter. **800/854-8257; www.rosemountanalytical.com.**

RS Technical Services

The **TranSTAR II** tractor and **TrakSTAR II** camera from **RS Technical Services** delivers inspection capability in lines 6 inches and larger and up to 3,000 feet in length. Equipped with dual 90-watt motors, it is capable of speeds up to 70 feet per minute. The clutch allows rapid freewheel retrieval. It is 14 inches in length, and options include a rearview camera, manual and motorized elevator systems and multiple tire configurations. The camera features adjustable LED lighting with remote control settings, internal pressure and humidity sensors, 40:1 (10x optical and 4X digital) zoom and configuration for multi-conductor format. **800/767-1974; www.rstechserv.com.**



Sauereisen

SewerGard No. 210G from **Sauereisen** can be applied via plural component equipment. It is a protective coating specifically formulated for municipal wastewater environments, serves as a sealing top-coat over other protective linings and may be used as a chemical-resistant coating for steel substrates. Installation is easily completed using plural component, airless spray equipment or roller. It is resistant to hydrogen sulfide, sulfuric acid, MIC and treatment chemicals. Its smooth surface aids wash-downs and prevents debris accumulation. **412/963-0303; www.sauereisen.com.**



See Water Inc.

WS Series simplex and duplex control panels from **See Water Inc.** are designed for sewage pump applications, and come equipped with "smart board" integrated circuitry, complete pump monitoring and UL 508A or 698A certification. Models include demand, timed dosing and intrinsically safe. These products have a three-year warranty. **888/733-9283; www.seewaterinc.com.**



Sewer Equipment Company of America

Sewer Equipment Company of America has redesigned the drive systems on their jetters to allow for more efficient operation speeds. The resulting ECO models



(continued)

Strong-Seal®

SYSTEMS

The Technology Leader in Manhole Rehabilitation



Strong-Seal® Systems

The fast, cost-effective solution for

- Stopping infiltration
- Restoring structural integrity
- Corrosion protection

Offering
Manhole
Rehabilitation
Solutions Since
1989

Complete Family of Strong-Seal® Engineered Products

- MS-2A - Portland cement based structural lining material
- MS-2C - Calcium Aluminate based structural lining material
- High Performance Mix - 100% pure fused Calcium Aluminate cement and aggregate structural lining material
- Profile Plus - Calcium Aluminate underlayment for epoxy/urethane coating
- Strong Plug
- Quick Set Repair (QSR)
- Bench Mix
- Strong-Seal® Ring Sealant
- Dependable and high output application equipment

THE
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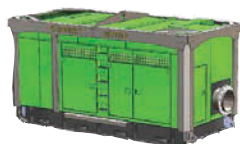
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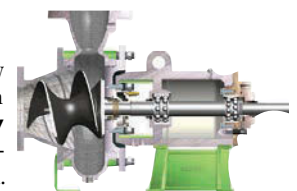
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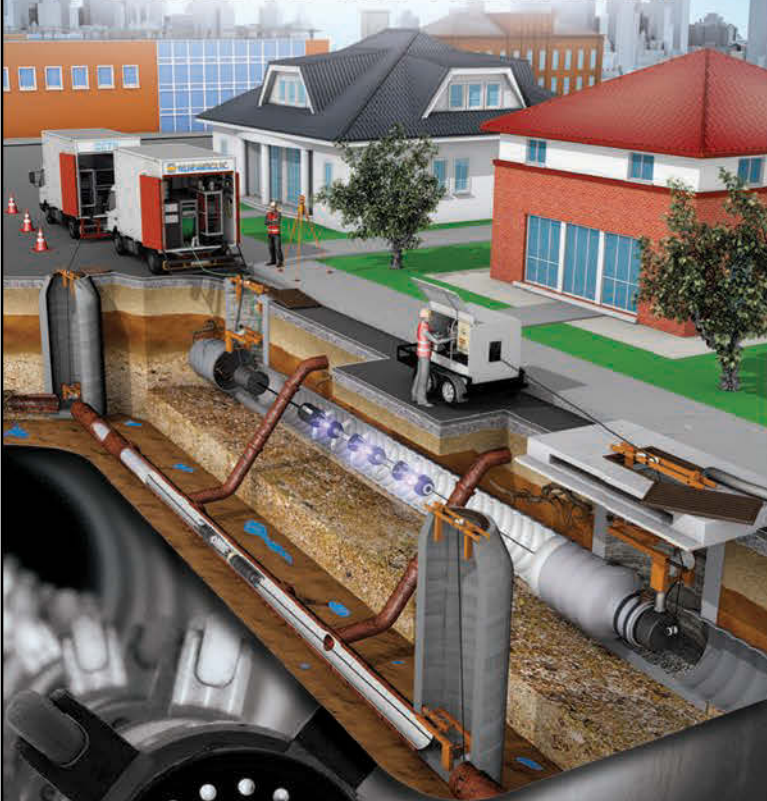
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GETTING THEIR JUST REWARDS

Recognizing and rewarding employees is a powerful motivational and retention tool — and it doesn't have to cost your organization a bundle of cash

By Ken Wysocky

It doesn't take a string-theory physicist to understand a basic management truth: Employees who feel they're recognized and rewarded for their work perform better and are more likely to become something that's less and less common these days — loyal, long-term employees.

But if this is such an obvious concept, then a lot of organizations still are missing the proverbial boat. According to the latest Globoforce Workforce Mood Tracker report, 42 percent of survey respondents said they're looking for new positions, despite the poor job market. The second most popular reason for leaving — cited by almost half of the respondents — was lack of recognition at work. And a whopping 82 percent agreed that getting recognition makes them feel more satisfied about their jobs.

"Rewards and recognition are valuable tools for managers, but they often overlook them or don't recognize their value," says Carol Hacker (www.carolahacker.com), a nationally known business consultant, speaker, seminar leader and author of 14 books, including *450 Low-Cost, No-Cost Strategies for Recognizing, Rewarding & Retaining Good People*. "To employees, rewards and recognition are comparable to oxygen — everybody needs it to survive.

"If you're not willing to reward and recognize people, you'd better look around because a lot of other companies already are ... and your employees are going to jump ship and go to where they can find those things," she adds.

OK, so far, so good. But what about budget-strapped organizations, where cash bonuses are about as likely as self-cleaning, no-clog sewer

mainlines? Well, it turns out that rewarding employees is similar to giving gifts: More often than not, it's the thought that counts, not the size or value of the gift, Hacker notes.

That's not to say that giving an employee a 10 percent cash bonus will make them unhappy. But most employees understand that because of budgetary constraints, that's not realistic. And cash bonuses don't



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Carol Hacker

have what Hacker calls "trophy value" — something tangible they'll always remember. (Free tip: Don't even *think* about handing out company-branded merchandise like T-shirts and coffee mugs.)

In fact, some studies show that employees would gladly forego monetary bonuses for more freedom and decision-making power. As such, delegating more responsibility to employees who want it, or giving them the power to make decisions about things that impact them directly, are both powerful motivators, Hacker says.

When considering rewards and recognition, managers also must consider the individuals involved. Older Baby Boomers, for instance, would appreciate certain rewards that Gen Xers or Yers would disdain, and vice-versa. The bottom line: To make sure you're hitting the right reward-and-recognition buttons, there's nothing wrong with asking employees what rewards they find meaningful, she points out.

Another thing to consider, Hacker suggests: Like the old adage says, there's no "I" in team. As such, rewards for team accomplishments should recognize the *entire* team — take the whole group out for dinner or have a free lunch brought into the office, for instance — lest an individual reward provoke claims of favoritism from resentful colleagues. Afterward, managers can informally poll team members to see

if there's prevailing sentiment that an individual deserves some sort of additional recognition.

During Hacker's more than 20 years of consulting, she has observed hundreds of clever and inexpensive ways that organizations use to reward employees. Here are some of her favorites:

Hold an employee recognition day (or week). This could include a small surprise each day for each employee in your department. For example, Hacker says she used to put department vending machines in a break room on free vend for 24 hours for coffee and soda. "The employees loved it," she recalls. "You would've thought they'd each received \$100. And it only cost me about \$200."

Weekly or monthly privilege grab bags. Write down desirable privileges/rewards on pieces of paper and have employees blindly draw them from a paper bag. Options could include leave work a half hour

early on a Friday. Take 15 minutes extra for lunch. Come in 15 minutes after start time on a certain day. Get a free lunch with the boss. "As simple as it was, it was such an energizing thing," Hacker says.

Public displays of achievement. Hacker says that while visiting a Fortune 100 client years ago, she came across a huge tech center, filled with a sea of gray cubicles — and a ceil-

ing covered with streamers. Turns out that every time a team hit a production goal — say, cleaned x amount of sewer lines in a week — they got to tack up streamers to the ceiling and have a brief but boisterous celebration. "As crazy as it sounds ... production skyrocketed," she says.

Build-your-own sub sandwiches or ice cream sundaes. To celebrate an achievement or the end of a business quarter, bring in ice cream and toppings or buy sub-sandwich rolls and fixings, and have managers man the tables and hand out bowls, spoons, etc.

Create an Employee Wall of Fame. When customers — or colleagues and supervisors, for that matter — submit compliments about employees, display them prominently on a bulletin board in a high-traffic area.

Small job-well-done treats. If someone does a great job on a proj-

We invite readers to offer ideas for this regular column, designed to help municipal and utility managers deal with day-to-day people issues like motivation, team building, recognition and interpersonal relationships. Feel free to share your secrets for building and maintaining a cohesive, productive team. Or ask a question about a specific issue on which you would like advice. Call editor Luke Laggis at 800/257-7222, or email editor@mswmag.com.

ect or goes above and beyond the routine to help out a customer, pass out Kudos candy bars. If an employee comes up with a "lifesaving" idea, give them a necklace made out of Lifesavers.

Head-honcho note. At the end of a new employee's first week on the job — or if someone does something noteworthy — have the head of your organization send them a personal, hand-written thank you note. "I have a client where the president of the company has sent personally written notes to hundreds of employees, thanking them for their accomplishments," Hacker says. "But the note should specify exactly what the thank-you is for ... that gives it a lot more power. And it doesn't cost a cent."

Of course, creative managers and organizations can think of hundreds

of other ways to recognize employees with rewards tailored to specific occasions, achievements and people. Sometimes something as simple as compensatory time off for employees who've put in long hours on a grueling project will do the trick.

But in lieu of nothing else, there's always this old tried-and-true concept: Personally thank employees for what they've done. In the end, employees simply want to be treated with dignity and respect, and few things resonate more with employees than a manager or supervisor who takes them aside and personally expresses appreciation for a job well done.

"There's no substitute for the words, 'Thank you,'" Hacker notes. "And most employees don't hear it often enough. And what does that take to do that? Not a whole lot." ♦



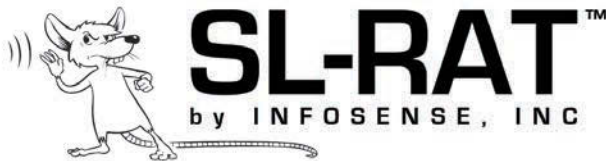
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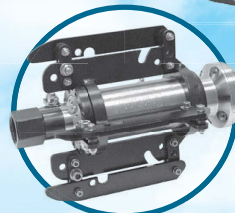
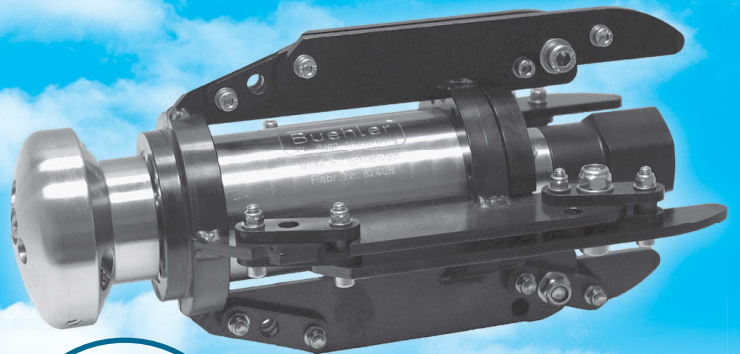
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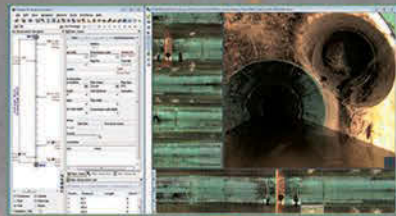
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www.3tequipco.com
Ad on page 95

A

A.W. Cook Cement

242 Amy Industrial Ln.
Hoschton, GA 30548
706-654-4706 • Fax: 706-654-3662
cookcement@windstream.net
www.awcookcement.com
Ad on page 110

Abart Industries - Top Hat Risers

PO Box 864
Skaneateles, NY 13152
315-730-2588
dave@tophatrisers.com
www.tophatrisers.com
Ad on page 110

Advanced Aquatic Products International, Inc.

18495 S Dixie Hwy., #161
Cutler Bay, FL 33157
800-738-7646 • 305-388-7195 • Fax: 305-388-7196
advaquaticprods@aol.com
www.hydro-cartridge.com
Ad on page 30

Advanced Drainage Systems, Inc.

4640 Trueman Blvd.
Hilliard, OH 43026
800-821-6710 • Fax: 614-658-0204
info@ads-pipe.com
www.ads-pipe.com

Advanced Valve Technologies, Inc.

800 Busse Rd.
Elk Grove Village, IL 60007
877-489-4909 • 847-364-3700 • Fax: 847-364-8883
avtkev@aol.com
www.avtfittings.com

Agri America, Inc.

500 Garrison Rd.
Georgetown, SC 29440
800-373-2478 • 843-546-0600 • Fax: 843-527-2738
salesandmarketing@agriamerica.com
www.agruamerica.com

American Highway Products, Ltd.

11723 Strasburg Bolivar Rd. NW
Bolivar, OH 44612
888-272-2397 • 330-874-3270 • Fax: 330-874-3800
sales@ahp1.com
www.ahp1.com
Ad on page 91

American Water Works

6666 W Quincy Ave.
Denver, CO 80235
800-926-7337 • Fax: 303-347-0804
www.awwa.org
Ad on page 27

AMerik Engineering, LLC
2600 Ainsley Ct.
Marietta, GA 30066
770-924-2899 • Fax: 770-924-2301
amerik@bellsouth.net
www.amerikengineering.com



AMT Pump (American Machine & Tool Co.)

400 Spring St.
Royersford, PA 19468
610-948-3800 • Fax: 610-948-5300
sales@amtump.com
www.amtpump.com
Ad on page 110

Anua

PO Box 77457
Greensboro, NC 27417
800-787-2356 • 336-547-9338 • Fax: 336-547-8559
info@anua-us.com
www.anua-us.com

AP/M PERMAFORM, Inc.

PO Box 555
Johnston, IA 50131
800-662-6465 • 515-276-9610 • Fax: 515-276-1274
info@permaform.net
www.permaform.net
Ad on page 71



Applied Felts, Inc.

450 College Dr.
Martinsville, VA 24112
276-656-1904 • Fax: 276-656-1909
info@appliedfelts.com
www.appliedfelts.com
Ad on page 103



Aries Industries, Inc.

550 Elizabeth St.
Waukesha, WI 53186
800-234-7205 • Fax: 262-896-7099
sales@ariesindustries.com
www.ariesindustries.com
Ad on page 99



Arthur Products Co.
1140 Industrial Pkwy.
Medina, OH 44256
800-322-0510 • 330-725-4905 • Fax: 330-722-2698
apcl@apclsq.com
www.arthurproducts.com

Avanti International
822 Bay Star Blvd.
Webster, TX 77598
800-877-2570 • 281-486-5600 • Fax: 281-486-7300
sales@avantigrout.com
www.avantigrout.com

B



BDP Industries, Inc.
354 Rte. 29
Greenwich, NY 12834
518-527-5417 • Fax: 518-695-5417
kelly@bdpindustries.com
www.bdpindustries.com

Best Management Products, Inc.

53 Mt. Archer Rd.
Lyme, CT 06371
800-504-8008 • 410-687-6256 • Fax: 860-434-3195
tjm@bmpinc.com
www.bmpinc.com
Ad on page 10

Bionetix International

4119 White Bear Parkway
St. Paul, MN 55110
800-426-7832 • 651-429-1100 • Fax: 651-429-1122
ddmarco@bionetix.ca
www.bionetix.ca

Blackburn Mfg. Co.

908 W Hwy. #275
Neligh, NE 68756
800-942-5816 • 402-887-4161 • Fax: 402-887-5171
don@blackburnflag.com
www.blackburnflag.com
Ad on page 111



Blue-White Industries
5300 Business Dr.
Huntington Beach, CA 92649
714-893-8529 • Fax: 714-894-9492
sales@blue-white.com
www.blue-white.com

BRIGHT DYES - Division of Kingscote Chemicals

3334 S Tech Blvd.
Miamisburg, OH 45342
800-394-0678 • 937-886-9100 • Fax: 937-886-9300
sales@brightdyes.com
www.brightdyes.com
Ad on page 110

Bright Technologies

127 N Water St.
Hopkins, MI 49328
800-253-0532 • 269-793-7183 • Fax: 269-793-4022
julie@brightbeltpress.com
www.brightbeltpress.com

C

Cam Spray

520 Brooks Rd.
Iowa Falls, IA 50126
800-648-5011 • 641-648-5011 • Fax: 641-648-5013
sales@camspray.com
www.camspray.com
Ad on page 10

Central Oklahoma Winnelson

5037 NW 10th St.
Oklahoma City, OK 73127
888-947-8761 • 405-947-8761 • Fax: 405-947-1934
krjones@winnelson.com
www.centralwinnelson.com
Ad on page 93

Chempace Corporation

339 Arco Dr.
Toledo, OH 43607
800-423-5350 • 419-535-0101 • Fax: 419-535-0531
vhorvath@chempace.com
www.chempace.com
Ad on page 34

Chempure Products Corp.

PO Box 740
Bolivar, OH 44612
800-288-7873 • 330-874-4300 • Fax: 330-874-4448
chempure@gmail.com
www.chempure.com
Ad on page 32



Cherne Industries, Inc.

5700 Lincoln Dr.
Minneapolis, MN 55436
800-843-7584 • Fax: 800-843-7585
gdanaher@cherneind.com
www.cherneind.com
Ad on page 13

CIPP Services, Inc.

320 Raccuglia Dr.
La Salle, IL 61301
815-712-8708
sales@cipp-services.com
www.cipp-services.com

Cloverleaf Tool Co.

PO Box 1338
Talleast, FL 34270
800-365-6583 • 941-739-0707 • Fax: 941-739-0001
sales@cloverleaftool.com
www.cloverleaftool.com
Ad on pages 87, 97 and 111

Cobra Technologies

4806 Wright Dr., Bldg. C
Smyrna, GA 30082
800-443-3761 • 770-435-8991 • Fax: 770-435-0402
sales@cobratec.com
www.cobratec.com

Cretex Specialty Products

N16 W23390 Stoneridge Dr., Ste. A
Waukesha, WI 53188
800-345-3764 • 262-542-8153 • Fax: 262-542-0301
info@cretexseals.com
www.cretexseals.com
Ad on page 34



CUES
3600 Rio Vista Ave.
Orlando, FL 32805
800-327-7791 • 407-849-0190 • Fax: 407-425-1569
salesinfo@cuesinc.com
www.cuesinc.com
Ad on page 57

Custom Holesaw Technologies Corp.

379 Monitor Rd.
Silverton, OR 97381
503-873-6101 • Fax: 503-212-0205
jh@customholesaw.com
www.customholesaw.com
Ad on page 111

Cyclops Electronics, Inc.
123 Commerce Ave.
Boerne, TX 78006
830-249-9756 • Fax: 830-249-8535
cyclopstv@beecreek.net
www.cyclopstv.com

D**Data Flow Systems**

605 N John Rodes Blvd.
Melbourne, FL 32934
321-259-5009 • Fax: 321-259-4006
tomh@dataflowsys.com
www.dataflowsys.com
Ad on page 26

Dove Ventures Inc.

928 Gatensbury St.
Coquitlam, BC V3J 5J1 Canada
604-218-1891
randy@dovediameter.com
www.dovediameter.com
Ad on page 110

Duke's Root Control, Inc.

1020 Hiawatha Blvd. W
Syracuse, NY 13204
800-447-6687 • 315-472-4781 • Fax: 315-475-4203
lynn@dukes.com
www.dukes.com

Dynamic Repairs

40 Arnot St., Unit 20
Lodi, NJ 07644
973-478-0893 • Fax: 973-478-0895
dynamicablerepairs@yahoo.com
www.dynamicrepairs.net
Ad on page 111

E**Eldred Environmental & Export Co. LTD**

PO Box 110
Milan, IL 61264
800-613-3640 • 309-787-3640 • Fax: 309-787-3635
info@fol-da-tank.com
www.eldredenvironmental.com



Electric Eel Mfg.
501 W Leffel Ln.
Springfield, OH 45501
800-833-1212 • 937-323-4644 • Fax: 937-323-3767
info@electriceel.com
www.electriceel.com

Electro Scan Inc.

1745 Markston Rd.
Sacramento, CA 95825-4026
800-975-6149 • 916-779-0660 • Fax: 916-779-0661
chuck@electroscan.com
www.electroscan.com
Ad on page 107

Environmental Coatings LLC

4702 E Virginia St.
Mesa, AZ 85215
480-984-7608
info@sewershield.com
www.sewershield.com

Envirosight^{LC}**Envirosight**

111 Canfield Ave., Unit B3
Randolph, NJ 07869
866-936-8476 • 973-252-6700 • Fax: 973-252-1176
office@envirosight.com
www.envirosight.com
Ad on page 2

Enz USA, Inc.

1585 Beverly Ct., Unit 115
Aurora, IL 60502
877-369-8721 • 630-692-7880 • Fax: 630-692-7885
sales@enzusainc.com
www.enzusainc.com
Ad on page 50

Epoxytec, Inc.

3000 N 29th Ct.
Hollywood, FL 33020
877-463-7699 • 954-961-4656 • Fax: 954-961-2395
drapanos@epoxytec.com
www.epoxytec.com
Ad on page 81

F**Fibrwrap Construction**

4255 E Airport Dr.
Ontario, CA 91761
909-390-4363
ajoyce@aegion.com
www.fibrwrap.com

FlowWorks Inc.

606 Maynard Ave. S, Ste. 251
Seattle, WA 98104
206-859-6999 • Fax: 206-320-9939
sales@flowworks.com
www.flowworks.com
Ad on page 111

Fluid Conservation Systems

502 Techne Center Dr., Ste. B
Milford, OH 45150
800-531-5465 • 513-831-9335 • Fax: 513-831-9336
sales@fluidconservation.com
www.fluidconservation.com
Ad on page 111

Fluid Technology, Inc.

PO Box 937
Oxford, OH 45056
888-844-7824 • 513-241-1600 • Fax: 513-756-1995
info@fluidtechinc.net
www.fluidtechinc.net
Ad on page 112

Footage Tools, Inc.

1-54 Audia Ct.
Vaughan, ON L4K 3N4 Canada
888-737-3668 • 905-695-9900 • Fax: 905-695-8874
df@footage.ca
www.footagetools.com
Ad on page 111

Fresh Creek Technologies, Inc.

1384 Pompton Ave., Ste. 2
Cedar Grove, NJ 07009
800-741-9486 • 973-237-9099 • Fax: 973-237-0744
fresh@freshcreek.com
www.freshcreek.com
Ad on page 111

G**GapVax, Inc.**

575 Central Ave.
Johnstown, PA 15902
888-442-7829 • 814-535-6766 • Fax: 814-539-3617
inquiry@gapvax.com
www.gapvax.com
Ad on page 115

**General Pipe Cleaners**

1101 Thompson Ave.
McKees Rocks, PA 15136
800-245-6200 • 412-771-6300 • Fax: 412-771-2771
info@drainbrain.com
www.drainbrain.com
Ad on page 25

General Pump

1174 Northland Dr.
Mendota Heights, MN 55120
888-474-5487 • 651-454-6500 • Fax: 651-454-8015
sales@gpcompanies.com
www.generalspump.com

Godwin, a Xylem brand

84 Floodgate Rd.
Bridgeport, NJ 08014
800-247-8674 • 856-467-3636
sales@godwinpumps.com
www.godwinpumps.com
Ad on page 29

Gorman-Rupp Company

600 S Airport Rd.
Mansfield, OH 44903
419-755-1011 • Fax: 419-755-1251
grsales@gormanrupp.com
www.GRpumps.com
Ad on page 53

Granite Leasing Co.

64 Basin St. SW
Ephrata, WA 98823
800-246-7997 • 406-892-5068 • Fax: 406-892-5072
mikea@graniteleasing.com
www.graniteleasing.com

H**Halliday Products, Inc.**

6401 Edgewater Dr.
Orlando, FL 32810
800-298-1027 • Fax: 407-298-4534
armond@hallidayproducts.com
www.hallidayproducts.com
Ad on page 51

HammerHead Trenchless Equipment

PO Box 3
Oconomowoc, WI 53066
800-331-6653 • 262-567-8833 • Fax: 262-567-5068
info@hammerheadmole.com
www.hammerheadtrenchless.com
Ad on page 35

Hanson Building Products

300 E John Carpenter Frwy.
Irving, TX 75062
800-445-1534 • 972-262-3600
www.hansonbuildingproducts.com

HARCO Fittings

3721 Cohen Pl.
Lynchburg, VA 24501-5047
434-845-7094 • Fax: 434-845-8562
sales@harcofittings.com
www.harcofittings.com
Ad on page 110

Hastings Irrigation Pipe Co.

1801 E South St.
Hastings, NE 68902
800-759-8823 • Fax: 402-463-4355
gones@hipco-ne.com
www.hastingsirrigation.com

Headworks International

11000 Brittmoore Park Dr.
Houston, TX 77041
877-647-6667 • 713-647-6667 • Fax: 713-647-0999
hw@headworksintl.com
www.headworksinternational.com

HEMCO Corporation

711 S Powell Rd.
Independence, MO 64056
800-779-4362 • Fax: 816-796-3333
info@hemcocorp.com
www.HEMCOcorp.com
Ad on page 110

Hi-Vac Corporation

117 Industry Rd.
Marietta, OH 45750
800-752-2400 • 740-374-2306 • Fax: 740-374-5447
sales@hi-vac.com
www.aquatechinc.com
Ad on page 45

Hibon Inc. (a division of Ingersoll Rand)

12055 Cote de Liesse
Dorval, QC H9P 1B4 Canada
888-704-4266 • 514-631-3501 • Fax: 514-631-3502
jeff.peterson@irco.com
www.hibon.com

HOBAS Pipe USA

1413 E Richey Rd.
Houston, TX 77073
800-856-7473 • 281-821-2200 • Fax: 281-821-7715
info@hobaspipe.com
www.hobaspipe.com
Ad on page 11

Hot Jet USA

14717 Heritage Crest Way
Riverton, UT 84065
800-213-3272 • 801-545-0777 • Fax: 801-545-9132
sales@hotjetusa.com
www.hotjetusa.com

Hurco Technologies, Inc.

409 Enterprise St.
Harrisburg, SD 57032
800-888-1436 • 605-743-2466 • Fax: 605-743-2465
info@gethurco.com
www.gethurco.com
Ad on page 52

Hydra-Stop

11700 S Cicero Ave.
Alsip, IL 60803
800-538-7867 • 708-389-5111 • Fax: 708-389-5125
dchristensen@idexcorp.com
www.hydra-stop.com

ICS - PowerGrit

4909 SE International Way
Portland, OR 97222
800-797-4748 • Fax: 503-653-4393
info@powergrit.com
www.powergrit.com

**InfoSense, Inc.**

1800 Camden Rd., Ste. 107-204
Charlotte, NC 28203
877-747-3245 • 336-302-0164 • Fax: 480-247-4851
sales@infosenseinc.com
www.infosenseinc.com
Ad on page 55

Infrastructure Repair Systems, Inc.

4301 A 34th St. N
St. Petersburg, FL 33714
877-327-4216 • 727-327-4216 • Fax: 727-327-4118
irsi@irsi.net
www.irsi.net
Ad on page 63

Inland Pipe Rehabilitation

2002 Timberloch Pl.
The Woodlands, TX 77380
855-832-6477 • 281-362-1131
jbrennan@teamipr.com
www.teamipr.com
Ad on page 73

Inliner Technologies

1468 W Hospital Rd.
Paoli, IN 47454
812-723-0704 • Fax: 812-723-5998
info@inliner.com
www.inliner.com
Ad on page 23

Insituform Technologies

17988 Edison Ave.
Chesterfield, MO 63005
800-234-2992
ajoyce@aegion.com
www.insituform.com

IPEX USA LLC

2441 Royal Windsor Dr.
Mississauga, ON L5J 4C7 Canada
704-889-2431 • Fax: 704-889-2390
marketing@ipexamerica.com
www.ipexamerica.com
Ad on page 105

J**Jack Doheny Supplies**

PO Box 609
Northville, MI 48167
800-336-4369 • 248-349-0904 • Fax: 248-349-2774
sales@doheny-supplies.com
www.doheny-supplies.com

Jetter Depot

745 Atlanta Rd., Ste. 207
Cumming, GA 30040
678-431-8136 • Fax: 678-807-2944
sales@jetterdepot.com
www.jetterdepot.com
Ad on page 112

JPCI Services

4702 E Virginia St.
Mesa, AZ 85215
480-986-1212
info@jpciservices.com
www.jpciservices.com

K**K&W Products, Inc.**

26264 US Hwy. 98
Elberta, AL 36530
800-503-0076 • 251-986-7900 • Fax: 251-986-7902
sales@kwproducts.net
www.kwmiequipment.com
Ad on page 110

KEG Technologies, Inc.

6220 N Pinnacle Dr.
Spartanburg, SC 29303
866-595-0515 • 864-804-6637 • Fax: 866-804-6629
jdoss@kegtechnologies.net
www.kegtechnologies.net

KOHLER Power Systems

444 Highland Dr.
Kohler, WI 53044
800-544-2444 • 920-457-4441 • Fax: 920-459-1646
scott.cinealis@kohler.com
www.kohlerpower.com

Komline-Sanderson

12 Holland Ave.
Peapack, NJ 07977
800-225-5457 • 908-234-1000 • Fax: 908-234-9487
info@komline.com
www.komline.com
Ad on page 79

KSB, Inc.

4415 Sarellen Rd.
Henrico, VA 23231
804-222-1818 • Fax: 804-226-6961
sales@ksbusa.com
www.ksbusa.com

L**LADTECH, Inc.**

6704 Meadowlark Ct.
Lino Lakes, MN 55038
877-235-7464 • 651-415-1252 • Fax: 651-415-1090
adjring@ladtech.com
www.ladtech.com
Ad on page 18

Lee Supply Company

305 1st St.
Charlrovi, PA 15022
800-353-3747 • 724-483-3543 • Fax: 724-483-0577
info@leesupply.com
www.leesupply.com
Ad on pages 38 and 39

**Linabond, Inc.**

1161 Avenida Acaso
Camarillo, CA 93012
805-484-7373
info@linabond.com
www.linabond.com

Linko Data Systems, Inc.

4251 Kipling St., #410
Wheat Ridge, CO 80033
877-546-5699 • 303-275-9968 • Fax: 303-275-9949
info@linkodatasytems.com
www.linkodatasytems.com/movie
Ad on page 85

LMK Technologies

1779 Chessie Ln.
Ottawa, IL 61350
888-433-1275 • 815-433-1275 • Fax: 815-433-0107
info@lmktechnologies.com
www.lmktechnologies.com

Logiball, Inc.

440 Papin St.
Quebec, QC G1P 3T9 Canada
800-246-5988 • 418-656-9767 • Fax: 418-653-5746
info@logiball.com
www.logiball.com
Ad on page 75

Lucity, Inc.

10561 Barkley, Ste. 500
Overland Park, KS 66212
800-492-2468 • 913-341-3105 • Fax: 913-341-3128
info@lucity.com
www.lucity.com

M**Mainline Backflow Products, Inc.**

12530 - 128 St.
Edmonton, AB T5L 1C9 Canada
877-734-8691 • 780-413-7204 • Fax: 780-457-1210
tomc@backwatervalve.com
www.backwatervalve.com

Maia Geoscience USA, Inc.

465 Deanna Ln.
Charleston, SC 29492
843-852-5021 • Fax: 843-284-0684
sales.usa@malags.com
www.malags.com
Ad on page 12

McElroy Manufacturing, Inc.

PO Box 580550
Tulsa, OK 74115
918-836-8611
www.mcelroy.com/fusion
Ad on page 110

McGard LLC

3875 California Rd.
Orchard Park, NY 14127
888-888-9192 • 716-662-8980 • Fax: 716-662-8985
rglass@mcgard.com
www.manholelocks.com
Ad on page 56

Mr. Manhole

125 S Canal St.
Delphos, OH 45833
419-229-3015 • Fax: 419-692-1600
sales@mrmanhole.com
www.mrmanhole.com

MTC

160 Corporate Dr.
Batesville, MS 38606
662-978-7797
mwetzel@mtubeonline.com
www.mtubeonline.com

MTech

7401 First Place
Cleveland, OH 44146
800-362-0240 • 440-646-0996 • Fax: 440-646-9953
sales@mtechcompany.com
www.mtechcompany.com
Ad on page 112

MyTana Mfg. Company, Inc.

746 Selby Ave.
St. Paul, MN 55104
800-328-8170 • 651-222-1738 • Fax: 651-222-1739
mytana@mytana.com
www.mytana.com
Ad on page 12

N**Nicor Inc.**

100 Commons Rd., #7-355
Dripping Springs, TX 78620
707-484-0835 • Fax: 512-276-2033
jeffacook@nicorinc.net
www.nicorinc.net

**NozzTeq, Inc.**

1497 Main St., Unit 354
Dunedin, FL 34683
866-620-5915 • 603-413-6583 • Fax: 603-413-6744
info@nozzteq.com
www.nozzteq.com
Ad on page 85

O**Oldham (An Industrial Scientific Company)**

1001 Oakdale Rd.
Oakdale, PA 15071-1500
800-338-3287 • 412-788-4353
info@oldhamgas.com
www.oldhamgas.com

P**Parson Environmental Products, Inc.**

PO Box 4474
Reading, PA 19606
800-356-9023 • 610-582-6060 • Fax: 610-582-6064
info@parsonenvironmental.com
www.parsonenvironmental.com

Perma-Liner Industries, LLC

13000 Automobile Blvd.
Clearwater, FL 33762
866-336-2568 • 727-507-9749 • Fax: 727-507-9849
info@perma-liner.com
www.perma-liner.com
Ad on page 5

Petersen Products Co.

PO Box 340
Fredonia, WI 53021
800-926-1926 • Fax: 262-692-2418
sales@petersenproducts.com
www.pipeplug.com
Ad on page 101

Pipeline Analytics

200 Cedar Ridge Dr., Ste. 207
Pittsburgh, PA 15205
877-626-8386 • Fax: 412-489-6471
wincan@pipelineanalytics.com
www.pipelineanalytics.com

Pipeline Renewal
TECHNOLOGIES™

Pipeline Renewal Technologies
111 Canfield Ave., Unit B3
Randolph, NJ 07869
866-936-8476 • 973-252-6700 • Fax: 973-252-1176
mail@pipelinert.com
www.pipelinert.com



PipeLogix, Inc.
PO Box 14014
Palm Desert, CA 92255
866-299-3150 • 760-779-1700 • Fax: 760-406-6023
joan.stone@pipelogix.com
www.pipelogix.com
Ad on page 95

PMC Engineering LLC
11 Old Sugar Hollow Rd.
Danbury, CT 06810
800-869-5747 • 203-792-8686 • Fax: 203-743-2051
sales@pmc1.com
www.pmc1.com

Pow-r Mole Sales LLC
1400 Commerce Pkwy.
Lancaster, NY 14086
800-344-6653 • 716-683-2486 • Fax: 716-683-6372
brian@powrmole.com
www.powrmole.com

PROCOMSOL

ProComSol, Ltd
13001 Athens Ave., Ste. 220
Lakewood, OH 44107
877-221-1551 • 216-221-1550 • Fax: 216-221-1554
sales@procomsol.com
www.procomsol.com
Ad on page 8

Productive Carbides, Inc.
10265 K Spartan Dr.
Cincinnati, OH 45215
800-676-7649 • 513-771-7092 • Fax: 513-771-7092
www.productivecarbides.com
Ad on page 110

Pronal-USA, Inc.
3000 Opportunity Ct., Ste. A
South Daytona, FL 32119
386-310-1558 • Fax: 386-310-1559
tsimunac@pronal-usa.com
www.pronal-usa.com



Prototek
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www.linabond.com

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www.kohlerpower.com

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800-969-3001 • 707-543-8555 • Fax: 707-543-8558
t3tequip@yahoo.com
www.3tequipco.com
Ad on page 95

**Cam Spray**

Iowa Falls, IA
800-648-5011 • 641-648-5011 • Fax: 641-648-5013
sales@camspray.com
www.camspray.com
Ad on page 10

Enz USA, Inc.

Aurora, IL
877-369-8721 • 630-692-7880 • Fax: 630-692-7885
sales@enzusainc.com
www.enzusainc.com
Ad on page 50

General Pipe Cleaners

McKees Rocks, PA
800-245-6200 • 412-771-6300 • Fax: 412-771-2771
info@drainbrain.com
www.drainbrain.com
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Hi-Vac Corporation

Marietta, OH
800-752-2400 • 740-374-2306 • Fax: 740-374-5447
sales@hi-vac.com
www.aquatechinc.com
Ad on page 45

Hot Jet USA

Riverton, UT
800-213-3272 • 801-545-0777 • Fax: 801-545-9132
sales@hotjetusa.com
www.hotjetusa.com

Jack Doheny Supplies

Northville, MI
800-336-4369 • 248-349-0904 • Fax: 248-349-2774
sales@doheny-supplies.com
www.doheny-supplies.com

Jetter Depot

Cumming, GA
678-431-8136 • Fax: 678-807-2944
sales@jetterdepot.com
www.jetterdepot.com
Ad on page 112

KEG Technologies, Inc.

Spartanburg, SC
866-595-0515 • 864-804-6637 • Fax: 866-804-6629
jdoss@kegtechnologies.net
www.kegtechnologies.net

MTech

Cleveland, OH
800-362-0240 • 440-646-0996 • Fax: 440-646-9953
sales@mtechcompany.com
www.mtechcompany.com
Ad on page 112

Sewer Equipment Co. of America

Dixon, IL
800-323-1604 • 815-835-5566 • Fax: 815-284-0452
sales@sewerequipment.com
www.sewerequipment.com

**Super Products**
TRUCK MOUNTED VACUUM EQUIPMENT

Super Products LLC
New Berlin, WI
800-837-9711 • 262-784-7100 • Fax: 262-784-9561
info@superproductsllc.com
www.superproductsllc.com

Trade Tool

Tualatin, OR
503-221-8665 • Fax: 503-223-0666
sales@tradetoolsupply.com
www.tradetoolsupply.com
Ad on page 112

**USB - SEC****USB - Sewer Equipment Corporation**

Marietta, GA
866-408-2814 • 770-984-8880 • Fax: 770-984-2802
info@usbsec.com
www.USBSEC.com
Ad on page 56

**VAC-CON**

Vac-Con, Inc.
Green Cove Springs, FL
888-491-5762 • 904-284-4200 • Fax: 904-284-3305
vns@vac-con.com
www.vac-con.com
Ad on page 116

Vactor Manufacturing

Streator, IL
800-627-3171 • 815-672-3171 • Fax: 815-672-2779
sales@vactor.com
www.vactor.com
Ad on pages 3 and 69

Vacuum Sales, Inc.

Lindenwold, NJ
800-547-7790 • 856-627-7790 • Fax: 856-627-3044
sales@vacuumsalesinc.com
www.vacuumsalesinc.com

Laboratory
Equipment/Supplies**HEMCO Corporation**

Independence, MO
800-779-4362 • Fax: 816-796-3333
info@hemcocorp.com
www.HEMCOcorp.com
Ad on page 110

Laser Profiling



CUES
Orlando, FL
800-327-7791 • 407-849-0190 • Fax: 407-425-1569
salesinfo@cuesinc.com
www.cuesinc.com
Ad on page 57



Envirosight
Randolph, NJ
866-936-8476 • 973-252-6700 • Fax: 973-252-1176
office@envirosight.com
www.envirosight.com
Ad on page 2

MTech

Cleveland, OH
800-362-0240 • 440-646-0996 • Fax: 440-646-9953
sales@mtechcompany.com
www.mtechcompany.com
Ad on page 112

**Pipeline Analytics**

Pipeline Analytics
Pittsburgh, PA
877-626-8386 • Fax: 412-489-6471
wincan@pipelineanalytics.com
www.pipelineanalytics.com

RapidView IBAK North America

Rochester, IN
800-656-4225 • 574-224-5426 • Fax: 574-223-7953
info@rapidview.com
www.rapidview.com
Ad on page 49

RS Technical Services, Inc.

Petaluma, CA
800-767-1974 • 707-778-1974 • Fax: 707-778-1981
sales.info@rstechserv.com
www.rstechserv.com
Ad on page 40

Leasing/
Financing Services**Granite Leasing Co.**

Ephrata, WA
800-246-7997 • 406-892-5068 • Fax: 406-892-5072
mikea@graniteleasing.com
www.graniteleasing.com

Lift Stations/
Wet Wells**Enz USA, Inc.**

Aurora, IL
877-369-8721 • 630-692-7880 • Fax: 630-692-7885
sales@enzusainc.com
www.enzusainc.com
Ad on page 50

Epoxytec, Inc.

Hollywood, FL
877-463-7699 • 954-961-4656 • Fax: 954-961-2395
drapanos@epoxytec.com
www.epoxytec.com
Ad on page 81

Gorman-Rupp Company

Mansfield, OH
419-755-1011 • Fax: 419-755-1251
grsales@gormanrupp.com
www.GRpumps.com
Ad on page 53

KSB, Inc.

Henrico, VA
804-222-1818 • Fax: 804-226-6961
sales@ksbusa.com
www.ksbusa.com

Linabond, Inc.

Camarillo, CA
805-484-7373
info@linabond.com
www.linabond.com

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800-508-6001 • 860-434-0277 • Fax: 860-434-3195
duran@reliner.com
www.reliner.com

**Smith & Loveless, Inc.**

Lenexa, KS
800-898-9122 • 913-888-5201 • Fax: 913-888-2173
answers@smithandloveless.com
www.smithandloveless.com

USB - Sewer Equipment Corporation

Marietta, GA
866-408-2814 • 770-984-8880 • Fax: 770-984-2802
info@usbsec.com
www.USBSEC.com
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Liquid Level
Indicators**FlowWorks Inc.**

Seattle, WA
206-859-6999 • Fax: 206-320-9939
sales@flowworks.com
www.flowworks.com
Ad on page 111

Fluid Conservation Systems

Milford, OH
800-531-5465 • 513-831-9335 • Fax: 513-831-9336
sales@fluidconservation.com
www.fluidconservation.com
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GapVax, Inc.

Johnstown, PA
888-442-7829 • 814-535-6766 • Fax: 814-539-3617
inquiry@gapvax.com
www.gapvax.com
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Gorman-Rupp Company

Mansfield, OH
419-755-1011 • Fax: 419-755-1251
grsales@gormanrupp.com
www.GRpumps.com
Ad on page 53

PMC Engineering LLC

Danbury, CT
800-869-5747 • 203-792-8686 • Fax: 203-743-2051
sales@pmc1.com
www.pmc1.com

Safety Sewer Drain

Ingalls, MI
906-753-4002 • Fax: 906-753-4080
safetysewer@hotmail.com
www.safetysewerdrain.com

Locators - Electronic

Blackburn Mfg. Co.
 Neligh, NE
 800-942-5816 • 402-887-4161 • Fax: 402-887-5171
 don@blackburnflag.com
 www.blackburnflag.com
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Central Oklahoma Winnelson
 Oklahoma City, OK
 888-947-8761 • 405-947-8761 • Fax: 405-947-1934
 krjones@winnelson.com
 www.centralwinnelson.com
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Dynamic Repairs
 Lodi, NJ
 973-478-0893 • Fax: 973-478-0895
 dynamicablerepairs@yahoo.com
 www.dynamicrepairs.net
 Ad on page 111

Electric Eel Mfg.
 Springfield, OH
 800-833-1212 • 937-323-4644 • Fax: 937-323-3767
 info@electriceel.com
 www.electriceel.com

General Pipe Cleaners
 McKees Rocks, PA
 800-245-6200 • 412-771-6300 • Fax: 412-771-2771
 info@drainbrain.com
 www.drainbrain.com
 Ad on page 25

Mala Geoscience USA, Inc.
 Charleston, SC
 843-852-5021 • Fax: 843-284-0684
 sales.usa@malags.com
 www.malags.com
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MyTana Mfg. Company, Inc.
 St. Paul, MN
 800-328-8170 • 651-222-1738 • Fax: 651-222-1739
 mytana@mytana.com
 www.mytana.com
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Pow-r Mole Sales LLC
 Lancaster, NY
 800-344-6653 • 716-683-2486 • Fax: 716-683-6372
 brian@powrmole.com
 www.powrmole.com


Prototek Corporation
 Poulsbo, WA
 800-541-9123 • 360-779-1310 • Fax: 360-779-1510
 prototeksales@prototek.net
 www.prototek.net
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RapidView IBAK North America
 Rochester, IN
 800-656-4225 • 574-224-5426 • Fax: 574-223-7953
 info@rapidview.com
 www.rapidview.com
 Ad on page 49

Schonstedt Instrument Co.
 Kearneysville, WV
 800-999-8280 • 304-725-1050 • Fax: 304-725-1095
 info@schonstedt.com
 www.schonstedt.com
 Ad on page 112

SubSurface Locators, Inc.
 Incline Village, NV
 775-298-2701 • Fax: 775-298-2703
 sldi@mindspring.com
 www.subsurfacelocators.com
 Ad on page 56

Trade Tool
 Tualatin, OR
 503-221-8665 • Fax: 503-223-0666
 sales@tradetoolsupply.com
 www.tradetoolsupply.com
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Vermeer
 Pella, IA
 888-837-6337 • 641-628-3141 • Fax: 641-621-7773
 salesinfo@vermeermfg.com
 www.vermeer.com
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 800-942-5816 • 402-887-4161 • Fax: 402-887-5171
 don@blackburnflag.com
 www.blackburnflag.com
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Cherne Industries, Inc.
 Minneapolis, MN
 800-843-7584 • Fax: 800-843-7585
 gdanaher@cherneind.com
 www.cherneind.com
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Electro Scan Inc.
 Sacramento, CA
 800-975-6149 • 916-779-0660 • Fax: 916-779-0661
 chuck@electroscan.com
 www.electroscan.com
 Ad on page 107

Fluid Conservation Systems
 Milford, OH
 800-531-5465 • 513-831-9335 • Fax: 513-831-9336
 sales@fluidconservation.com
 www.fluidconservation.com
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General Pipe Cleaners
 McKees Rocks, PA
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 www.drainbrain.com
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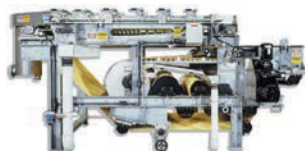
Paddle Dryer

- indirectly heated
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Belt Filter Press

- sludge dewatering
- high cake solids
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- continuous operation



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- sludge transfer
- positive displacement
- high suction lift



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info@gethurco.com
www.gethurco.com
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Jetter Depot

Cumming, GA
678-431-8136 • Fax: 678-807-2944
sales@jetterdepot.com
www.jetterdepot.com
Ad on page 112

Maia Geoscience USA, Inc.

Charleston, SC
843-852-5021 • Fax: 843-284-0684
sales.usa@malags.com
www.malags.com
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MTech

Cleveland, OH
800-362-0240 • 440-646-0996 • Fax: 440-646-9953
sales@mtechcompany.com
www.mtechcompany.com
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NozzTeq, Inc.

Dunedin, FL
866-620-5915 • 603-413-6583 • Fax: 603-413-6744
info@nozzteq.com
www.nozzteq.com
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Pow-r Mole Sales LLC

Lancaster, NY
800-344-6653 • 716-683-2486 • Fax: 716-683-6372
brian@powrmole.com
www.powrmole.com

Radiodetection Corporation

Raymond, ME
877-247-3797 • 207-655-8525 • Fax: 207-655-8535
rd.sales.us@spx.com
www.radiodetection.com



Ratech Electronics, Ltd.

Concord, ON Canada
800-461-9200 • 905-660-7072 • Fax: 905-660-1519
sales@ratech-electronics.com
www.ratech-electronics.com
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Red Valve Co. / Tideflex Technologies

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valves@redvalve.com
www.redvalve.com
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ridgidinfo@emerson.com
www.RIDGID.com
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Kearneysville, WV
800-999-8280 • 304-725-1050 • Fax: 304-725-1095
info@schonstedt.com
www.schonstedt.com
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New Smyrna Beach, FL
800-635-2323 • Fax: 386-427-4552
csewerequisite@cfl.rr.com
www.sewerequisite.com
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SubSurface Instruments, Inc.

De Pere, WI
855-422-6346 • Fax: 920-347-1791
info@ssilocators.com
www.ssilocators.com
Ad on page 87

SubSurface Locators, Inc.

Incline Village, NV
775-298-2701 • Fax: 775-298-2703
sldi@mindspring.com
www.subsurflocators.com
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Superior Signal Company LLC

Spotswood, NJ
800-945-8378 • 732-251-0800 • Fax: 732-251-9442
info@superiorsignal.com
www.superiorsignal.com
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Vactor Manufacturing

Streator, IL
800-627-3171 • 815-672-3171 • Fax: 815-672-2779
sales@vactor.com
www.vactor.com
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Vermeer

Pella, IA
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salesinfo@vermeerfmfg.com
www.vermeer.com
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VIVAX

METROTECH

Vivax-Metrotech Corp.

Santa Clara, CA
800-446-3392 • 408-734-1400 • Fax: 408-734-1415
sales@vxmt.com
www.vivax-metrotech.com
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Locators - Smoke/Dye



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Miamisburg, OH
800-394-0678 • 937-886-9100 • Fax: 937-886-9300
sales@brightdyes.com
www.brightdyes.com
Ad on page 110

Central Oklahoma Winnelson

Oklahoma City, OK
888-947-8761 • 405-947-8761 • Fax: 405-947-1934
krjones@winnelson.com
www.centralwinnelson.com
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Cloverleaf Tool Co.

Tallevast, FL
800-365-6583 • 941-739-0707 • Fax: 941-739-0001
sales@cloverleaffool.com
www.cloverleaffool.com
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800-888-1436 • 605-743-2466 • Fax: 605-743-2465
info@gethurco.com
www.gethurco.com
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MTech

Cleveland, OH
800-362-0240 • 440-646-0996 • Fax: 440-646-9953
sales@mtechcompany.com
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Ad on page 112

NozzTeq, Inc.

Dunedin, FL
866-620-5915 • 603-413-6583 • Fax: 603-413-6744
info@nozzteq.com
www.nozzteq.com
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Sewer Equipment Co. of Florida, Inc.

New Smyrna Beach, FL
800-635-2323 • Fax: 386-427-4552
csewerequisite@cfl.rr.com
www.sewerequisite.com
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Superior Signal Company LLC

Spotswood, NJ
800-945-8378 • 732-251-0800 • Fax: 732-251-9442
info@superiorsignal.com
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TURBO FOG Division of Kingscote Chemicals

Miamisburg, OH
800-394-0678 • 937-886-9100 • Fax: 937-886-9300
sales@turbo-fog.com
www.turbo-fog.com
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Manhole Inserts

Cretex Specialty Products

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info@cretexseals.com
www.cretexseals.com
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Hanson Building Products

Irving, TX 75062
800-445-1534 • 972-262-3600
www.hansonbuildingproducts.com



McGard LLC

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888-888-9192 • 716-662-8980 • Fax: 716-662-8985
rglass@mcgard.com
www.manholelocks.com
Ad on page 56

Mr. Manhole

Delphos, OH
419-229-3015 • Fax: 419-692-1600
sales@mrmanhole.com
www.mrmanhole.com

Nicor Inc.

Dripping Springs, TX
707-484-0835 • Fax: 512-276-2033
jeffacook@nicorinc.net
www.nicorinc.net

Parson Environmental Products, Inc.

Reading, PA
800-356-9023 • 610-582-6060 • Fax: 610-582-6064
info@parsonenvironmental.com
www.parsonenvironmental.com

Rowland, Inc.

Pinellas Park, FL
855-545-3815 • 727-545-3815 • Fax: 727-546-8464
rick@rowland-inc.com
www.rowland-inc.com
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Sealing Systems, Inc.

Loretto, MN
800-478-2054 • 763-478-2057 • Fax: 763-478-8868
pam@ssisealingsystems.com
www.ssisealingsystems.com
Ad on page 55

Sewer Equipment Co. of Florida, Inc.

New Smyrna Beach, FL
800-635-2323 • Fax: 386-427-4552
csewerequisite@cfl.rr.com
www.sewerequisite.com
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Sewer Shield Composite LLC

Mesa, AZ
480-830-9537
info@sewershieldcomposites.com
www.sewershieldcomposites.com

Simple Solutions LLC

West Milford, NJ
866-667-8465 • 973-846-7817 • Fax: 973-858-0219
sales@industrialodorcontrol.com
www.industrialodorcontrol.com
Ad on page 110



The Man Pan
McMurray, PA
724-942-9500 • Fax: 724-942-7591
johnmanning@themanpan.com
www.themanpan.com

Trelleborg Pipe Seals Milford Inc.

Milford, NH
800-626-2180 • Fax: 603-673-7271
milfordsales@trelleborg.com
www.trelleborg.com/npc

Manhole Parts/Components

Abart Industries - Top Hat Risers

Skaneateles, NY
315-730-2588
dave@tophatrisers.com
www.tophatrisers.com
Ad on page 110

American Highway Products, Ltd.

Bolivar, OH
888-272-2397 • 330-874-3270 • Fax: 330-874-3800
sales@ahp1.com
www.ahp1.com
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Cretex Specialty Products

Waukesha, WI
800-345-3764 • 262-542-8153 • Fax: 262-542-0301
info@cretexseals.com
www.cretexseals.com
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Orlando, FL
800-298-1027 • Fax: 407-298-4534
armond@hallidayproducts.com
www.hallidayproducts.com
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Hanson Building Products

Irving, TX 75062
800-445-1534 • 972-262-3600
www.hansonbuildingproducts.com

LADTECH, Inc.

Lino Lakes, MN
877-235-7464 • 651-415-1252 • Fax: 651-415-1090
adjring@ladtech.com
www.ladtech.com
Ad on page 18



McGard LLC

Orchard Park, NY
888-888-9192 • 716-662-8980 • Fax: 716-662-8985
rglass@mcgard.com
www.manholelocks.com
Ad on page 56

Mr. Manhole

Delphos, OH
419-229-3015 • Fax: 419-692-1600
sales@mrmanhole.com
www.mrmanhole.com

Parson Environmental Products, Inc.

Reading, PA
800-356-9023 • 610-582-6060 • Fax: 610-582-6064
info@parsonenvironmental.com
www.parsonenvironmental.com

Rowland, Inc.

Pinellas Park, FL
855-545-3815 • 727-545-3815 • Fax: 727-546-8464
rick@rowland-inc.com
www.rowland-inc.com
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RELINER/Duran Inc.

Lyme, CT
800-508-6001 • 860-434-0277 • Fax: 860-434-3195
duran@reliner.com
www.reliner.com

Sewer Shield Composite LLC

Mesa, AZ
480-830-9537
info@sewershieldcomposites.com
www.sewershieldcomposites.com

Uticom Systems, Inc.

Coatesville, PA
610-857-2655 • Fax: 610-857-2986
ben@uticom.net
www.uticom.net
Ad on page 112

Manhole Rehabilitation

A.W. Cook Cement

Hoschton, GA
706-654-4706 • Fax: 706-654-3662
cookcement@windstream.net
www.awcookcement.com
Ad on page 110



Abart Industries - Top Hat Risers

Skaneateles, NY
315-730-2588
dave@tophatrisers.com
www.tophatrisers.com
Ad on page 110

American Highway Products, Ltd.

Bolivar, OH
888-272-2397 • 330-874-3270 • Fax: 330-874-3800
sales@ahp1.com
www.ahp1.com
Ad on page 91

AP/M PERMAFORM, Inc.

Johnston, IA
800-662-6465 • 515-276-9610 • Fax: 515-276-1274
info@permaform.net
www.permaform.net
Ad on page 71



Avanti International
Webster, TX
800-877-2570 • 281-486-5600 • Fax: 281-486-7300
sales@avantigrout.com
www.avantigrout.com

Cretex Specialty Products

Waukesha, WI
800-345-3764 • 262-542-8153 • Fax: 262-542-0301
info@cretexseals.com
www.cretexseals.com
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Duke's Root Control, Inc.

Syracuse, NY
800-447-6687 • 315-472-4781 • Fax: 315-475-4203
lynn@dukes.com
www.dukes.com

Environmental Coatings LLC

Mesa, AZ
480-984-7608
info@sewershield.com
www.sewershield.com

Epoxytec, Inc.

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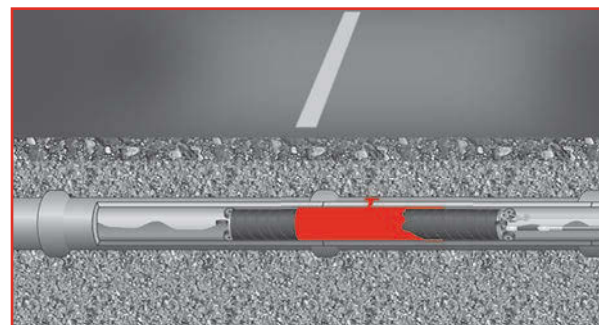
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info@leesupply.com
www.leesupply.com
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McElroy Manufacturing, Inc.
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www.mcelroy.com/fusion
Ad on page 110

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800-344-6653 • 716-683-2486 • Fax: 716-683-6372
brian@powrmole.com
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800-373-2478 • 843-546-0600 • Fax: 843-527-2738
salesandmarketing@agruamerica.com
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Ad on page 29

Hanson Building Products
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800-445-1534 • 972-262-3600
www.hansonbuildingproducts.com

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marketing@ipexamerica.com
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duran@reliner.com
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Pipe Plugs

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www.3tequipco.com
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gdanaher@cherneind.com
www.cherneind.com
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sales@cloverleaffool.com
www.cloverleaffool.com
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www.gethurco.com
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info@logiball.com
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jbrennan@teamipr.com
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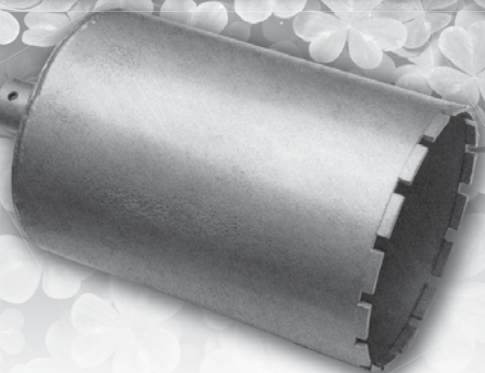
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www.GRpumps.com
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www.komline.com
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KSB, Inc.
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sales@ksbusa.com
www.ksbusa.com

Red Valve Co. / Tideflex Technologies

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Smith & Loveless, Inc.
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answers@smithandloveless.com
www.smithandloveless.com

Pumps - Grinder

AMT Pump (American Machine & Tool Co.)

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610-948-3800 • Fax: 610-948-5300
sales@amtump.com
www.amtump.com
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Central Oklahoma Winnelson

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krjones@winnelson.com
www.centralwinnelson.com
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Chempure Products Corp.

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chempure@gmail.com
www.chempure.com
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Cloverleaf Tool Co.

Tallevast, FL
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sales@cloverleaftool.com
www.cloverleaftool.com
Ad on pages 87, 97 and 111

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inquiry@gapvax.com
www.gapvax.com
Ad on page 115

General Pump
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sales@gpcompanies.com
www.generalpump.com

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www.GRpumps.com
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www.sewerequipment.com

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www.godwinpumps.com
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sales@ksbusa.com
www.ksbusa.com

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800-888-1436 • 605-743-2466 • Fax: 605-743-2465
info@gethurco.com
www.gethurco.com
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www.cloverleaftool.com
Ad on pages 87, 97 and 111

GapVax, Inc.

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www.sewerequipmentco.com
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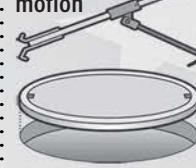
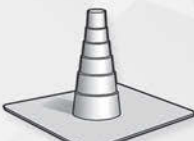
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info@logiball.com
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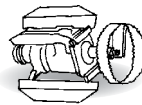
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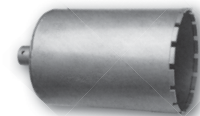
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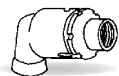
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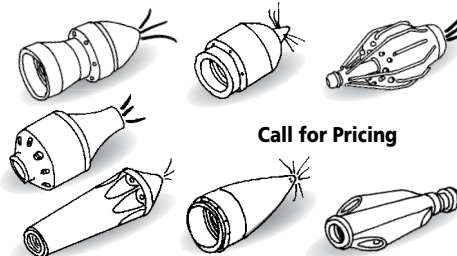
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STORMWATER MANAGEMENT

By Craig Mandli

The effective and responsible management of stormwater runoff has become an important part of the job description for most municipal sewer and water professionals. Highlighted below are products that will assist you in making sure stormwater is managed effectively.

Non-structural spray lining systems

Ecodur PG2C (plasticized gypsum coating) systems from **Colorado Lining International** are an ideal solution where protection against chemical and gas corrosion is desired but structural enhancement is not needed. It is formulated to withstand extreme levels of hydrogen sulfide gas and other corrosive elements found in water and wastewater environments, making it ideal for stormwater runoff. Benefits include 100 percent solids, zero VOC, superior adhesion, single-coat system, high-build capacity and NSF 61 compliance. The non-toxic liner system is completely solvent free. The site will also have a rapid return to service condition. **800/524-8672; www.coloradoining.com.**



Rental clarifiers

UniPure rental clarifiers are ideal for municipalities with stormwater that contains more than 50 mg/L of total suspended solids. They combine a drop-in and a locally sourced open top storage tank. The drop-in provides all the treatment capabilities of permanent clarifiers. The host tank reduces transportation costs, ensures availability and is delivered ready to operate. The unit can be delivered to a facility in days, and can be operating minutes after delivery. Demobilization is quick and easy. The host tank also provides ample sludge-holding capacity, as sludge management is as simple as placing a submersible pump under the drop-in. Periodic sludge transfers will allow the clarifier to operate efficiently and uninterrupted for the duration of the project. Rental units are available throughout the U.S. **877/864-7873; www.unipure.com.**



Combination jet/vac truck

The **Aquatech F-10** from **Hi-Vac** features a front-mounted reel designed by Aquatech. The 180-degree rotating reel facilitates easy unit placement. Reel capacity is designed and engineered for up to 800 feet of 1-inch hose. The top-loading boom powers up and down and extends to 26 feet from the pivot point. The single-engine drive dramatically decreases fuel consumption, maintenance expense, weight on the chassis and the initial chassis price. The water pump consists of a continuous flow, triplex reciprocating design and is rated up to 80 gpm at 2,000 psi. An optional unloader valve allows for complete control of water flow and pressure independent of the vacuum power. Tanks are constructed of high-strength, UV stabilized polyethylene, with optional fixed internal baffled aluminum tanks. **800/752-2400; www.aquatechinc.com.**



Storm screen

The **RoKI** storm screen from **Huber Technology** provides a straightforward and effective method for screening stormwater while not increasing the head-loss over the overflow. It is a trough of stainless steel perforated plate with a brush-edged auger. Water spilling from the storm overflow passes through the unit positioned beneath the weir crest. It removes solids in the overflow before continuing downstream. A discharge scraper either returns the screenings directly back into the flow for treatment, or discharges them for final disposal by separate means. **704/949-1010; www.huber-technology.com.**



High-rate filtration process

The **WWETCO FlexFilter** from **WesTech Engineering** uses a synthetic compressible media to capture solids in a high-rate filtration process. Ideal for stormwater runoff, rising influent applies hydrostatic force to the outside of tapered flexible bladders, causing the media within the bladders to compress loosely at the top of the filter, with a tighter porosity gradient through the depth of the filter. This tapered compression provides for a filtration bed that is more open at the top of the filter, graduating to more densely packed synthetic media in the deeper portions of the filtration bed. As the liquid flows over the top of the bladders and into the media bed, larger particles are trapped in the upper portions of the filter. As the liquid works its way down through the media, the smaller particles are captured. It is a simple gravity system with a design requiring no moving parts. It has a backwash system involving an air scour coupled with a high-energy wash cycle and specialized backwash troughs to minimize the volume of backwash water needed. **801/265-1000; www.westech-inc.com.**



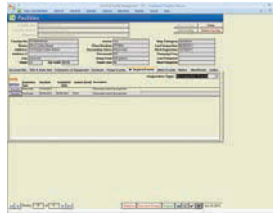
Wet weather flow treatment

The **BIOACTIFLO** system from **Kruger USA** combines two process steps, contact stabilization and microsand-ballasted clarification, to produce treatment of wet weather flows. Return activated sludge (RAS) from existing clarifiers is combined with the excess flows in a solids contact tank. A targeted mixed liquor suspended solids (MLSS) concentration is maintained in the contact tank to facilitate rapid uptake of soluble biological oxygen demand (BOD) via contact stabilization, which is followed by clarification. The combination of the two results in total BOD removals in excess of 85 percent, greater than 95 percent TSS removal and total phosphorus levels less than 0.15 mg/L. Existing installations for wet weather flows can be easily converted, and the train can also be used for tertiary treatment during dry weather flows. **919/677-8310; www.krugerusa.com.**



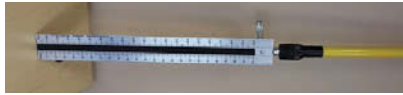
Stormwater management software

Linko software can be used to assist municipal technicians in managing their stormwater management programs. The robust database tracks sites, BMPs and public outreach efforts. It also schedules and records inspection events, sends letters and permits, and produces customizable reports, which is beneficial to agencies that are required to submit SWMP reports to state environmental departments. Data is easily gathered and summary reports are quickly generated. Users save time by avoiding complicated spreadsheets, and gain peace of mind knowing their data is secure in a fully supported database. **877/546-5699; www.linkodatasystems.com.**



Level calibration tool

The **QuickCal** level calibration tool from **ELAN Technologies** provides precise and accurate level measurement, an ideal tool for anyone performing open-channel stormwater flow monitoring. It consists of a 26-inch tapered edge aluminum ruler with 0.01-foot and 0.1-inch markings alongside an inset indicator strip and comes with extension pole. The tapered edge is designed to reduce flow disturbance, providing a more accurate reading. The level indicator strip darkens when wet, giving an easy-to-read line for water level. The level increments correlate directly to primary device tables and flowmeters without a decimal conversion. **815/463-8105; www.elantechnologies.net.**



Inline check valve

The **CheckMate Valve** from **Red Valve Co./Tideflex Technologies** was developed for CSO and diversion chamber applications. It is an inline check valve designed to be installed at the upstream or downstream side of a diversion chamber. The entire valve is constructed of rubber, making it rust-free and resistant to grease and oils typically found in wastewater. Additionally, with seven elastomers to select from, it can be manufactured to resist chemicals found in industrial wastewater applications. It boasts extremely low headloss, and can be specified and used in CSO, SSO, odor control, and municipal and industrial cross-connection. **412/279-0044; www.tideflex.com.**



Hydrostatic level transmitter

The **VL4000 Series** fully submersible hydrostatic level transmitter from **PMC Engineering** is designed for use in early warning monitoring systems for stormwater management. The fully welded titanium construction featuring a molded polyurethane Kevlar-reinforced cable provides more than 10 years of maintenance-free operation when terminated with the PMC TE11/MP11. The small diameter of either 0.75 or 0.39 inches is ideal for mounting in runoff or sewage pipes, stilling wells or deep wells. The piezo-resistive sensing element is fast to respond and can accurately monitor changes in water level down to less than 0.01 inch. It has an overpressure rating of 400 percent that enables the user to install transmitters of an appropriate range for normal monitoring, but still be confident of survival during extreme flood conditions where up to four times the depth might be experienced. **203/792-8686; www.pmc1.com.**



Utility sealant

Flex-Seal utility sealant from **Sealing Systems** is a plural component aromatic urethane with an 800 percent elongation and a tensile strength of 3,200 psi. It is designed to prevent inflow/infiltration and to provide corrosion protection at the grade adjustment ring section or joint section. It provides a seal that will pass a vacuum test according to ASTM standards. The internal seal is manually applied using a paintbrush, and the kit is designed to cover 12 vertical inches on a 27-inch-diameter manhole. **800/478-2054; www.ssisealingsystems.com.**



Stormwater runoff filter system

The **Linear** system from **Modular Wetlands Inc.** is ideal for green design and sustainable projects. It utilizes horizontal flow biofiltration, as it replicates natural processes to remove a variety of pollutants from stormwater runoff, including fine TSS, bacteria, oils and grease, heavy metals and harmful nutrients like nitrate and phosphorus. It incorporates screening, hydrodynamic separation, sorptive media filtration and bioretention into a single system. Completely modular, it can either replace standard stormwater inlets or function perfectly in an online or offline design to replace downward flow systems. **760/433-7640; www.modularwetlands.com.** ♦

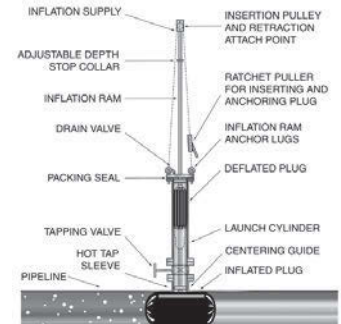


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Filter system prevents stormwater hydrocarbons from entering water system

Problem: The City of Norwalk (Conn.) Stormwater Management Improvement Project (CNSM IP) began in 2005 as a commitment to clean up local waterways as a part of the Long Island Soundkeepers' mission of protecting the Sound's ecosystem. The city wished to prevent debris, sediment, bacteria, hydrocarbons, oil and grease from entering the Long Island Sound.

Solution: This \$500,000 project involved installing **AbTech Industries' Ultra-Urban Filter units**. These units included Smart Sponge Plus, which is approved for the removal of coliform bacteria and is registered with the EPA.



RESULT

The units had an initial average trash, debris and sediment removal rate of 75 percent, and maximum removal rates in excess of 99 percent. The first cleaning of the 275 catch basins yielded over 15,000 pounds of trash, debris and sediment. Two years after the initial installation, the filters have removed over 51,500 pounds of contaminants. Deconstruction of the filters found that approximately 49 pounds of contaminants were captured by each filter. In total, the 275 filters likely prevented in excess of 1,200 gallons of hydrocarbons from entering Long Island Sound, protecting the ecosystem and recreational use. **800/545-8999; www.abtechindustries.com.**

Polyethylene pipe provides underground CSO storage

Problem: The City of Monticello, Ind., planned to replace a lift station at the Bryan Wastewater Treatment Plant and add an underground storage system for combined sewer overflow (CSO). The existing plant received large amounts of stormwater during wet weather events from the discharge of the city's other combined sewers that lead to the Bryan lift station. In addition to the unnecessary treatment of millions of gallons of water, rain events surcharged the sanitary sewers leading to the plant, and caused raw sewage backups throughout the city.

Solution: **DuroMaxx steel-reinforced polyethylene (SRPE) pipe from Contech Engineered Solutions** was selected for 395,000 gallons of underground CSO storage. It was chosen because of its 80-ksi steel-reinforcing ribs, pressure-rated PE resin, use of electrofusion joints for watertight protection and the ability to nest the 96-, 84- and 72-inch-diameter pipes to reduce freight costs.



RESULT

The pipe provides necessary storage capacity with long-term service and performance. Its durability and long service life allow for easy future expansion as the municipality continues to grow. **800/338-1122; www.conteches.com.**

Removable catch basin filter helps the management of illegal disposal in storm drains

Problem: After a large rainfall in Miami, Fla., in 1994, city workers found a flooded street and the catch basin plugged with concrete. The city's public works department regularly faced the costly problem of catch basin concrete dumping down municipal storm drains. People often see it happening but don't realize it's a crime; it often goes unreported. The catch basin is then plugged with concrete and costs thousands of dollars to correct. The city taxpayers were eating the cost.

Solution: A **Hydro-Cartridge from Advanced Aquatic Products International** was installed in a catch basin that was randomly selected by a driver to dump the slurry of remaining concrete in his truck. This catch basin filter not only meets NPDES pollution reduction goals, but is easily removable for cleaning.



RESULT

City workers were able to lift out the entire filter and remove the concrete. The catch basin and filter were not damaged. After sampling and testing local concrete batch plants, the perpetrators were charged and fined. **800/738-7646; www.hydro-cartridge.com.**

SCADA system helps keep remote surface water pumps operational

Problem: The Northern Palm Beach County Improvement District (NPCID) manages surface water through an approximate 128-square-mile multi-jurisdictional area that includes extensive wetlands that meander through many high-end communities including the PGA National resort and headquarters. The area has a mean elevation of 15 feet above sea level and high wet season rainfall levels (average 61 inches per year). NPBCID keeps all in check with a series of 15 remote pump stations (some having up to six pumps, with each pump moving water at a rate of 35,000 gpm) and 56 level control sites (many with multiple flood control gates). During the wet season (May thru October), many of these sites are difficult to reach and require a substantial amount of manpower to either remain on site or to risk injury and/or equipment failure trying to traverse the rain-saturated routes.



Solution: The municipality installed **Data Flow Systems' Tac II SCADA system** to remotely monitor and control the pump stations and flood gates from a central site.

RESULT

The municipality enhanced its ability to efficiently manage manpower and equipment, and the ability to consistently monitor and control the flow of surface and stormwater through the entire district. **321/259-5009; www.dataflowsys.com.**

Terraced vegetated slope solves drastic road grade change issues

Problem: A road-widening project in Sanford, Fla., was converting a two-lane county road into four lanes. The challenge was to look for a way to overcome an 8-foot change in grade from one side of the road to the other. County engineers were interested in an economical solution that would provide the most aesthetic solution possible, accounting for stormwater absorption and runoff.

Solution: The design, by Soil Reinforcement Design, Inc., called for **Miramesh GR and Miragrid 3XT with a wire basket facing from TenCate Geosynthetics North America**. Miramesh GR is a fairly open high-tenacity monofilament polypropylene product and Miragrid 3XT is a polyester geogrid that provides reinforcement for walls and slopes and has low creep values. A terraced vegetated wall was chosen in lieu of sheet piling or modular block wall. The total length of the wall was approximately 400 feet and tapered from 8 feet.



RESULT

The system worked out both from an economical and aesthetic perspective. Stormwater runoff has not been an issue. **800/685-9990; www.mirafi.com.**

RESULT

The system eliminated the need for a pumping system and any associated maintenance. The hydraulic system maximized the use of the limited space while providing the school with significant cost savings. **800/428-5832; www.cultec.com.**



Basin system utilizes gravity to drain stormwater runoff

Problem: Acacia Middle School in Hemet, Calif., recently underwent extensive improvements, including a redesign of the school's stormwater management system. The original system was designed to hold most of the runoff in the system, but it was determined that after a storm, runoff might pump back onto the street. Engineers were tasked with developing a system where the runoff would not exceed its peak flow to the street.

Solution: Engineers at Tory R. Walker Engineering, Inc. consulted with **CULTEC Inc.** to determine the most efficient way to install a subsurface stormwater management system that would include hydraulic principles and eliminate a pumping system. A three-basin system was designed to drain as much water volume by gravity as possible. Water that cannot be drained by gravity is directed to the parking lot next to the street. The first two basins are hydraulically connected, and a third longer basin was added in lieu of a drainage pipe.

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CASE STUDIES STORMWATER MANAGEMENT

Store built near Florida woodlands utilizes stormwater modules for runoff

Problem: Construction of a national drug store chain location in New Port Richey, Fla., required that the site be raised and fill be placed in a natural flood-mitigating woodland, reducing the attenuation capacity. The project contractor needed a product with acceptable levels of structural strength and stability.

Solution: The contractor looking for an alternative product contacted **Brentwood Industries distributor, RH Moore and Associates**, for pricing. RH Moore **recommended the StormTank** because of its high strength and high void space as an improvement to the system.



RESULT

StormTank modules were installed abutting the retaining wall to provide capacity as floodwaters rise. This solution provided the developer, engineer and contractor a cost effective solution. **610/374-5109; www.brentwoodindustries.com.**

Web-based weather stations track performance of green roof

Problem: Amherst College in western Massachusetts needed to determine the most prolific vegetation varieties for the green roof planned for its new 250,000-square-foot science building, expected to open in 2018. The green roof is intended to mitigate stormwater runoff, offset interior cooling costs and help the facility blend in with its natural surroundings.

Solution: Four Web-based **HOBO U30 weather stations from Onset Computer Corporation** are being used to help track local weather conditions. The weather stations feature double-weatherproof enclosures and are outfitted with plug-in soil moisture and temperature sensors, as well as sensors for measuring air temperature, wind speed, wind direction, relative humidity, rainfall, barometric pressure and solar-radiation data. The units are affixed to the top of an 8-foot shade wall from which they transmit data wirelessly to the college's computer network via HOBOLink, a 24/7 cloud-based data access service hosted by Onset.



RESULT

The stations are collecting data from the demonstration plots every 15 minutes, 24 hours a day, for the duration of the 2012-13 growing season. The collected data will help determine specific air temperatures, humidity levels and moisture levels that yield the healthiest plants, and gauge how the green roof is performing. **800/564-4377; www.onsetcomp.com.** ♦

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Rain for Rent partners with MobyDick

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Tri-Cities North Regional Wastewater Authority purchases sewer scanner

Tri-Cities North Regional Wastewater Authority, Dayton, Ohio, purchased Electro Scan's ES-620 for Sewer Mains to evaluate 6- to 20-inch-diameter pipes, target areas in need of repair and certify ongoing lining projects as leak free.

Sauereisen names research manager, office staff

Sauereisen promoted Greg Maloney to research manager, overseeing the company's C. Fred Sauereisen Laboratory. It also promoted several members of the office staff. Kim Galley was named finance administrator and Vicki Abell was promoted to billing, credit and collections administrator. Pam Semgo joined the accounting department as financial assistant to the controller and Patti Kenzie joined the company as executive assistant and human resource generalist.



Greg Maloney



Kim Galley



Vicki Abell



Patti Kenzie

FreeWave celebrates grand opening of new headquarters

FreeWave Technologies celebrated the grand opening of its new corporate headquarters in Boulder, Colo. The 45,000-square-foot facility — 80 percent larger than its previous building — includes increased manufacturing space and product testing center.

BDS Technologies expands management team

BDS Technologies named Thelma Flores, P.E., vice president. She will oversee engineering operations of the Dallas and Fort Worth offices. Flores has 30 years of development, design and management experience.

SOR Inc. founder Dunlap passes away

Roy Dunlap, founder of SOR Inc., passed away at age 90. Starting with \$2,000 and one employee, Dunlap opened a machine shop in 1946 and in 1956 leveraged static-o-ring technology to invent a mechanical pressure switch that helped prevent the overfilling of oil tanks. Dunlap remained involved in the business and on the board of directors until his passing in April. His daughter, Linda Dunlap, assumed the role of chairman of the board in 2010.

Brown and Caldwell promotes senior managers

Brown and Caldwell promoted Jay Patil, P.E., to director of client services and Cindy Paulson, Ph.D., to director of technical services.

Marc Damikolas, P.E., was promoted to senior vice president and business unit manager for the California region, replacing Patil. Robert Ash, P.E., was promoted to senior vice president and the new role of enterprise risk management. Jeffrey Theerman, P.E., was promoted to lead the newly combined utility performance, operations and maintenance, and information technology group.

LMK names managing director, northeast sales

LMK Technologies named David Archard managing director, northeast sales. He has 30 years experience in the municipal public works sector, assisting municipalities in managing and optimizing assets, with a focus on underground asset management/optimization projects.



David Archard

ePIPE receives innovation awards

ACE DuraFlo Systems' ePIPE placed second in the Selected Products category at the Construmat Fair for innovation and sustainability in Barcelona, Spain. ePIPE also was named a winner in the Best Innovation Implemented or Applied by a Contractor category at the UK Energy Innovation Awards in Manchester, UK.

Itron joins Smart Cities Movement

Itron joined global leaders Cisco, IBM, GE, Microsoft and AT&T as a founding member of the Smart Cities Council. The group is dedicated to creating smart, sustainable cities with high-quality living and high-quality jobs. It will develop targeted resources for core city departments and functions, including environment, economic development, energy, health and human services, public safety and security, transportation, waste, water and wastewater.

Vivax-Metrotech affiliate receives CivEnEx show awards

Vivax-Metrotech's Australian affiliate, Vivax-MetrotechAUS, received the Best Indoor Stand and Most Innovative New Product award for its vCam-5 inspection camera system at the CivEnEx show in Sydney, Australia. ♦

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PACP scholarship added to WEFTEC Operations Challenge

By *Ted DeBoda, P.E.*

The Operations Challenge, a competition that combines five equally weighed skills tests in collections, laboratory, maintenance, process control and safety events, is right around the corner. Every year

NASSCO works with the Water Environment Federation to develop PACP questions for this event, which is held during WEFTEC in October.

This year, we are also partnering with WEF to award an Operations Challenge team member with a PACP scholarship. To learn more about

PACP scholarships, visit the scholarships page on nassco.org for an application and eligibility information.

The quizzes we develop are available on our website for anyone who wants to sharpen their PACP skills. Below are a few example questions. To check your score,

NASSCO (National Association of Sewer Service Companies) is located at 11521 Cronridge Drive, Suite J, Owings Mills, MD 21117; 410/486-3500; www.nassco.org

click the PACP icon on nassco.org and follow the link to "PACP Sample Quizzes." Look for "MSW September 2013 Quiz" for the answers. ♦

Ted DeBoda is executive director of NASSCO. He can be reached at director@nassco.org.

Select the correct line of code for each CCTV photograph.

1) Code the water level.



Distance (feet) (meters)	Video Ref	Code		Continuous Defect	Value			Joint	C. Location		Img. Ref	Remarks	
		Group/ Descript.	Modifier/ Severity		S/M/L	Inches			%	At/From			To
						1st	2nd						
0.0			MWL					04	08				
0.0			MWM				45						
0.0			MWL				40						

3) Code the most severe structural damage



Distance (feet) (meters)	Video Ref	Code		Continuous Defect	Value			Joint	C. Location		Img. Ref	Remarks	
		Group/ Descript.	Modifier/ Severity		S/M/L	Inches			%	At/From			To
						1st	2nd						
81.9			HVV					J	07	08			
81.9			CM	S02				J	07	08			
81.9			TFD		06				07				

2) Code the infiltration.



Distance (feet) (meters)	Video Ref	Code		Continuous Defect	Value			Joint	C. Location		Img. Ref	Remarks	
		Group/ Descript.	Modifier/ Severity		S/M/L	Inches			%	At/From			To
						1st	2nd						
50.7			RMJ				10	02	09				
50.7			IR					09	02				
50.7			DAE				10	09	02				

4) End the survey



Distance (feet) (meters)	Video Ref	Code		Continuous Defect	Value			Joint	C. Location		Img. Ref	Remarks	
		Group/ Descript.	Modifier/ Severity		S/M/L	Inches			%	At/From			To
						1st	2nd						
44.9			MSA									Crossbore	
44.9			AEP										
44.9			ADP										

WORTH NOTING

PEOPLE/AWARDS

Charleston County (S.C.) Public Works, Transportation Development and Facilities Departments were awarded full accreditation on May 10. Charleston County's three departments joined Anderson and Georgetown counties to become the third agency in South Carolina and the 83rd agency in North America to receive full accreditation, according to a news release.

West Virginia University's Environmental Health and Safety Department was honored this year with an Environmental Excellence Award in the municipal stormwater category from the West Virginia Department of Environmental Protection.

The City of South Lake Tahoe (Calif.) was awarded a competitive grant from the State Water Resources Control Board through the Proposition 84 Stormwater Grant Program.

LEARNING OPPORTUNITIES

American Society of Civil Engineers

The ASCE has these courses:

- Sept. 19 – Stormwater BMPs: What Works, What Doesn't and What About Maintenance, online
- Sept. 23 – Creating Design Storms for Rainfall-Runoff Models, online
- Sept. 26-27 – Pumping Systems Design for Civil Engineers, Austin, Texas

Visit www.asce.org.

American Water Works Association

The AWWA has a Dam Safety 2013 seminar on Sept. 8-12 in Providence, R.I. Visit www.awwa.org.

CALENDAR

Oct. 1-3

National Rural Water Association H2O-XPO, Louisville, Ky. Visit www.h2o-expo.org.

Oct. 5-9

Water Environment Federation's Technical Exhibition and Conference, McCormick Place South, Chicago. Visit www.wef.org.

Oct. 10-12

American Society of Civil Engineers 2013 Annual Conference, Charlotte Convention Center, Charlotte, N.C. Visit www.asce.org.

Nov. 4-7

American Water Resources Association Annual Conference, Red Lion Hotel, Portland, Ore. Visit www.awra.org.

Texas

The National Association of Flood and Stormwater Management Agencies has a Flood Risk Management Agency-to-Agency Mentoring Session on Oct. 4 in Sugar Land. Call 281/275-8400 or visit www.nafsmag.org.

Wisconsin

The University of Wisconsin Department of Engineering-Professional Development has these courses:

- Oct. 14-15 – Using WinSLAMM v. 10: Meeting Urban Stormwater Management Goals, Madison
- Oct. 21-23 – Essentials of Hydraulics for Civil and Environmental Professionals, Madison

Visit <http://epdweb.engr.wisc.edu>. ♦

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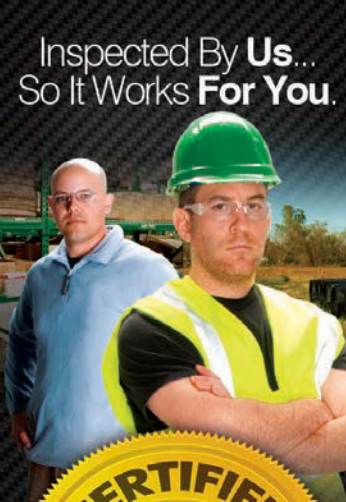
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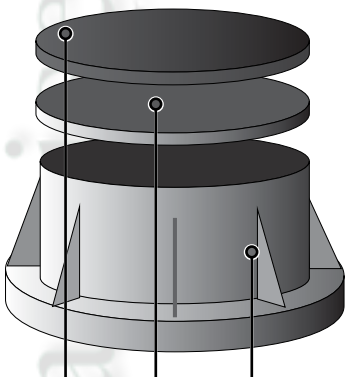
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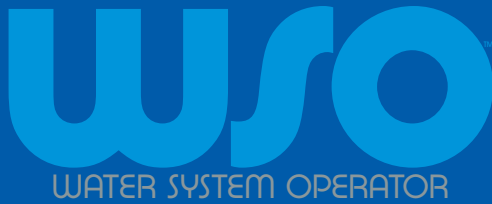
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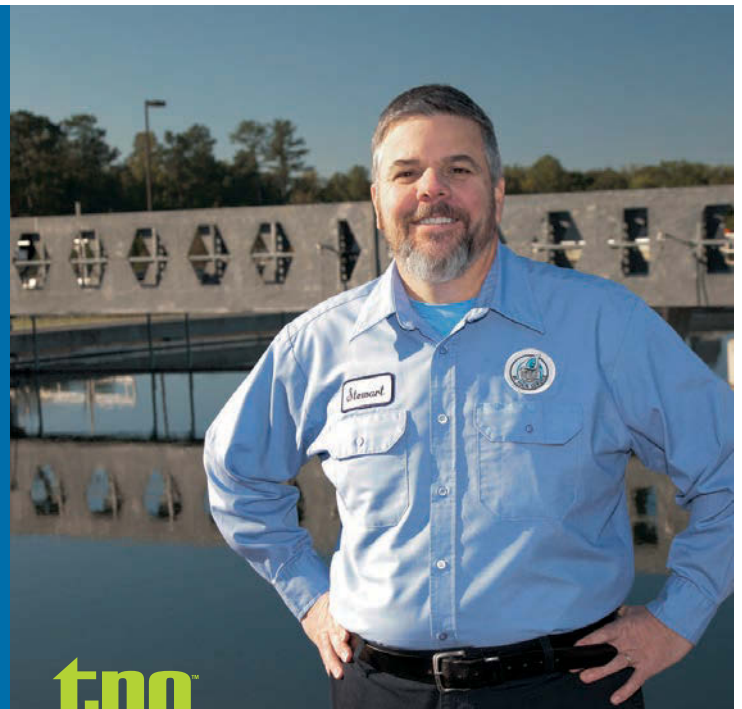
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