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February

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BETTER MOUSETRAPS: ST. LOUIS  
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SOLUTION

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# AN 18-YEAR FIX

Toledo Waterways Initiative  
is closing in on completion  
of a half-billion-dollar  
sewer improvement program

PAGE 14

Julie Cousino, P.E.,  
Program Administrator  
Toledo Waterways Initiative



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Water & Wastewater Equipment, Treatment & Transport Show

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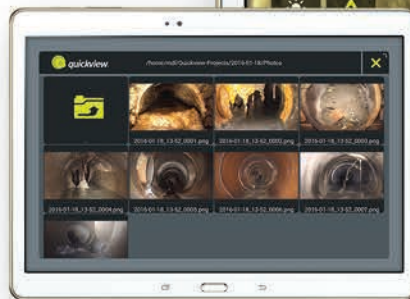
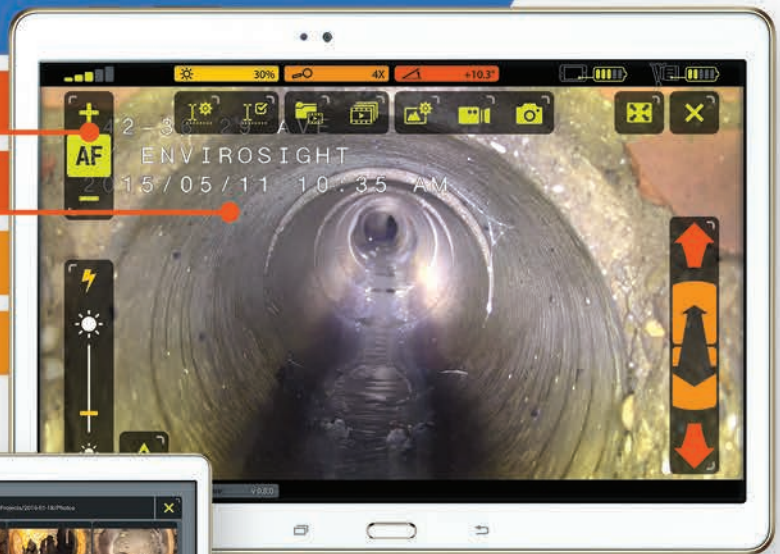
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# INSIDE:

WWETT SHOW ISSUE,  
PIPELINE & INFRASTRUCTURE, HYDRANTS



ON THE COVER: Julie Cousino, P.E., program administrator with the Toledo (Ohio) Waterways Initiative, stands at the top of the Ottawa River Storage Facility, which is the largest part of the Toledo Waterways Initiative. (Photography by Amy Voigt)



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CONEXPO Show Issue, Manhole TV Inspection & Location

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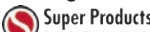







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## MUNICIPAL SEWER & WATER

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



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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](mailto:editor@mswmag.com).

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**CIRCULATION:** 2016 average circulation was 37,623 copies per month (U.S. and international distribution).

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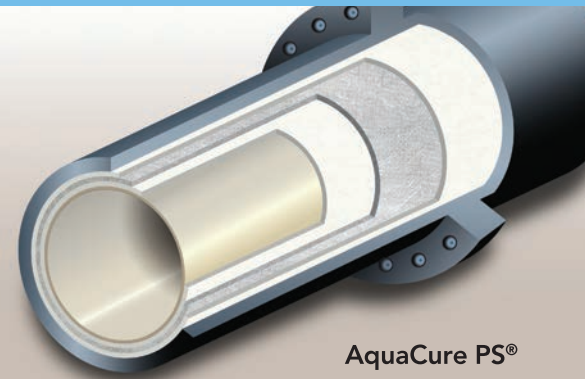


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## FROM THE EDITOR

*Luke Laggis*

The work you do is rarely given the credit it deserves. Your best work is too often buried and forgotten by the people you serve. But every February, the water and wastewater industry, and all of you who help ensure the health and safety of your communities, are celebrated.

More than any other, the Water & Wastewater Equipment, Treatment & Transport Show in Indianapolis is the event that brings the whole industry together and highlights the great work you're doing. It's an opportunity to speak with and learn from your peers, and to get direct feedback from people facing the same challenges.

It's also an opportunity for me to get some feedback on the magazine and what we can do to serve you better. I always appreciate hearing your thoughts about what we're doing — right and wrong — and how we can do it better.

This will be my sixth trip to Indy. The first time I was fresh to *MSW* and was just taking it all in. In the subsequent years, as I've grown to know and

understand the industry better, I've been able to get more out of the show. The more I learn, the more interesting it becomes.

This year will be a little different. COLE Publishing's role with the show has changed. As most of you know, the show is in new hands, but *MSW* and the other COLE publications will still be well represented.

In years past, I was responsible for the daily program and much of my time was consumed with getting that off to press each day. For me personally, the good news is I won't be on a daily deadline this year. Instead, I'll be focused on seeing what's new and talking to more of you.

I can remember how impressed I was with the size and scope of the show floor on my first trip to Indy, but at this point I realize it's not the trucks and equipment that make it so impressive. It's the people. I'm looking forward to talking to as many of you as possible, getting your feedback, listening to the issues you're facing, and hearing your stories. Of course, I'm excited to check out all the new tools, trucks and equipment, too, but it's really your stories I'm interested in.

We won't be right up front running it all like in years past, but we'll be available throughout the show in the COLE Publishing booth (#2371) out on the exhibit floor. Our editorial staff will be on site, ready to answer your questions, and more importantly, hear your stories.

I hope you had a chance to check out the WWETT Product Preview in the January issue of *MSW*. It's a good look at some of the new tools and equipment you can expect to see on the floor. The level of technology and innovation is remarkable.

I also hope you're gearing up for Indy and are excited to take in everything the show has to offer. I'm looking forward to it and I hope to see you there.

Have a great time at the show, and enjoy this month's issue. ♦

Comments on this column or about any article in this publication may be directed to editor Luke Laggis, 800/257-7222; editor@mswmag.com.

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## MACHINE MAINTENANCE

### Proper Boom and Debris Tank Care is Vital

Two of the most important hydroexcavator components to keep an eye on are the boom and debris tank. After all, the boom is what makes first contact with the material you're tackling on the job site, and that material ultimately ends up in the debris tank. Neglect those two areas and your machine won't be operating at peak efficiency. At worst, you might experience downtime. A couple hydrovac manufacturers provide their maintenance advice. [mswmag.com/featured](http://mswmag.com/featured)

## OVERHEARD ONLINE

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— *Initiating Water Culture Through Water Clusters* [mswmag.com/featured](http://mswmag.com/featured)



## ENVIRONMENTAL STEWARDSHIP

### California Water District Improves Fish Spawning Grounds

The Santa Clara Valley Water District is proof that a utility can help combat the negative effects it may have on the environment. When conservation groups complained that the district's operations were not allowing for adequate flows for area fisheries, the utility got to work. In 2015, after years of planning and collaborating with the California Department of Fish and Wildlife, the district completed the first of three planned projects that will give the endangered steelhead trout and other fish better access to their spawning grounds. [mswmag.com/featured](http://mswmag.com/featured)

## BUYER BEWARE

### Smart Shopping a Must When Buying a Pre-Owned Truck

As demand for vacuum trucks rises, causing the lead time for taking delivery of new trucks to rise as well — not to mention tight equipment budgets — pre-owned vehicles are becoming an increasingly popular option. But there's also a lot to consider when going the pre-owned route. Here are eight tips that can help guide you through the pre-owned purchasing process. [mswmag.com/featured](http://mswmag.com/featured)



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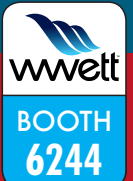


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# AN 18-YEAR FIX

Toledo Waterways Initiative is closing in on completion of a half-billion-dollar sewer improvement program

By Erik Gunn

The city of Toledo has many claims to fame. It's home to the iconic Jeep, the granddaddy of sport utility vehicles. It's also home to the Mud Hens — the equally iconic minor league baseball team celebrated by Cpl. Klinger in the classic TV show *M\*A\*S\*H*.

Against such popular cultural touchpoints, the Toledo Waterways Initiative may seem positively mundane. But when it comes to the ongoing work to rejuvenate the nation's environmental protection infrastructure, the 18-year initiative estimated at more than \$500 million could be among the most ambitious and successful programs to date.

"As we go through and finish out, I'm very proud to be able to say we're on schedule and on budget," says Julie Cousino, who since 2014 has been program administrator for the Toledo Waterways Initiative within the Toledo Department of Public Utilities.


The story isn't over yet. The assortment of projects still on the to-do list runs through 2020. By then the city will have completed an enormous rehabilitation of its most problematic sanitary and combined sewer collections and treatment systems. Along the way it has tested some new approaches, strived to finance the project responsibly, met countless federal deadlines, and even

developed a sophisticated set of strategies to help the public understand why the time, energy and expense will make their lives better.

It has also made essential contributions to the city's quality of life and its business climate, Cousino points out. The city prides itself on the amenities of the nearby Maumee and Ottawa rivers and Swan Creek, and ensuring they are clean and safe preserves a favorite source of recreation and natural beauty.

And more to the point, the TWI continues to accomplish its bottom-line objective: eliminating sanitary sewer discharges and reducing combined sewer discharges to a minimum.

*(continued)*



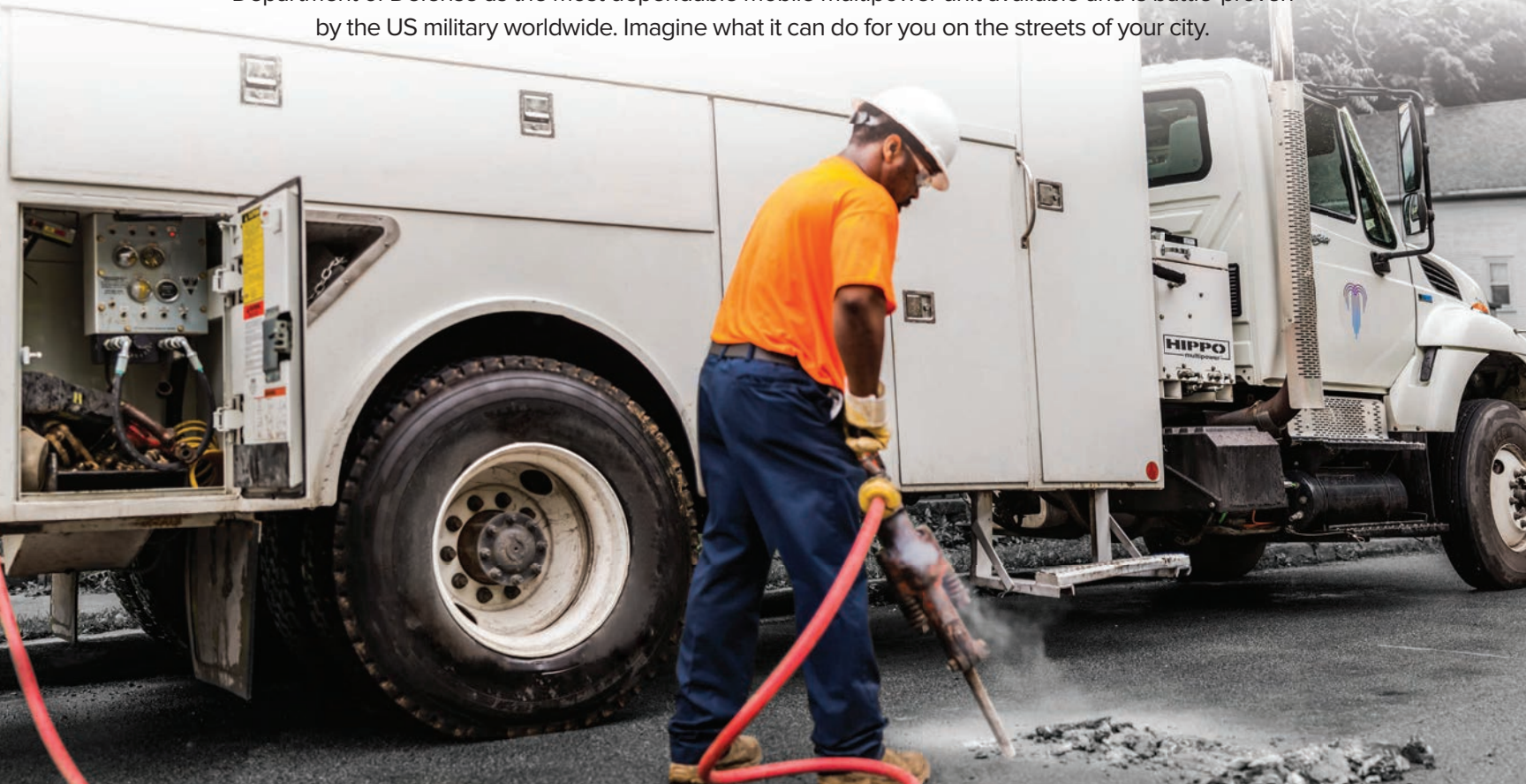
Workers build part of the pump station in the Ottawa River Storage Facility, which is the largest part of the Toledo Waterways Initiative in Toledo, Ohio. (Photography by Amy Voigt)



## ANSWERING THE CALL OF DUTY

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Workers pour concrete for the columns on the underground storage basin in the Ottawa River Storage Facility. The basin will hold 36 million gallons.

**“As we go through and finish out, I’m very proud to be able to say we’re on schedule and on budget.”**

– Julie Cousino

The keys to success? Cousino points to a number of strong management practices in response to the strict standards imposed by federal regulators: Clear deadlines and benchmarks, and methodical planning to meet them; experience and professionalism inside the department and among its outside consultants and contractors; and cooperation and support from the same regulatory agencies that must ultimately hold the city to account.

It doesn’t stop there, though.

“We’ve had tremendous support from the city council and the city administration,” Cousino says. “That’s a big reason for our success.”

And, she adds, backing from the public. “We’ve had great community support.”

### Initiative history

The program’s roots are likely familiar to municipal sewer utility operators. The Toledo Waterways Initiative grew out of 11 years of litigation over sanitary and combined sewer system overflows into the nearby Maumee and Ottawa rivers and Swan Creek. The long court proceeding culminated in a 2002 consent decree that the city of Toledo signed with the U.S. EPA — one of hundreds that the federal government has obtained with cities nationwide to clean up pollution caused by aging sewer systems.

The repair and rehabilitation program, that



### PROFILE:

## City of Toledo Department of Public Utilities

**POPULATION SERVED:**  
Estimated 320,000

**SERVICE AREA:**  
City of Toledo, Ohio

**TREATMENT CAPACITY:**  
400 mgd

**EMPLOYEES:**  
328 [Entire department]

**INFRASTRUCTURE:**  
1,055 miles of sanitary sewers, including combined

**ANNUAL OPERATING BUDGET (WASTEWATER COLLECTION AND TREATMENT):**  
\$51 million in 2015

**WEBSITE:**  
[www.toledowaterwaysinitiative.com](http://www.toledowaterwaysinitiative.com)



the consent decree committed Toledo to undertake, was so large and expensive the city took it to a voter referendum for approval in July 2002.

The city implemented special sewer rates to pay off loans and partially fund the initiative, and it has had to raise those rates periodically as new projects are instituted and new loans secured to fund them. The last round of rate increases went before the Toledo City Council for approval in August 2014 and carries the project through 2020, setting increases of 7.1 percent per year from 2015 through 2019, concluding with a final hike of 7.9 percent in 2020. The debt is projected to be paid off in the mid-2030s.

Grants from various state and federal pro-

grams have also helped to pay for some of the work.

The consent decree imposed strict project deadlines, with hefty fines for failing to meet them. The initiative's total number of projects exceeds 45. In moving to completion, the city has met every consent decree deadline so far — 138 as of this writing.

"We're very proud of meeting those dates," Cousino says. Another 28 deadlines are still on the calendar, and she's confident the city will adhere to its perfect record. Professional pride

**"When that construction is complete, we will have eliminated 650 million gallons of untreated sewage annually from entering our area waterways. That's an 80 percent total reduction in waste overflow."**

– Julie Cousino

is one incentive; so are the financial penalties for falling short.

### Three-part agenda

- The initiative has three broad components:
- Improvements to Toledo's Bay View Treatment Plant

## PROFESSIONAL AND COMMUNITY SUPPORT

The massive Toledo Waterways Initiative owes an important measure of its success to teamwork, says TWI's program administrator, Julie Cousino.

Consulting engineers Black & Veatch have provided high-level construction management skills to most of the projects that make up the initiative, Cousino says. State and federal regulators have offered cooperation and support as the city strives to meet the terms of the legal consent decree that set the overall program, as well as the individual projects, in motion.

But community outreach has been a key as well. Business associations and neighborhood groups have been on board, participating through advisory committees to the project.

And the initiative has looked for ways to turn some big projects into win-win affairs that could provide community amenities. For example, a 36-million-gallon storage basin that helps keep polluted storm and sewer water out of the Ottawa River was built at a park.

TWI teamed up with neighborhood leaders to spruce up the park with a new shelter, a lighted baseball diamond and replacement playground equipment.

Communication is central, Cousino says. The program's website keeps visitors to the page updated on project progress and details. As a result, community support for the effort is widespread, she points out.

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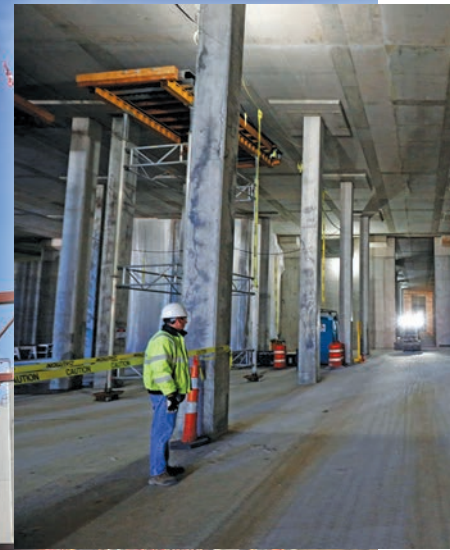
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Construction manager Rich McQuade (left) speaks with Julie Cousino, program administrator with the Toledo Waterways Initiative, at the bottom of the Ottawa River Storage Facility.



- Elimination of sanitary sewer discharges
- Control and reduction in combined sanitary/storm sewer overflows

The wastewater plant improvements include doubling capacity to 400 mgd. That was the result of the construction of a wet-weather facility at the plant to accommodate the excess flow of stormwater from the combined sewers and from inflow and infiltration in the sanitary sewer system.

The wet-weather facility reconstruction included building a 232 mgd-capacity high-rate clarification facility, a 25-million-gallon equalization basin, and a new effluent pump station.

Adding the high-rate clarification system was part of a test to see if the chemical treatment system could be an efficient alternative to the plant's longstanding biological treatment process. As part of the consent decree, the city is testing treated water for pathogens to compare the effectiveness of the chemical treatment with that of the standard biological treatment. The comparison study has a requirement of 10 qualifying rain events.

The plant renovations produced swift results.

"Since we completed that construction in 2006, we have not had any bypasses of untreated sewage at the plant," Cousino says.

### Sanitary sewer discharges

Eliminating sanitary sewer discharges required identifying and rebuilding locations throughout the collections system where discharges take place.

"With the consent decree we were required to eliminate all known sanitary sewer discharges," Cousino explains. The list started with 10; by 2014 they had all been eliminated. But the city has since found that the job wasn't over: There were two more sanitary sewer overflow points that hadn't been identified before.

"Any time you discover a new sanitary sewer overflow, you are required to eliminate it," she adds. The TWI is now addressing the two newly discovered discharge points.

Beyond simply closing off the sanitary sewer discharges, a variety of approaches have been employed for the projects. Some entailed building underground concrete basins or storage tun-

nels to hold excess flow until it could be sent to the treatment plant.

In other instances, sewer lines were replaced or separated from combined sanitary/storm lines. Still other lines were rehabilitated with CIPP to eliminate stormwater inflow & infiltration that burdened the system.

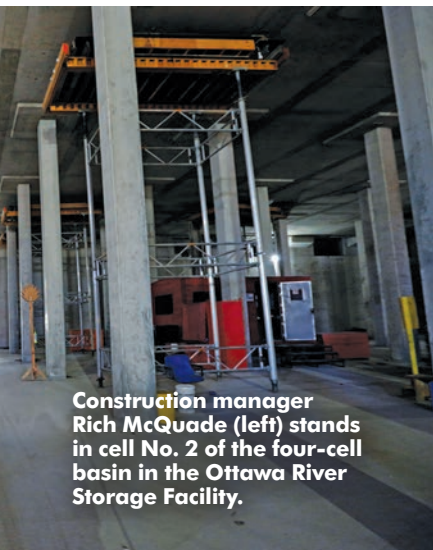
### CSO improvements

As with eliminating sanitary sewer discharges, reducing combined sewer overflows has first required identifying the CSO discharge points.

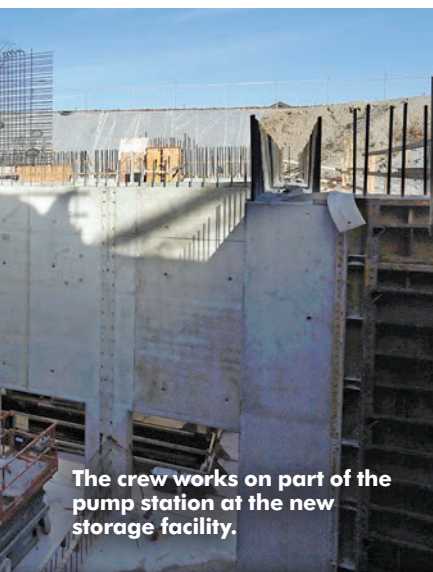
The 100 square miles of area that is served by the city's sewer collections system includes 17 square miles served by combined storm/sanitary sewers.

Before the initiative, "we had 32 permitted combined sewer overflow discharge points," says Cousino. "Some of them discharged 34 times per year on average."

The EPA consent decree required the city to eliminate eight of those entirely. So far seven of the eight have been taken out: Three that dis-



Construction manager Rich McQuade (left) stands in cell No. 2 of the four-cell basin in the Ottawa River Storage Facility.



The crew works on part of the pump station at the new storage facility.

charge into the Maumee River, three into the Ottawa River, and one into Swan Creek. The eighth, another Maumee River discharge location, is scheduled to be removed in 2019.

Toledo must also reduce the frequency of overflows at the remaining combined sewer outfalls. Instead of 34 discharges a year on average, the consent decree requires the city to discharge a mere fraction of that — no more than two overflows in five years at one location, for instance, or three a year at another. Overflows are measured over a five-year period, allowing for fluctuations so long as the required average is met.

“We use several approaches to reduce combined sewer overflows,” Cousino says. “We’ve done sewer separation, we’ve done sewer separation with flow reduction, we’ve done storage basins, we’ve done storage pipelines. We’ve also performed optimization of our existing storage tunnels, and we have two projects coming up that will construct regulator modifications.”

Combined sewer separation projects have included some in which the combined line was restricted to sanitary sewer use and a new, separate storm sewer was installed. In other instances, the reverse happened: new sanitary sewer lines were installed while the combined line was shifted to entirely stormwater flow.

Currently the initiative is working through a list of 25 projects that must be completed in order for the system to meet the CSO control standard set in the consent decree, Cousino says.

Along the way, the need for supplemental projects has cropped up from time to time. In one case, a crew showed up to clean a segment of sewer line and found it so deteriorated it needed to be replaced. That project wasn’t part of the original list, but the work was done nonetheless.

Of the 25 CSO-related projects, 18 have reached substantial completion, two are in the middle of construction, and five are in various preconstruction stages.

Altogether, 35 million gallons of capacity for combined sewer storage has been completed (including 19 million gallons prior to the TWI with the construction of CSO storage tunnels), 43 million gallons of capacity is under construction, and another 17 million gallons is on the drawing board. When finished, the city will have added a total of 95 million gallons of combined sewer storage capacity to the system.

With just four years left until that last deadline in 2020, Cousino is confident that the work will finish on time.

“When that construction is complete, we will have eliminated 650 million gallons of untreated sewage annually from entering our area waterways,” Cousino says. “That’s an 80 percent total reduction in waste overflow.

“I think that’s something to be proud of.” ♦

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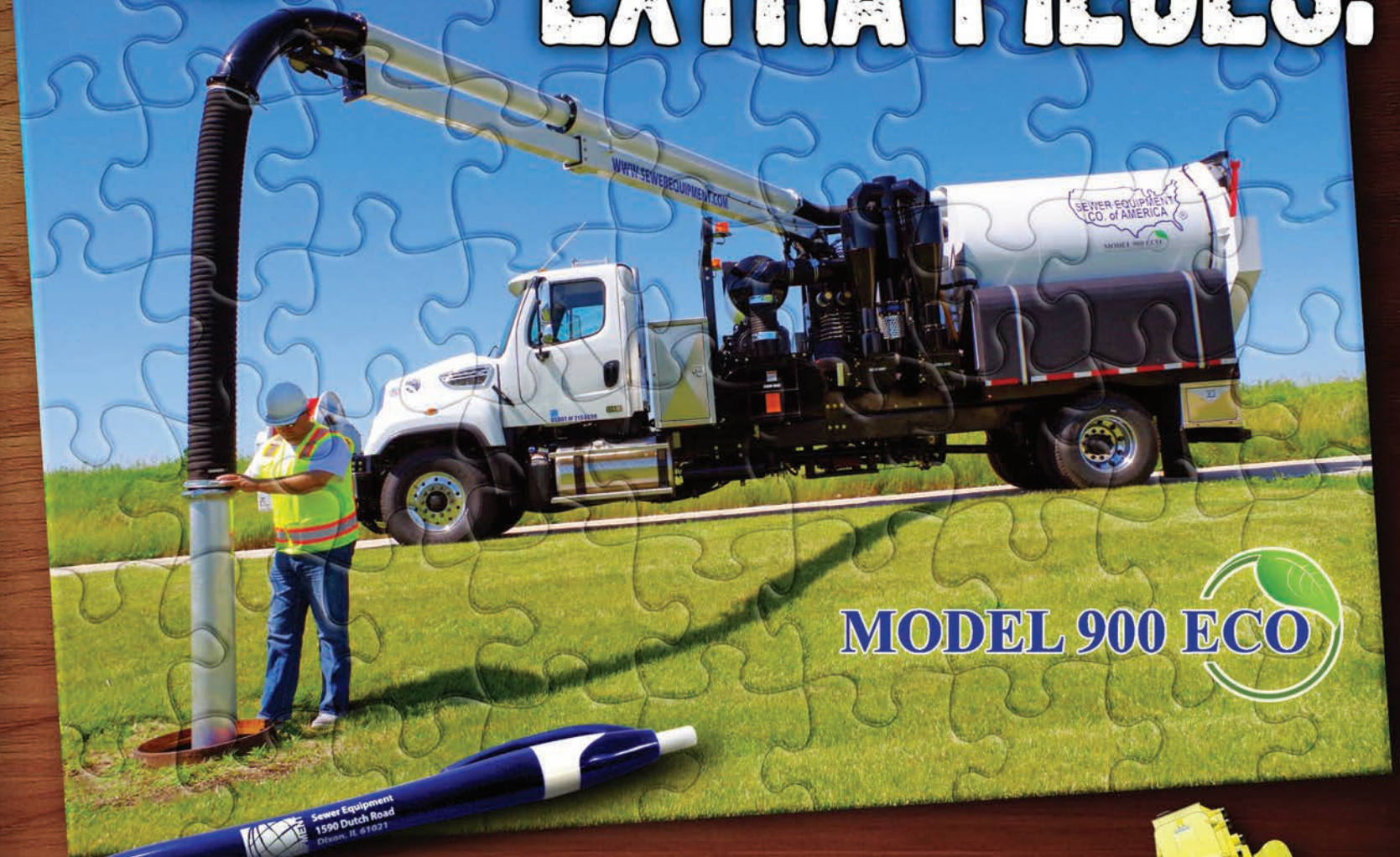
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# BUILT TO LAST

Combination jet/vac from GapVax is time-tested and trusted

By *Craig Mandli*

**GapVax owners Gary Poborsky (middle) and wife Rose (left) discuss the water pump on the MC 1510 Combination JetVac with an attendee at the 2016 WWETT Show. The user-friendly unit is designed for one operator to handle effectively. (Photo by Craig Mandli)**



While GapVax always uses the annual Water & Wastewater Equipment, Treatment & Transport Show to unveil their newest products, the show also gives the company the opportunity to highlight the longstanding stalwarts in their fleet of products.

Despite being available for more than 14 years, the MC 1510 Combination JetVac turned plenty of heads at the 2016 show. According to Gary Walker, a product specialist and demonstrator of the MC Series, that's because the unit is the perfect fit for the WWETT Show crowd.

"The best fit for this particular unit is municipalities and industrial drain cleaners," says Walker. "This is the show those guys are always at. This is what they are looking for."

The unit comes with a two-compartment tank that includes a 1,500-gallon water tank compartment constructed from 3/16-inch stainless steel, and a 10-cubic-yard debris tank made from 3/16-inch ASTM A572 Grade 50 exten steel. The tank has a full-opening tailgate with field-adjustable hinge and dual cylinders. Four fail-safe, individually adjustable locks ensure no spillage. A heavy-duty, double-acting lift cylinder provides a stable 50-degree dump angle.

"This unit is designed to be operator-friendly," Walker says. "The operator has easy access to all controls and functions needed during the job. It is designed for operation by one person if necessary."

The unit's front-mounted, articulating hose reel has a heavy-duty frame mount with high ground clearance and allows for easy engine access. It is directly driven with a capacity of 1,200 feet of 3/4-inch hose, 800 feet of

1-inch hose, or 500 feet of 1 1/4-inch hose. The water system includes a 3-inch water fill line with anti-siphon and 2 1/2-inch fire hose fitting, a curbside water level sight tube, 3-inch water supply line with easy access filter and shut-off valve, and low-point water drains. Its triplex water pump provides 80 gpm at 2,000 psi, with upgrades increasing capacity to 100 gpm at up to 3,000 psi.

Vacuum is provided by a positive displacement pump offering 3,500 cfm at 16 inches Hg. The 500 hp transfer case provides up to 15.5 ft-lbs of torque, and the 8-foot front-mounted, telescopic boom has twin lift cylinders and a 26-foot reach, allowing it access to the hard-to-reach areas found in urban areas. Blowers are available offering up to 6,000 cfm at 27 inches Hg. GapVax has hundreds of MC 1510 units currently in operation around the world, and according to Walker, few complaints ever come in.

"People just don't call us with problems on these units," he says. "They are built to last. We do a lot of demos with competing manufacturers for potential buyers, and that really lets customers compare. We love going head to head."

Walker was very happy with how the 2016 WWETT Show went for GapVax, especially the show's first day and the Kick-Off Party at Lucas Oil Stadium. An MC unit was on display at the party, and it definitely got attendees talking.

"Talking to people right on the field was so much fun for us," Walker says. "Seeing those beautiful trucks in a completely different environment was electric. That was a great addition to the show." 888/442-7829; [www.gapvax.com](http://www.gapvax.com). ♦

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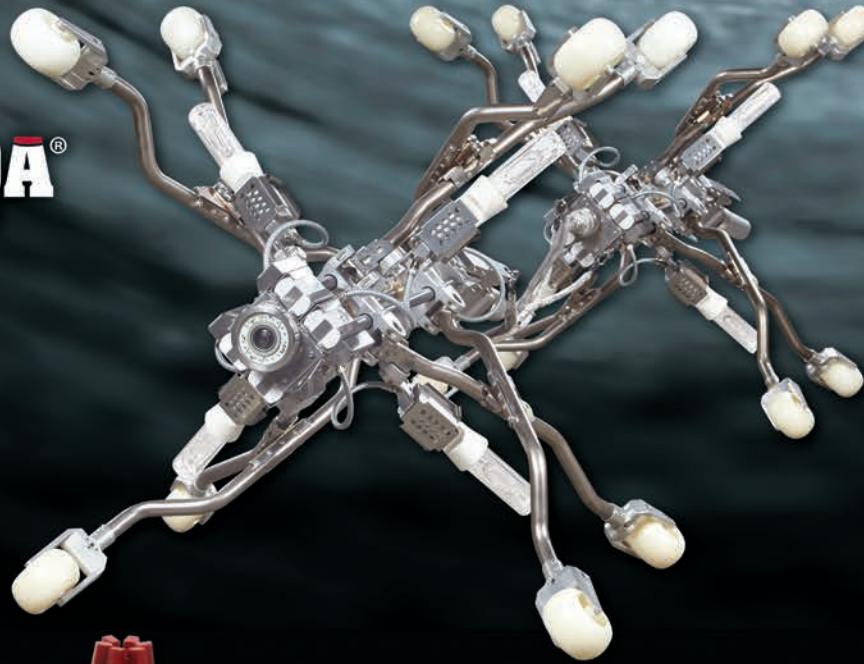




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# TAKING CARE OF THE CHESAPEAKE

Maryland utility's protection and restoration program is making a significant impact on an important watershed

By *Jim Force*

**I**nnovative public-private partnerships are just one of a stream of steps Anne Arundel County, Maryland, is taking to reduce stormwater runoff, meet their Municipal Separate Storm Sewer System permit, and help achieve new Total Maximum Daily Load limits for phosphorus, nitrogen and sediment in the Chesapeake Bay.

The effort — titled the Anne Arundel County Watershed Protection and Restoration Program — is managed by the county's Department of Public Works. Erik Michelsen is program administrator.

"We are under orders to implement the plan by the end of 2019," Michelsen explains. "We are well along in implementing a number of specific projects that will enable us to meet our new MS4 permit."

The projects include restoration of eroding and degrading areas like streambeds and outfall discharges into natural areas, retrofitting of old stormwater retention ponds, restoring shorelines and repairing infrastructure. Financial support comes from the county's stormwater remediation fees, initiated in 2013.

**Anne Arundel County Department of Public Works program specialist Bryan Perry (right) checks water quality along Wilelinor Stream with Erik Michelsen (left) and Robb Fish. (Photography by John Boal)**

The program includes a groundbreaking restoration grant program that incentivizes area nonprofit entities as well as the private sector to undertake restoration projects on their own property. "The county then gets credit for the restoration toward its permit requirements," Michelsen explains. (More information on the grant program can be found at [www.cbtrust.org](http://www.cbtrust.org).)

## **Anne Arundel County**

Anne Arundel County is home to over 530,000 people and includes the state capital  
*(continued)*

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city of Annapolis. With over 500 miles of coastline along the Chesapeake Bay, the county is known for boating, fishing, crabbing, waterskiing, sailing and swimming. Baltimore is located just north of the county, and Washington, D.C., just to the southwest.

Like other large jurisdictions in the state, the county had been mandated to assess property owners a stormwater remediation fee to provide a dedicated source of revenue for stormwater management programs. The fee differs for residential versus commercial property owners, and is based on the amount of impervious surface area on the property and its zoning location in the community.

In addition, in 2010, the EPA had established new TMDL limits for the phosphorus, nitrogen and sediment in the Chesapeake Bay watershed, which includes most of the state of Maryland as well as Delaware, D.C., and parts of New York, Pennsylvania, Virginia and West Virginia.

"We knew the obligation (to restore the watershed and reduce pollutant discharges to the Bay) was coming in our renewed MS4 permit," Michelsen says. That gave the county a head start in identifying, planning, designing and building critical projects.

Today, Michelsen says, the county is well along on implementing the plan. "We still have some watershed assessment

work going on," he explains, "but we're about 90 percent complete (with that phase). We're lucky in that — over the preceding decade — the county had spent funds and identified locations where restoration work could take place. We've been able to put together a capital program and implement the work based on those assessments."

The stormwater fees have been used to leverage bonds, pay debt service, cover staff expenses, and fund some of the watershed assessment and maintenance costs. Overall cost to meet the MS4 restoration requirements in the county is expected to be about \$344 million.

### Capital projects

Broadly speaking, the capital projects in the county's WPRP fall into several specific categories:

- Stormwater facility retrofits
- Outfall projects
- Stream and wetland restoration

The stormwater facility retrofits involve improvements to old ponds or other facilities that were parts of the county's initial flood control system, Michelsen explains. "These are mostly old dry ponds that were used for shaving peak flows, not really much in the way of water quality protection," he says. "They provide a nice footprint for us to go back in and obtain storage as well as provide volume control. They're really the low-hanging fruit in the overall project."

The existing stormwater ponds near the Hospital Drive project in Glen Burnie provide an example. There, tree roots had penetrated the banks and during a rainstorm the trees could have collapsed into the ponds. The retrofitting of the pond created a more sustainable stormwater facility, according to the county's website. The dam embankment was removed, and a rock-lined step pool storm conveyance system was installed, serving as an ecologically friendly way to safely convey stormwater flows while recharging the groundwater and reducing runoff. From an aesthetic standpoint, the pond looks a lot better, as well.

The outfall rebuilds are necessary because the county has quite a range of topography, with

little bedrock and mostly erosive soil, according to Michelsen. He says pipes were discharging stormwater onto the sides of slopes, causing erosion and undermining the pipe structures. In the rebuild projects, eroded or failing stormwater outfalls are being reconstructed into systems that can move high flows as well as provide enhanced water quality and habitat enhancements.

In the Annapolis area, the county performed an emergency embankment breach and culvert repair within an old decommissioned railroad embankment. The failing culvert had caused several sinkholes to form, and stream flow appeared to be running through voids rather than confined within the existing pipe, posing a threat of flooding to the adjacent community. Repairs included the removal of the culvert, and establishment of a stable channel through the breached areas. Later phases of the repairs will include stormwater retrofits within the watershed, and restoration of upstream segments of the channel, north of the embankment.

### Stream and wetland restoration

Perhaps the biggest bang for the buck in the Anne Arundel WPRP program has been stream and wetlands restoration projects. "It's a big piece of the puzzle," says Michelsen. Much of the sediment and phosphorus originates in the metropolitan core of the county, he explains, and high flows have created channels that funnel the pollutants

*(continued)*

#### PROFILE:

## Anne Arundel County, Maryland, Watershed Protection and Restoration Program

**BEGUN:**  
2014

**POPULATION SERVED:**  
530,000

**AREA SERVED:**  
All of Anne Arundel County, 588 square miles, with 530 miles of Chesapeake Bay shoreline

**MANAGEMENT:**  
County Department of Public Works

**MISSION:**  
Develop and implement projects designed to reduce stormwater runoff

**ANNUAL BUDGET:**  
\$21 million

**STAFF:**  
54 employees

**EXECUTIVE DIRECTOR:**  
Erik Michelsen, program administrator

**WEBSITE:**  
[www.aacounty.org](http://www.aacounty.org)



Anne Arundel County Department of Public Works program administrator Erik Michelsen takes a picture of the Wilelinor Stream and Watershed Restoration project. Michelsen often posts photos to the department's Facebook page to keep citizens updated on projects and progress around Anne Arundel County.

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**Bryan Perry sets up a YSI ProDSS multiparameter meter to test pH, water flow and dissolved oxygen in Wilelinor Stream.**

## CHESAPEAKE BAY TMDLS

In December 2010, the US EPA issued TMDL limits for the Chesapeake Bay, noting that previous efforts to restore water quality in the Bay and its tidal tributaries had been ineffective.

According to the order, 60 percent of the practices designed to reduce nitrogen, phosphorus and sediment must be in place by the end of 2017. All measures must be in place by the end of 2025.

The order affects six states that are part of the Chesapeake Bay watershed, as well as the District of Columbia.

The overall targets of the order are a 25 percent reduction in nitrogen discharges to the Bay and its tributaries, a 24 percent reduction in phosphorus, and a 20 percent reduction in sediment.

downstream. Culverts exacerbate the problem.

“By restoring the streambeds, we connect the streams back to their riparian wetlands,” Michelsen says. “That provides a better aquatic habitat; there’s more water on the landscape.”

He says the projects have involved raising the stream bottom back up, filling the channel, and providing vertical grade control with wood or stone in order to connect the stream to its flood plain. In projects to excavate the flood plain, the issue is removing “legacy sediments” that have built up over the decades.

In the Warehouse Creek project, 970 linear feet of an unnamed tributary to the creek had become severely eroded and the stream channel had little connection to its floodplain. The area was overrun with invasive plants, as well.

The county installed an SPCS to stabilize the channel and connect the tributary to the flood plain. The system also enhanced nutrient uptake in the stream and the associated wetlands, and reduced sediment loading to Warehouse Creek. Native vegetation was planted to replace the invasive growth.

“Overall, we’ve got something on the order of 29 miles of stream rebuilding in the design process and several miles completed,” Michelsen says. “It’s pretty significant.”



**Anne Arundel County Department of Public Works program specialist Bryan Perry, program administrator Erik Michelsen, and education and outreach manager Robb Fish (from left) at the Wilelinor Stream and Watershed Restoration project.**

While the county is working on over 200 capital projects in the three above categories, significant work is being accomplished in restoring shoreline areas and improving urban infrastructure.

Michelsen says the shoreline work provides additional credit toward its MS4 permit compliance, and involves stabilization of areas along Chesapeake Bay and its tributaries.

“We have 530 miles of shoreline, and while much of it is stable, there are areas that are rapidly eroding,” he says. The restoration work involves rebuilding dunes and beaches by placing sand and planting vegetation, and creating marsh areas. The work also improves the shoreline as a habitat for wildlife.

The WPRP also targets faulty infrastructure and fosters improved operational strategies. Michelsen says defective sewer lines are known to be leaking nutrients in urban areas, especially in low-lying stream valleys. “Our utility crews use CCTV to inspect the lines on a regular basis,” he says. “In some cases we walk the lines looking for leaks or overflows, and monitor water quality for spikes in bacteria.”

To remediate the issue, the county is repairing and patching pipes where necessary, or in some cases replacing entire pipe sections.

Septic systems and fertilizer runoff from lawns are other sources of pollution being addressed. “We have about 40,000 septic systems,” Michelsen says. “We don’t have much agriculture or farm runoff.”

On the operational side, the county is improving street sweeping in the Patapsco River watershed along Baltimore Harbor. An outside contractor uses vacuum-assisted sweepers to keep street debris and pollutants from running into the waterways. “We’re also doing a more thorough job of inlet cleaning,” Michelsen says.

### Partnerships and communication

While the WPRP features many design innovations, the partnerships the county has developed with the private sector and area nonprofit organizations may be the most creative approach. It offers incentives for entities outside the public realm to participate in the restoration work, helping improve the environment of the watershed while adding to the county’s credits toward permit compliance.

Here’s how it works: Using funds available through the Chesapeake Bay Trust ([www.cbtrust.org](http://www.cbtrust.org)), the program offers restoration grants to nonprofit watershed groups, religious organizations, homeowners and private landowners to undertake restoration projects on their own property, in parallel with the county’s program.

The county evaluates the projects that are submitted under the program, evaluating them on a cost-per-pound of pollutants reduced, as well as the project timeline and acreage covered. “We are looking for turnkey restoration projects that we can use toward meeting

the county’s overall restoration goals,” Michelsen says. Participants receive payment once the projects are complete.

Throughout the watershed restoration and protection program, the county has overcome a number of challenges inherent in working with the private sector. Communication is key, Michelsen believes.

“We’ve done a lot of work on private property — negotiation, purchase of property; a lot of hurdles,” he says.

“Our approach has been to communicate effectively right from the outset — reaching out

to landowners even before we engage a design consultant.” Another key is assigning specific project managers to specific geographic areas so they become familiar with the territory, and then making them accessible to the public.

The idea, Michelsen says, is to keep the affected parties engaged in the process — including inviting them to have a say in the design process. “We want projects that everybody is happy with,” he says. “It’s not a silver bullet, but so far, it has worked. It’s helped us create a relationship and build up a level of trust.” ♦

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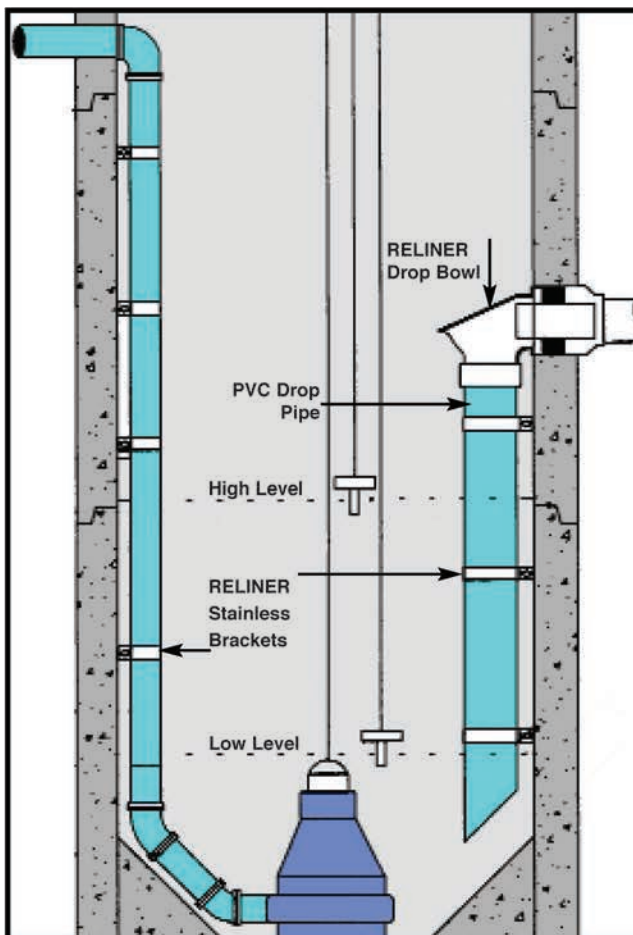
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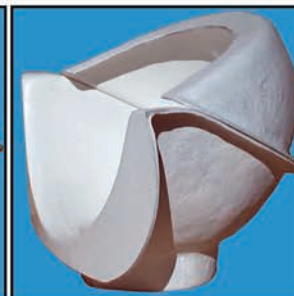
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# GETTING STREETS UP TO SPEED

St. Louis finds a manhole rim-raising solution that stands up to time and traffic

By Angus W. Stocking



The Metropolitan St. Louis Sewer District includes 160,000 manholes. With the constant street work and repaving required in any metro area, raising manholes to grade is a major task performed thousands of times annually.

## BETTER MOUSETRAPS

**PRODUCT:**  
Turnbuckle Manhole Riser

**MANUFACTURER:**  
American Highway Products, Ltd.  
888/272-2397  
www.ahp1.com

**APPLICATION:**  
Raising manholes to grade

**BENEFITS:**  
Manhole-raising solution that was durable and permanent.

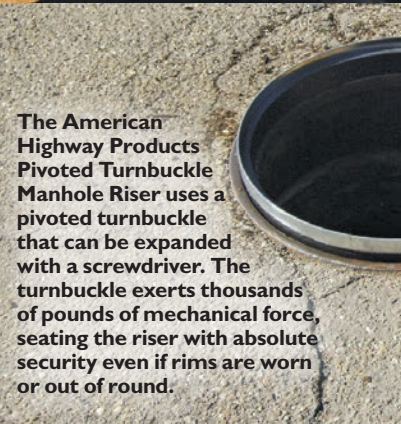
**USER:**  
City of St. Louis, MO.

With a population of about 320,000, St. Louis, Missouri, is the 60th largest city in the U.S. But due to an unusual arrangement, St. Louis, its metro area (population about 3 million), and surrounding St. Louis County (about 1 million) happens to be served by the fourth-largest sewer district in the U.S., just behind New York, Los Angeles and Chicago.

“We’re odd,” says Jonathon Sprague, director of operations for the Metropolitan St. Louis Sewer District. “We cover the city and county of St. Louis, and about 90 small municipalities. So it’s an extremely large system, and we have to be efficient — ideally, we only want to do a job once, and not have to come back for a long time.”

There are 160,000 manholes in the MSLSD system. With that many manholes, and with the constant amount of street work and repaving required in any metro area, raising manholes to grade is a major task, performed thousands of times annually, according to Sprague. In accordance with his belief in doing a job once, Sprague wanted a manhole-raising solution that was durable and permanent.

The water department first tested the American Highway Products Pivoted Turnbuckle Manhole Riser in 1996, which was a major change in policy — the department had given up on the use of risers after cast iron products had proven to be ineffective and unsafe. “We could never get them to seat well,”



The American Highway Products Pivoted Turnbuckle Manhole Riser uses a pivoted turnbuckle that can be expanded with a screwdriver. The turnbuckle exerts thousands of pounds of mechanical force, seating the riser with absolute security even if rims are worn or out of round.

says Vince Foggie, St. Louis Water Department superintendent, referring to the nonadjustable cast iron risers. “They’d rattle and even pop out at times, leaving the traffic and the public exposed to an open manhole — it was dangerous.”

For several years after they quit using cast iron risers, water department crews raised manholes to grade by manually exposing and lifting concrete grade rings, a process that takes several hours and compromises new paving lifts — after jackhammering and raising, the newly raised rims have to be sealed in with new concrete, creating seams in the new pavement that wear faster than undamaged concrete. It was clearly a problem, so it made sense to do a pilot test with an adjustable riser.

The American Highway Products riser relies on a pivoted turnbuckle that can be expanded with a screwdriver. “For the pilot test, we put a riser in an intersection on Kingshighway Boulevard, one of our busiest downtown roads,” Foggie explains. “It was easy to install, stayed put and didn’t cause any problems, and it didn’t rattle. It was very encouraging, especially since we were getting behind on paving at the time.”

Given the sheer scale of manhole raising in MSLSD, there was a significant opportunity to save money and time. For both those reasons, the pivoted riser has proven to be the MSLSD’s preferred solution for raising manholes.

“We’ve been using them a long time, more than 15 years,” Foggie says. “And in all that time, we’ve only had one fail — and that’s because we installed it in a worn frame that we should have replaced. When we did, we had no problems.”

*(continued)*



### Sturdy but flexible

The turnbuckle exerts thousands of pounds of mechanical force, seating the riser with absolute security even if rims are worn or out of round. The turnbuckles can also be loosened, which is useful in St. Louis.

“We looked at risers that are glued in, and decided they were no good,” Sprague explains. “Because then they’re hard to remove when we come back in a few years. It’s possible to stack the AHP risers, but I prefer not to

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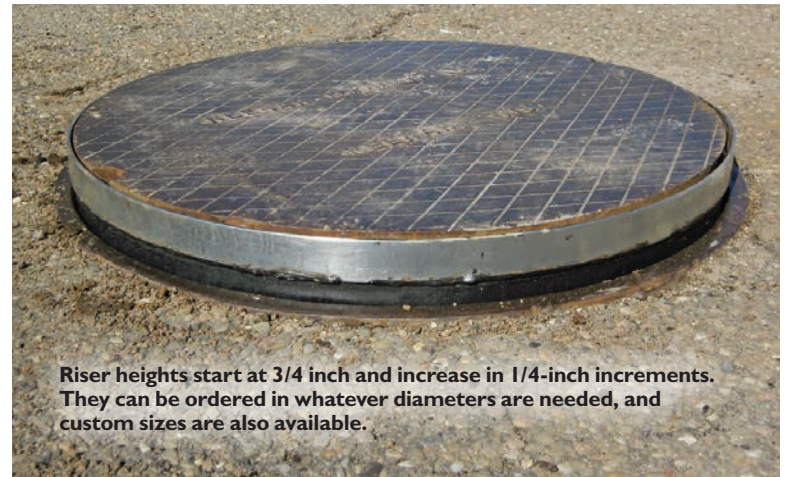
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Riser heights start at 3/4 inch and increase in 1/4-inch increments. They can be ordered in whatever diameters are needed, and custom sizes are also available.

do that. With the turnbuckle, we can just loosen the riser installed for the first paving lift, and replace it with a taller riser that will match the total height of new paving after the second lift — it's very convenient."

Riser heights start at 3/4 inch and increase in 1/4-inch increments. Likewise, risers can also be ordered in whatever diameters are needed, and are shipped fully assembled. Since they're relatively lightweight and stackable, they're easy to keep on hand. Custom-sized risers are also available.

Now, the department keeps risers on hand in several different thicknesses, and installs 200 to 300 annually, and even more in a heavy paving season. "They save us thousands of dollars," Foggie says. "And more important, they save labor. I don't have to assign a crew to spend hours following a paving truck, and that means they can be doing water department business." The city also specifies that the risers be used on state paving projects within city limits.

In addition to repaving projects, St. Louis also uses the AHP risers anywhere a manhole is below grade, creating a pothole. They make maintenance easier, and since virtually all of the city's manholes are at grade, snowplows don't catch rims and cause damage.

For many reasons, the AHP risers are also safer; they're lighter, which reduces pinch and strain injuries; they don't rattle loose and expose drivers to open manholes; and they're quicker to install, which reduces crew exposure to traffic.

"They only take 10 to 15 minutes to install, and we don't have to remove any material or fill in with mix," Sprague says. "Usually, we only have to close traffic down for a half-hour or less. So they keep my crews and the public safer." ♦

# RHINO



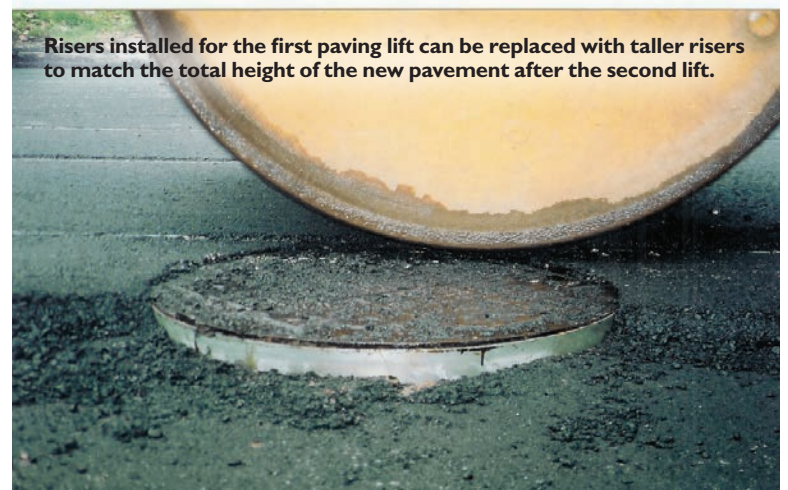
- 8 lb. and 12 lb. (4140) ASTM A148 cast steel head breaks frozen covers free easily. Serrated edge strengthens pick-end and eliminates possibility of tool becoming bottlenecked in the cover.

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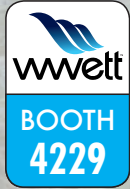
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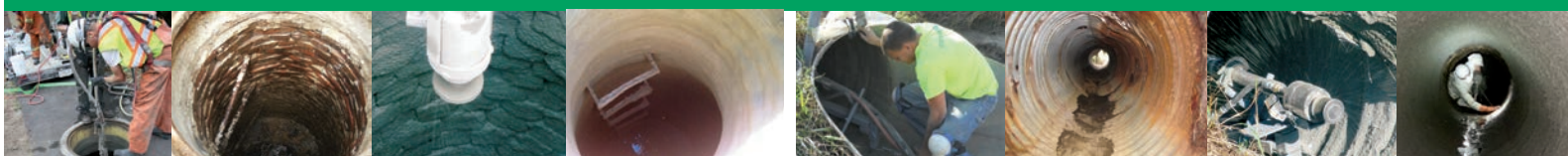
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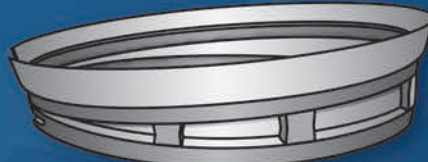
### Safety Ramp

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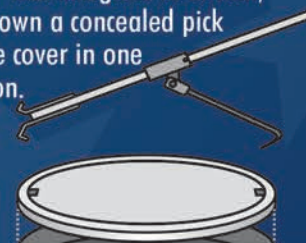
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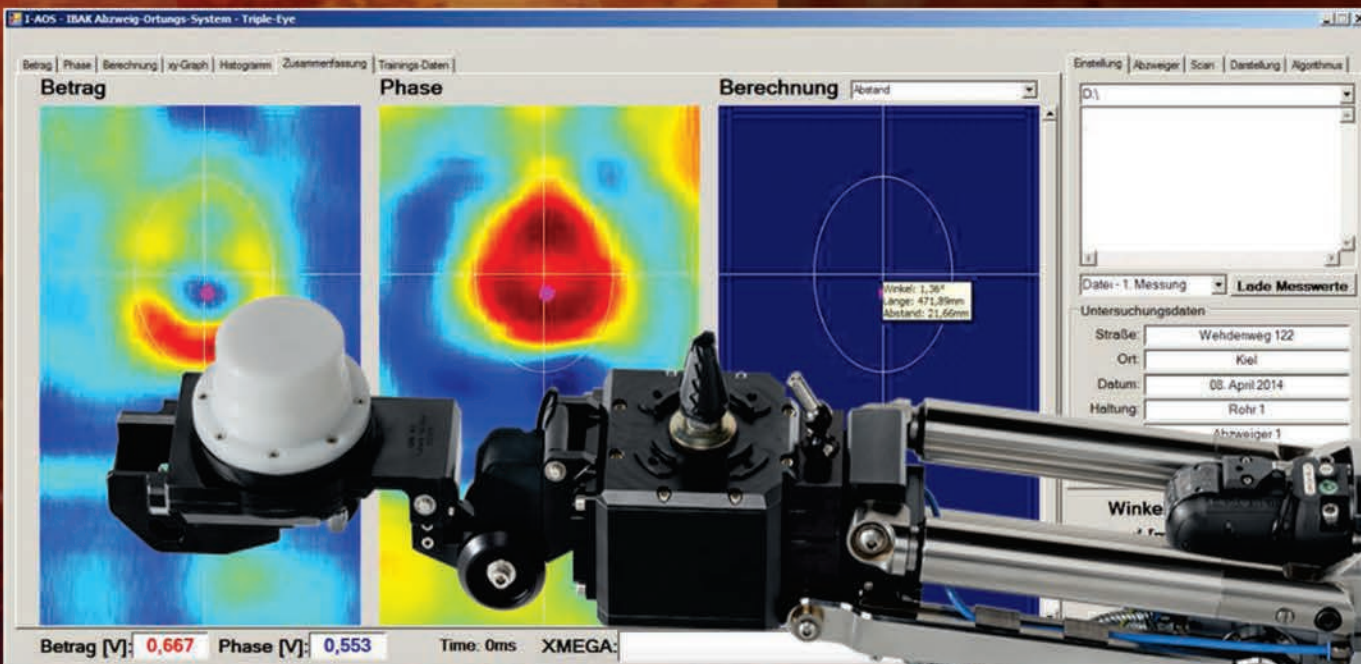




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# GETTING BETTER EVERY DAY

Marshalltown Water Works earns Directors Awards for optimizing distribution system performance and water quality

*By Trude Witham*

**The Marshalltown Water Works team includes (from left) utility maintenance mechanic Jared Wall, Director of Water Production Tim Wilson, treatment operator Jon Reuter, and CEO and General Manager Steve Sincox. (Photography by Scott Morgan)**





For many years, employees at Marshalltown (Iowa) Water Works were used to doing things a certain way. The Partnership for Safe Water Program changed all that.

Three years ago, the utility went through the Partnership's self-assessment process to optimize its distribution system. The next year, it took part in a groundwater treatment assessment and optimization pilot program for the conventional lime softening process.

The team identified performance-limiting factors, developed system optimization action plans, and submitted two peer-reviewed reports, one each for the distribution system and treatment plant. "We are already a very efficient operation, but there were things we identified during self-assessment that showed we could do better," says Tim Wilson, director of water production. Those included better data collection and better-documented standard operating procedures.

Treatment plant operators focused on the lime softening system parameters, while distribution staff analyzed the hydrant flushing process and chlorine residual testing. "We asked ourselves how consistently we were able to produce the same quality of water through our lime softening process," says Wilson. "We also asked what we could do to reduce the turbidity of the water coming off our softening basins. That reduces the turbidity going to our filters and increases our filter runtimes."

The hard work paid off. In 2016, the utility received the Partnership Directors Award for both water treatment and water distribution system assessment and optimization. Marshalltown became the second utility in Iowa to receive the Directors Award for treatment and the first for distribution.

A team of 20 worked together to improve distribution system and treatment plant operations. "When we started with the self-assessment pro-



#### PROFILE:

### Marshalltown (Iowa) Water Works

**POPULATION SERVED:**  
29,000

**SERVICE AREA:**  
City of Marshalltown

**DISTRIBUTION:**  
162 miles of water mains

**SYSTEM STORAGE:**  
6 million gallons

**WEBSITE:**  
[www.marshalltownwater.com](http://www.marshalltownwater.com)



**Marshalltown Water Works maintenance mechanic Jared Wall services metering pumps at the utility's facility in Marshalltown, Iowa.**

cess, we went through piles of data, which showed us what we are really good at and what we needed to improve,” says Steve Sincox, general manager and CEO. “We asked ourselves what we could fix right away and what was more capital-intensive that we could plan for down the road.”

The utility just celebrated its 140th anniversary, and some of its distribution piping is nearing the replacement stage. “Our trustees and staff regularly monitor the equipment condition through our five-year capital improvement plan,” Sincox says “We’ll be starting to replace those old pipes soon.”

When work toward optimization began, the staff fixed the simple, inexpensive things first and then concentrated on the more challenging areas, like the pipe gallery. “A limitation in the pipe gallery for our filters does not allow us to control flow as consistently as we would like as water passes through the filter gallery,” says Wilson. “While the quality of our effluent is still very good, better flow control would provide a much more consistent product and allow us to more consistently meet the Partnership goals. This is something we will continue to plan for and work toward in the future.”

In April 2016, the plant began a \$6.7 million upgrade. “When Alliant Energy asked to purchase water from us for their new Marshalltown power plant, we hired Fox Engineering to evaluate our water system and determine if we had enough capacity,” says Sincox. Although the treatment plant does have enough capacity, the staff decided to repair, rehabilitate and upgrade some of the older equipment to help accommodate the new demand. The upgrade, scheduled for completion next month, includes:

- Replacing 1.5-million-gallon in-ground reservoir with 2-million-gallon reservoir
- New high-service pump building
- Two 3 mgd horizontal split case pumps (Flowserve)
- New SCADA system with Allen-Bradley ControlLogix hardware, Rockwell FactoryTalk View software (Rockwell Automation)
- New 1.5 MW standby emergency generator (Caterpillar)

“The SCADA system replacement will allow better monitoring of chemical feed systems, and the new reservoir will improve circulation of the finished water,” says Wilson.

Today, the utility serves about 29,000 people in Marshalltown and sells 30 percent of the treated water to the Central Iowa Water Association, a rural water provider. Source water comes from nine deep wells that provide a stable, high-quality supply. The final product won the Best Tasting Drinking Water competition in 2008 and 2009 from the AWWA Iowa Section.

### **Highly experienced**

Many Marshalltown staff members have spent most or all of their careers with the utility. Sin-



**Marshalltown Water Works CEO and General Manager Steve Sincox at the water treatment plant**

cox holds Grade IV Water Distribution certification and has been with the water works for 21 years. Wilson holds Grade IV Water Treatment and Water Distribution certifications, and has been at the treatment plant for nine years. Reporting to him are:

- Treatment plant operators Bruce Frisk (24 years), Jon Reuter (17 years), Ryan McFarland (one year) and apprentice Pat Bell
- Ed Phillips, operator and maintenance employee (17 years)
- Dana Pope, director of distribution (eight years)
- Utility workers Ronald McWilliams (15 years), David Rebik (15 years), Brian Kreimeyer (14 years) and Jordan Dolash (two years)
- Jared Wall, utility maintenance mechanic (five years)
- Meter service employees Mike Ellis (10 years), Jennifer Hulin (nine years) and Doug Knoll (16 years)

Operators work two 12-hour shifts and two eight-hour shifts (four days on and three days off) each week. Phillips fills in when operators are on vacation. The staff gives back by giving plant tours and presentations to the general public and student groups.

“They give tours to third-graders, high-schoolers and sometimes students from Marshalltown Community College as part of their science classes,” says Wilson. “Sometimes we have two to three groups a day. Different operators take different groups to give the students fresh perspectives, and also to save our voices.”

Outreach and education doesn't end with the tours. The water distribution team came up with a unique way to teach the community about the benefits of tap water over bottled water.

“The staff was tasked with building a watering station to promote our tap water and educate people about the exorbitant cost and waste associated with bottled water,” says Sincox. “Rather than create a freestanding device that would need to be loaded on a pickup or trailer, they recommended repurposing an old portable air compressor that hadn't been used in over a decade.”

All four distribution employees dismantled, sandblasted and painted the

*(continued on page 47)*

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Jared Wall runs a turbidity test using Hach Turbidimeters at the water treatment plant.

(continued from page 45)

compressor, and developed the concept for the watering station plumbing and the layout. "They really took ownership of the project, and it would not have been the same without their ingenuity and expertise," says Sincox.

The result is a watering station that's easy to move and allowed the utility to recycle an old piece of equipment. Introduced in April 2015, the water wagon travels to community events around town. Team members connect the wagon to a water source and chill the water before serving it to the public. "One year, we included a water meter so we could measure how much water we put through it," says Sincox.

### Future challenges

One challenge facing the utility in recent years is staff turnover. "This is a great place to work and historically we've not had a lot of turnover," says Wilson. "But, we've had some people retire or move on the last two years, and they are hard to replace. It takes a lot of training and time, and those who are still here have to juggle their hours. So it affects everyone."

Three years ago, the plant started an apprentice program, in which experienced operators train new ones. "We got someone trained and certified in 12 months by job shadowing with an existing operator," Wilson says. "It worked out well."

On the distribution side, the main challenge will be replacing water mains. "We inventoried all our mains and looked at the breakage point," says Wilson. "We have experienced higher breakage in pipes from the 1920s, and we've targeted these for replacement in 2017."

In the meantime, the plant will continue with the Partnership program. "It's all about continuous improvement," Sincox says. "Some areas that need work are capital-intensive, but it's a goal we're shooting for. The most valuable part is the self-assessment. Although it can seem daunting, if you systematically check off each area that needs to be improved and then implement that change, it gets easier. The payback in terms of what you learn makes it all worthwhile." ♦

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# BEHIND THE SCENES

Years of experience and instruction form the backbone of training programs

By Ted DeBoda

**N**ASSCO's mission to set standards for the assessment, maintenance and rehabilitation of underground infrastructure is accomplished, in part, by the training offered through the Pipeline Assessment Certification and Inspector Training Certification programs.

What students see in a PACP or ITCP class, however, is just the tip of the iceberg. Behind the instruction lies volumes of data, years of experience and tireless hours spent by industry professionals who volunteer their time to ensure the accuracy, relevancy and usability in the information conveyed. Ensuring the content remains up to date requires ongoing evaluation, modification, and, in some cases, re-engineering how training is delivered.

The following are all examples of NASSCO's recent behind-the-scenes efforts to make training programs as valuable as possible.

**Online PACP Recertification.** The development of our online certification course has been a long, yet thorough process. Using updated PACP training materials (including the changes from PACP Version 6 to 7) as a guide, an investment in technology was made to make recertification more easily accessible. The development of scripts, voiceover recordings, and the creation of online activities to help users retain key PACP components were just a few steps of the process to make PACP recertification available anytime, anywhere.

**Online MACP and LACP Recertification.** Following the success of the release of Online PACP Recertification, NASSCO is also creating online recertification programs for the Manhole Assessment and Lateral Assessment programs. We are currently writing the scripts and will incorporate the same voiceover and knowledge-retention activities as the online PACP recertification version. While there is a fee for PACP recertification (which is a prerequisite for MACP and LACP), MACP and LACP online recertification will be provided free of charge to anyone currently certified in PACP, and was previously certified in MACP and LACP.

**PACP Version 7 in Spanish.** Spearheaded by NASSCO's International Relations Committee, NASSCO members are working hard to translate PACP Version 7 to Spanish. While the translation will be used for training in South America,

Spanish manuals will also be made available in North America as a reference for Spanish-speaking underground infrastructure professionals.

**ITCP Updates for Cured-In-Place Pipes.** In our quest to continually improve the content delivered to students, NASSCO is updating ITCP-CIPP course information. The update will address CIPP technologies and materials that have been added to the industry since the program was last updated, as well as revised inspection procedures and techniques. Currently in the early stages of development, NASSCO will also be producing an online recertification program for ITCP, with a special focus on new technologies and inspection techniques recently added to the program, which include 10 major quality checks for CIPP installation.

**ITCP Affiliated Classes.** NASSCO has worked closely with the Chesapeake Water Environment Association to conduct ITCP classes as a cooperative effort between WEF member associations and NASSCO. We anticipate these joint classes will be conducted with similar associations in Virginia, Alabama and Tennessee/Kentucky.

**ITCP Technologies.** With ITCP classes for CIPP and Manhole Rehabilitation well established, the Infiltration Control Grouting Association (ICGA), a Division of NASSCO, continues to develop the curriculum for an ITCP course focused on Chemical Grouting.

**NASSCO Trenchless Manual of Practice.** NASSCO has been working with volunteers from across the industry to develop an updated manual that will provide a baseline reference for a wide range of trenchless technologies for municipal managers and engineers, contractors and consultants. The manual provides basic information from asset management, to assessment, to design and rehabilitation.

These initiatives, and many more, have taken an enormous amount of volunteer effort, and the expertise of our volunteers will continue to help shape our industry and prepare for the future of trenchless technologies. When it comes to our commitment to ensuring the continued acceptance and use of trenchless technologies, we will continue to improve and advance training opportunities to make sure underground infrastructure assessments and repairs are done right. ♦

**NASSCO (National Association of Sewer Service Companies)** is located at 2470 Longstone Lane, Suite M, Marriottsville, MD 21104; 410/442-7473; www.nassco.org

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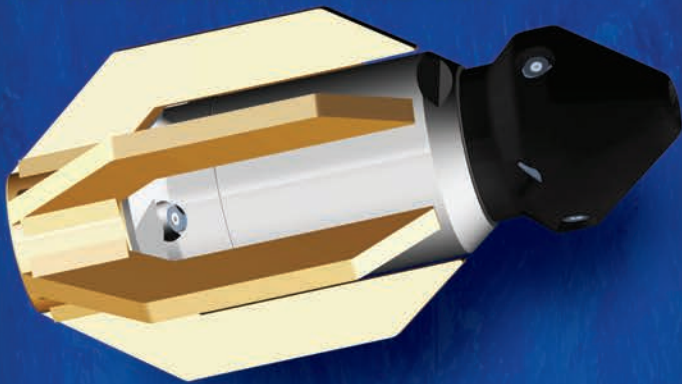
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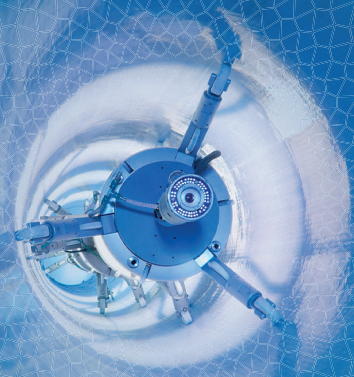
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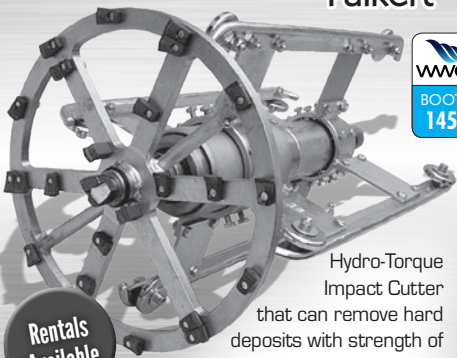


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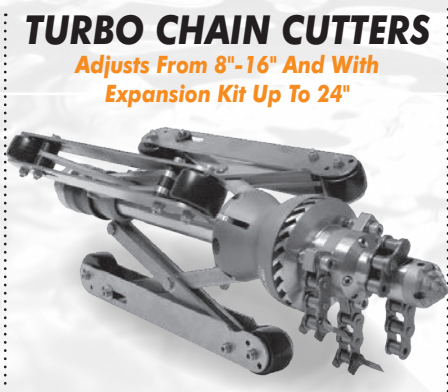
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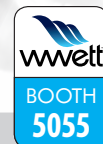
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# GUIDE YOUR EMPLOYEES

Managers play an important role in helping employees build successful, fulfilling careers

By Ken Wysocky

For too long, many organizations have taken a conventional default approach to employees' career development that centers on the four Ps: processes, paperwork, programs and promotions.

But Julie Winkle Giulioni suggests a new paradigm is in order. And this time, it's personal — as in managers who personally take time to explore what their direct reports need to reach higher levels of job satisfaction. "Careers are developed one conversation at a time," says Winkle Giulioni, the co-author (with Beverly Kaye) of the best-selling book, *Help Them Grow or Watch Them Go: Career Conversations Employees Want*.

"We want managers to start thinking about how to help people develop in the role they're in," says Winkle Giulioni, who is also a principal at DesignArounds ([www.designaround.com](http://www.designaround.com)), a consulting firm that offers corporate training and coaching. "They don't need a new desk, title or business card to grow in their jobs. From the time we're kids, we're wired to think about what we want to be when we grow up, and that mentality only shuts down options.

"So we need to shift the conversation and perspective," she adds. "We need to get employers to think in terms of what employees want to do — what they want to achieve, the talents they yearn to cultivate or the kind of customers they want to work with. When you talk about the 'doing,' the options became much less limited. Employees don't have to get promotions to do the things they find most satisfying."

Research backs up this assertion. Studies show that a job that makes creative use of their skills and talents is a top priority for many employees — not higher pay or promotions. In fact, one study Winkle Giulioni conducted showed employees rank better pay and promotions at the bottom of a list of top 15 job expectations. "That's totally counterintuitive," she notes. "Managers aren't aware of the power that they have. There's so much that matters to employees that's within managers' sphere of influence as leaders."

Other studies show that there's a clear business case for an emphasis

on career development. In one survey, 91 percent of respondents called it a key priority. "Yet when you look at organizations across the board, employees give career development the lowest marks in employee surveys," she says.

Moreover, surveys show that career development is one of the top three drivers of employee engagement. That's no small matter, because employee engagement in turn activates discretionary effort — the extra time, energy, creativity and commitment that employees either volunteer or withhold, she explains.

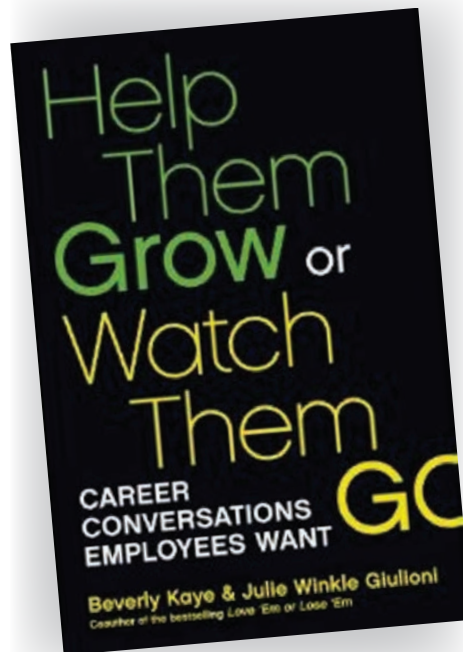
Additional research suggests that managers who promote career development enjoy 40 percent greater employee retention. That's a strategic advantage in light of the looming labor shortage that experts predict is on the horizon. "The ability to hang on to good talent is critical," she says. "Organizations that don't promote career development put their bottom-line business results at risk. In addition, greater employee job satisfaction frequently correlates to greater customer satisfaction. So if you're not taking care of your employees, you're also not taking care of your customers."

If career development is so important to attracting and retaining employees, sustaining high levels of on-the-job satisfaction and improving business results, why don't more organizations emphasize it? Winkle Giulioni believes that in many cases, managers just don't have enough time. In other cases, she posits that managers fear employees will parlay their new-found skills into a job

at another company.

In addition, many managers feel it's not worth the time because there are so few promotions available — a sad irony, given that one study indicated that only 25 percent of employees actually want promotions. "By believing in this corporate myth, managers assume employees have expectations that can't be met," she points out. "Yet that other 75 percent of employees gives them plenty of room to maneuver." Last but not least, many managers simply don't know how to go about developing employees' careers.

**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](mailto:editor@mswmag.com).



**“We want managers to start thinking about how to help people develop in the role they’re in. They don’t need a new desk, title or business card to grow in their jobs.”**

– Julie Winkle Giulioni

So how can organizations morph into career-development powerhouses? Winkle Giulioni says the charge must be led by managers, not human resources departments. And as they do so, it’s critical that they look at career development from a completely different perspective. With Baby Boomers delaying retirements and many organizations becoming “flatter” as they downsize, the traditional view of climbing the corporate ladder is out of sync with reality, she notes.

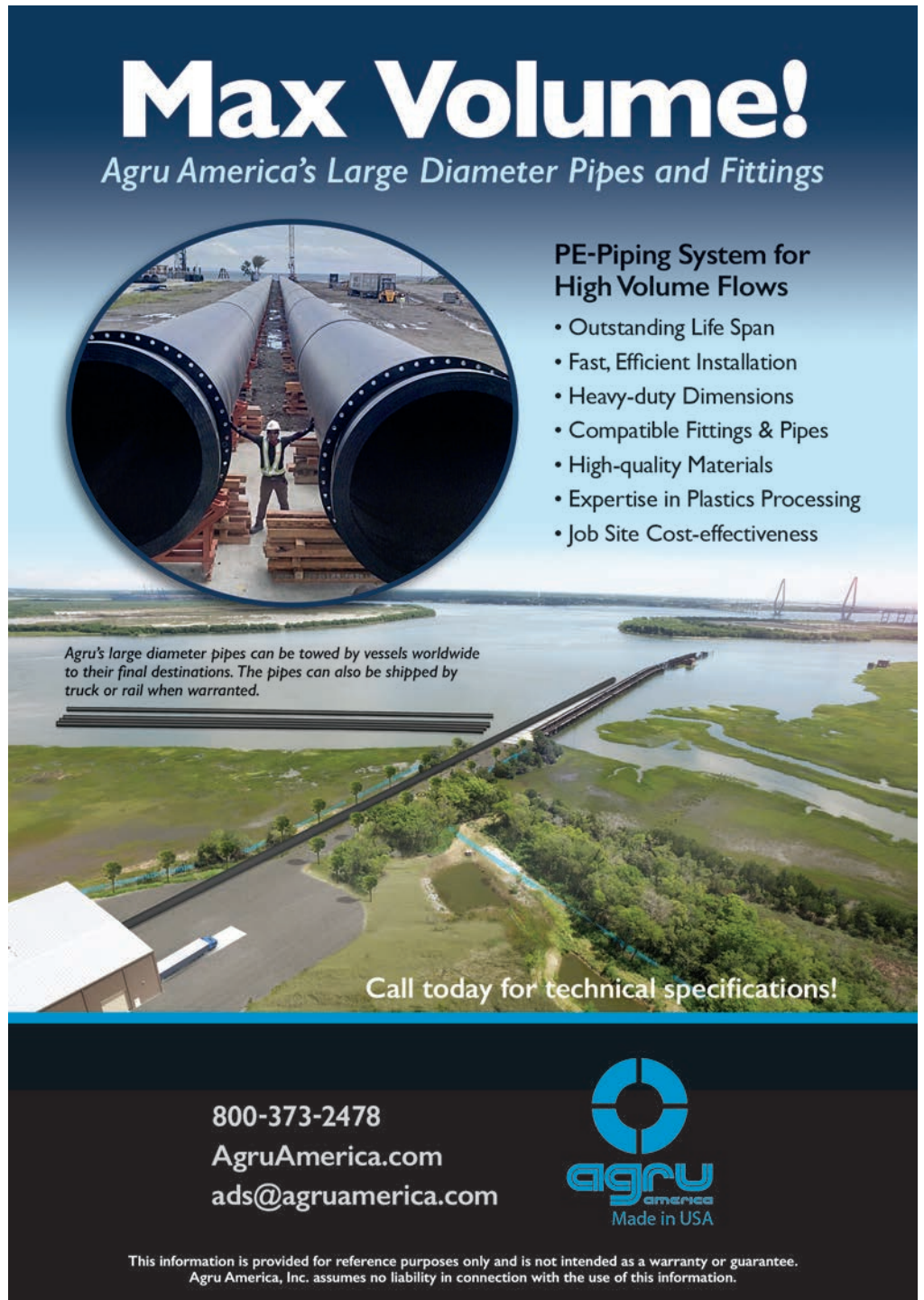
“Thinking about career development as a ladder is very limiting,” she explains. “We need to help employees understand that while moving up is one option, there may be more opportunities if we think laterally.” In short, instead of using ladders as a metaphor for career development, they should envision a climbing wall instead. On a climbing wall, she explains, there are a lot of different ways to get from Point A to point B, and sometimes climbers have to go down to eventually get up and over. Fruitful careers can work in the same fashion.

“Employees don’t have to move up to grow,” Winkle Giulioni emphasizes. “If employees are intentional about what they invite into their current positions, they can stay engaged and growing for an entire career.”

In the long run, too many organizations rely on the *archaic* artifacts of employee development — the aforementioned four Ps — instead of practicing the *art* of development, which relies on what managers do day-in and day-out to expand employees’ capabilities and fulfill their aspirations. “I’m not saying human resources isn’t necessary, but real career development happens at the point of contact with employees, a little bit every day,” she asserts. “No employee ever says that their best boss moved the needle (on their development) through processes. Instead, they say that boss helped by offering new opportunities, trusting in their abilities or pulling them out when they jumped into the pool and couldn’t quite swim yet.

“It’s great if whole organizations approach career development differently,” she continues. “But if individual managers choose to engage employees in an authentic and ongoing fashion, they can

really make a difference. If they can figure out what’s really important and interesting to their employees, then determine how to align those interests with overall strategic goals and needs, it provides an unbeatable, sustainable and competitive advantage for their organizations.” ♦



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# MAPPING MADE EASIER

New system provides a 3-D picture of underground assets during regular inspection

By Luke Laggis

Getting a clear picture of underground assets has always been difficult. As-built plans and paper inspection records are often incomplete or inaccurate, and locating buried lines is labor intensive.

For years, the best way to map wastewater infrastructure has been a sonde and locator, but RapidView has addressed this issue with a new tool designed to provide a complete picture of buried lines in real time. The new 3D-GeoSense system provides a 3-D picture from within the pipe, eliminating guesswork.

Matthew Sutton, RapidView's vice president of sales and marketing, recently discussed the system with *Municipal Sewer & Water*.

## What's the philosophy behind development and innovation at RapidView?

RapidView is the North American partner of IBAK Helmut Hunger of Kiel, Germany. IBAK is the world's oldest and largest manufacturer of pipeline inspection robotics. Since IBAK invented the sewer camera in 1957, they have been the driving force behind nearly every innovation in the market. They invented color inspection cameras, the first camera tractor, the first lateral launching system, the first data logging software, the first pan and tilt camera, Panorama 360-degree scanning technology, and many more industry-defining advancements. These innovations are in common use today throughout the industry. Over 18 percent of IBAK's staff work in research

and development on a daily basis, inventing the tools we will use to inspect and rehabilitate pipelines in the future.

## What was the idea behind the 3D-GeoSense system?

Underground pipelines are unseen by their very nature. Up until now, locating and defining exactly where these pipelines are has been a challenge. Often, as-built plans are incorrect or nonexistent. Typically, it required digging up the pipeline to find it, but this is often unwise or impossible.

RapidView has addressed wastewater infrastructure mapping with the 3D-GeoSense system. The sensor provides a 3-D picture from within the pipe, creating a complete picture of buried lines in real time.

## TECH CLOSE UP

**PRODUCT:**  
3D-GeoSense system

**MANUFACTURER:**  
RapidView IBAK  
North America  
800/656-4225  
www.rapidview.com

**APPLICATION:**  
Mapping buried wastewater infrastructure

**BENEFITS:**  
Provides a 3-D picture from within the pipe





The 3D-GeoSense sensor, mounted to a camera crawler system, provides real-time, accurate positional data as the system moves through the pipeline. The sensor is small enough to be used in with both mainline and smaller lateral cameras.

It is easily shared with asset management databases or GIS systems. In addition, we had to design a sensor small enough so that it could be used in mainline and smaller lateral cameras.

We believe one of the major markets for this technology will be in the tracking and logging of house laterals prior to directional drilling. With an accurate model of the pipeline in 3-D space, the

*(continued)*

A more intensive approach to discovering where these pipelines run could be accomplished with a time-consuming procedure whereby a transmitter and locator were used to follow the inspection camera as it traveled through the pipeline. This method required periodically stopping, measuring and logging this information. Personnel were also required to follow the path of the system above ground, which is not always possible or safe. The data gathered in this manner is often inconsistent and required many hours of work. Deeper pipelines were impossible if the transmitter signal could not reach the ground. Pipelines running under obstructions, buildings or underwater were also impossible, due to the lack of access above ground.

We set out to design a sensor that would track itself in 3-D space from within the pipeline. The 3D-GeoSense sensor provides real-time, accurate positional data as the system moves through the pipeline. As the system travels underground, a three-dimensional computer model of the pipeline is constructed. This model can be shared, analyzed and manipulated.

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**TECH CLOSE-UP**

directional drilling company can program their machine to easily avoid the existing pipelines, dramatically reducing the chance of cross bores. In mainlines, this system will allow the discovery of pipeline position, depth and travel in hard-to-reach, dangerous or obstructed areas.

**Is this a stand-alone system, or is it designed to work with one of your other cameras?**

The 3D-GeoSense sensor is an available option in all of our new, video-based cameras. When the customer orders a new camera they can specify if they wish to have the sensor installed. In mainline applications, this is all that the customer needs, with the exception of software to view the data, which is provided by third-party software providers like WinCan.

**Are there any limitations on pipe sizes and lengths the system can effectively map?**

There are no limitations on pipe size or length. The sensor is inside the camera and will track its movement wherever it travels.

**How is mapping information recorded and shared? Is it separate from the video file, or is the mapping information embedded?**

The data is saved as a small file of XYZ coordinates. How this is displayed is determined by the software you view the data in. We expect that visualizations and analysis methods may vary from each software vendor as they integrate the data. WinCan's integration of the 3D-GeoSense data stores the XYZ coordinates in the pipeline inspection file along with video and observations. This data can be viewed in a 3-D space in WinCan's map module, constructing the file in real time as the system moves through the pipeline. Therefore, anyone who views the report after the inspection could have access to this visualization in the map module or export them to CAD for further analysis. Since system owners have never had this level or accuracy of data, we are excited to see what they can do with it, and how it will be used in their inspection programs.

**What type of user is this system aimed at?**

The technology is so simple and cost-effective that we expect widespread adoption. Municipal engineers, planners, system owners and contractors should see the added benefit of this data immediately. What system does not have pipelines that would benefit from more accurate mapping? We also expect that this data will revolutionize the way pre-inspection occurs for gas line boring contractors.

**What will the average contractor or utility gain from this tool?**

What pipeline inspector hasn't wished to know exactly where the pipeline they were in was running? What city couldn't benefit from a more accurate, complete and visual representation of their underground infrastructure? What horizontal drilling company couldn't benefit from knowing exactly where the laterals are underground? The 3D-GeoSense sensors in our 3-D cameras can provide this information to them at a reasonable cost and in a simple-to-use package. ♦



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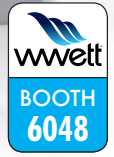


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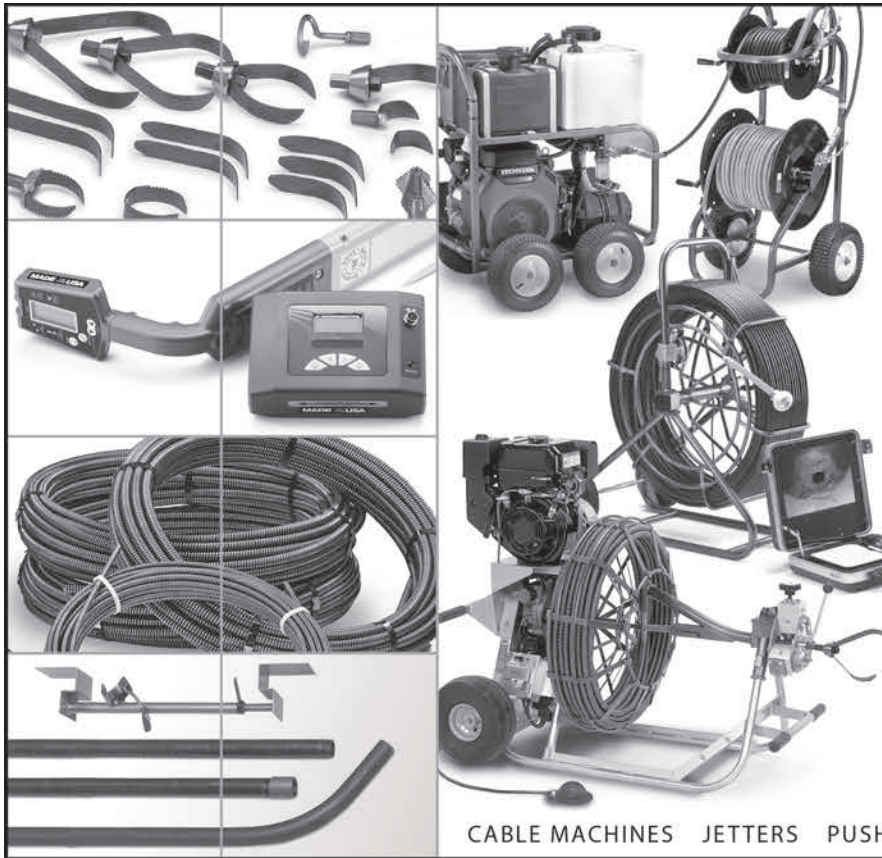


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# PIPELINE AND INFRASTRUCTURE, HYDRANTS

By Craig Mandli

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### 2. RELINER/Duran Inside Drop

By using Inside Drops from RELINER/Duran in lift stations, pump life can be extended by preventing aerated influent from being directly drawn into the pumps. Their use can help dramatically reduce pump-related problems, as well as reduce general maintenance and odor complaints. The drop pipe should be extended below the low-limit level and cut to follow the slope of the base fillet. If there is no fillet, cut the pipe at 45 degrees, one pipe diameter from the floor or fillet. This will create a diffuser by directing the flow back against the structure, thus de-aerating the influent. This simple arrangement is easy to maintain, as there is nothing to collect debris. It can be cleaned from above. **800/508-6001; www.reliner.com.**

## PIPES

### 3. Advanced Drainage Systems HP Storm

**HP Storm** from **Advanced Drainage Systems** is a high-performance polypropylene pipe for gravity-flow storm drainage applications. It is ideal for when

premium joint performance and/or greater pipe stiffness is required, as it couples advanced polypropylene resin technology with a dual-wall profile design for performance and durability. The smooth interior wall offers additional strength as well as high flow. It has an extended bell that adds an additional factor of safety within each joint. It meets or exceeds typical standards for pipe stiffness and joint integrity and meets ASTM F2881 and AASHTO M330 for the respective diameters. It is approved for use by the Army Corps of Engineers, Federal Aviation Authority, and American Railway Engineering and Maintenance-of-Way Association. **800/821-6710; www.ads-pipe.com.**

### 4. Thompson Pipe Group Flowtite FRP

**Flowtite FRP** pipe from **Thompson Pipe Group** is suited for sliplining applications because of its imperviousness to corrosion and ideal hydraulic performance. It is available in custom diameters, a major benefit made possible because it is manufactured with a continuous-winding process. Sliplining helps eliminate the risk of sleeve or other damage during installation. **225/658-6166; www.flowtitepipe.com.**

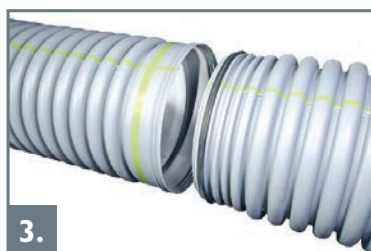
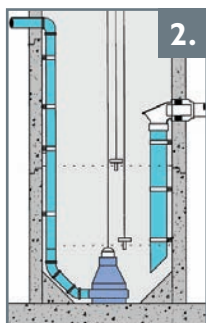
## PUMPS

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### 6. Gorman-Rupp Company Eradicator Solids Management System

The **Eradicator Solids Management System** upgrade kit for Super T Series self-priming centrifugal pumps from **Gorman-Rupp Company** can handle new sewage, poultry waste, plastic bags, hair and other stringy, clog-prone materials that may wreak havoc on pumps. The system consists of a lightweight inspection cover, a back cover plate incorporating an obstruction-free flow path, and an aggressive self-cleaning wear plate including laser-cut notches and grooves, along with a tooth designed to clear material from the eye of the impeller. It can be easily installed into existing Super T Series pumps in the field. **419/755-1011; www.grpumps.com.**





### 7. Vaughan Co. Triton

**Triton** screw centrifugal pumps from **Vaughan Co.** handle thick biosolids, large or stringy solids, shear-sensitive fluids, and delicate or highly abrasive materials. They have non-overloading power characteristics, heavy-duty power frames and a flushless mechanical seal. A water-flushed mechanical seal or packing is available. **888/249-2467; www.chopperpumps.com.**

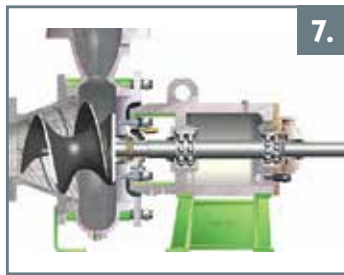
### 8. Vertiflo Pump Company Series 900

The **Series 900** industrial vertical immersion vortex sump pump from **Vertiflo Pump Company** provides an unrestricted flow, since the impeller is not normally in contact with the solids being pumped. Applications include chemical slurries, fragile food-processing solids, paper and pulpy solids, petroleum and oils, sewage, wastewater treatment, and textiles. It handles solids up to 4 inches in diameter. It is designed for long life in severe services with heads to 170 feet, temperatures to 350 degrees F, and pit depths up to 26 feet with flows to 1,600 gpm. Construction options include cast iron, 316 stainless steel fitted, all 316 stainless steel, Alloy 20 and CD4MC. **513/530-0888; www.vertiflopump.com.**

## VALVE

### 9. Singer Valve 106-RPS-8700

The **106-RPS-8700** pressure relief valve from **Singer Valve** is UL/FM labeled and listed, and automatically relieves excess pressure in the fire protection system to discharge. It will automatically modulate to relieve excess pump capacity during pump startup and shutdown, allowing the pump to operate without causing surges. It is based on 106-PG or A106-PG main valves and comes in a complete range of sizes from 2 1/2 to 8 inches. In a typical pressure relief application, the angle style is often the preferred selection. Testing includes UL- and FM-approved hydrostatic pressure tests and a full function and operation test. **604/594-5404; www.singervalve.com. ♦**



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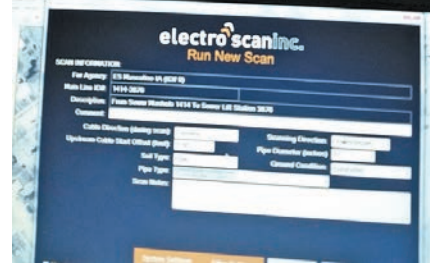


**Problem:**

The city of Muscatine, Iowa, experiences high-flow conditions in its sanitary sewer interceptors that run through flood control levees on the Mississippi River. As a designated critical sewer, the U.S. Army Corps of Engineers ordered the city to inspect its interceptors on a regular basis. However, bypassing and dewatering high-flow pipes so they can be taken offline to accommodate CCTV inspection can be an expensive and time-consuming process, often with mixed results.

**Solution:**

The city chose instead to use low-voltage conductivity to test its large-diameter mains. By turning off the pump station and allowing a temporary buildup in effluent flow, **Electro Scan**, in partnership with Municipal Pipe Tool, was able to inspect all 3,000 feet (12 segments) of 24-



and 27-inch CIPP-lined RCP in less than a day and half. Additionally, defects often not seen on CCTV were located and quantified in gpm. All work was done in accordance with ASTM F2550 and newly issued *7th Edition, Volume 1 of the Operations & Maintenance Manual of Wastewater Collection Systems*.

**RESULT:**

While nine of 12 pipes had little to no defects, two segments had multiple defects. In fact, combined defect flows for the two pipes accounted for nearly 80 percent of the infiltration flows for the 3,000-foot project. The city was happy with the speed and efficiency of the project and the level of data provided. **800/975-6149; www.electroscan.com.** ♦

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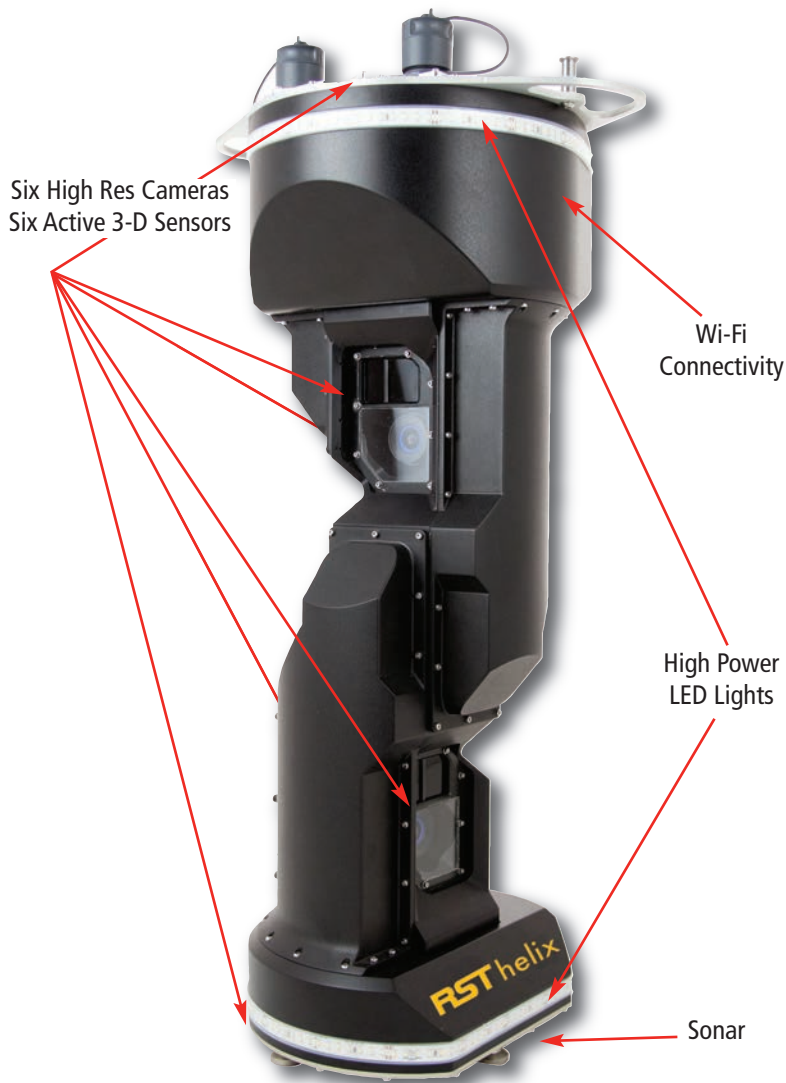
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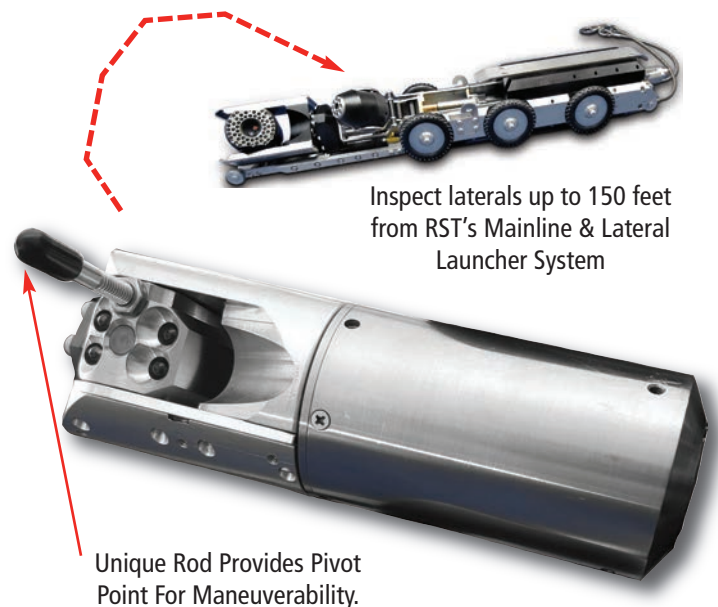
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▶ The RodStar improves access to laterals and inspection quality! This state-of-the-art camera offers pan-and-tilt capabilities and is designed with a unique rod that provides an important maneuvering advantage when accessing different pipe sizes and negotiating T and Y junctions. The rod is used to pivot the camera head to help the probe change directions and angles within the lateral to overcome common obstacles that stop ordinary cameras in their tracks. The camera is deployed from RST's popular Mainline and Lateral Launcher System.



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# Product Spotlight

## Quick-Lock rehab sleeve provides easy install

By Jared Raney

Resins, wash-outs, cure times; trenchless spot repairs can be full of pitfalls and obstacles, but with Pipeline Renewal Technologies' Quick-Lock rehab sleeve, you can say goodbye to all those time-consuming aspects of pipeline repair.

Quick-Lock is a point repair product that is fast and easy to install. Offering a patented stainless steel locking mechanism and single-piece EPDM vulcanized rubber gasket, Quick-Lock can be used for anything from stand-alone point repair to pre-lining under high infiltration.

"In the world of pipe rehab, performing localized repairs can still be a big undertaking," says Sean Lipscomb, field operations manager at Pipeline Renewal Technologies. "Either you're digging up a road, or you're using a trenchless method and everything that entails: resin mixing, winching, bypass pumping/plugging, wash-out risk, short pot life and long ambient cure times. Quick-Lock solves all these problems."

Quick-Lock is positioned inside the host pipe on a wheeled flow-through packer pushed by any standard CCTV crawler. Once in position, air pressure supplied to the packer expands the sleeve against the pipe wall. Patented stainless steel gear ratchets within the sleeve sustain the outward pressure, which structurally reinforces failing regions of the host pipe, and also compresses the gasket for leak-proof service.

"The technology is as simple as it is effective," Lipscomb says. Two peo-



ple can install a Quick-Lock for a small-diameter repair in about 30 minutes, and the only major equipment needed is a common inspection crawler.

"This product handles all applications where you'd need spot repair: active infiltration, offset joints, abandoned laterals, root intrusion, holes and cracks. Beyond that, it also addresses a need in the CIPP industry for end cap protection," says Jake Wells, director of marketing for Envirosight, which owns Pipeline Renewal Technologies. "When a CIPP liner fails, it often happens at the ends. Quick-Lock end caps install at the endpoints of a CIPP liner, providing rigid structural protection against damage from entrained debris and jetter hoses."

Quick-Lock sleeves are available in diameters ranging from 6 to 28 inches, and in lengths of 16 and 20 inches. Multiple sleeves can be interleaved to perform longer repairs. The sleeve design meets ASTM F3110-14 for mechanical trenchless point repair.

"Everyone knows CIPP has a high barrier to entry — it requires a lot of costly support equipment with extensive training and licensing commitments, plus the costs associated with a failed installation are high," Wells says. "Quick-Lock is the opposite — it's installed with a common inspection crawler and relies on no sensitive chemical processes." **973/252-6700; [www.pipelinert.com](http://www.pipelinert.com).**

## Steam-Flo steam generators by Sioux



Sioux's line of Steam-Flo steam generators is quickly becoming the selected choice for curing CIPP and installing fold-and-form PVC pipe liners. The Steam-Flo increases production by transferring heat faster than hot-water curing or ambient curing. The steam cure system increases efficiency with faster setup, and reduces water usage and

sewer system pollution. Steam curing releases lower styrene levels and odors, and reduces the risk of liner failure due to heating the liner too quickly. Sioux has been designing and building low-pressure steam generators since 1939. Sioux units are rugged, compact and easy to operate. Sioux offers many different mounting options including completely self-contained,

trailer-mounted systems. Sioux specializes in application-specific designs and has the capabilities to design the exact piece of equipment you need. **877/763-4039; [www.sioux.com/trenchless-pipelinert-rehabilitation.html](http://www.sioux.com/trenchless-pipelinert-rehabilitation.html).**

## Mueller Co.'s Super Centurion hydrant safety flange video



With no expectations to go viral, Mueller Co. has recreated the Super Centurion hydrant safety flange video with a twist. While they are still not sure how granny hit a Mueller hydrant in this quiet residential neighborhood, a duo of ever-so-helpful

water utility personnel install a new safety flange, repair the hydrant and

help granny get back behind the wheel. Check out this fun yet instructional new video on their YouTube channel: [youtu.be/YcIskZGJbZI](http://youtu.be/YcIskZGJbZI). 800-423-1323; [www.muellercompany.com](http://www.muellercompany.com).

## Hi-Vac hydroexcavator



The X-8 hydroexcavator from Hi-Vac Corporation has been redesigned for increased power and capacity. A new debris tank with dished front head allows operators to legally load up to 8 cubic

yards, helping avoid overweight tickets. The total payload capacity is 24,000 pounds and there is an onboard scale located at the operator station. The unit also features a 4,000 cfm, 27-inch Hg blower and a cyclone separator capable of 10-micron filtration. 800/752-2400; [www.x-vac.com](http://www.x-vac.com).



## Ring-O-Matic offers Hurco valve exercisers

Spin Doctor valve exercising models from Hurco can be mounted to any Ring-O-Matic vacuum excavator, allowing operators to clean debris from the valve and then exercise it. Exercisers have 13 feet of reach and

270 degrees of swing. The Hurco SD-400 provides 400 ft-lbs of torque, sufficient for municipal valve exercising programs. The SD-800 exerciser offers 800 ft-lbs of torque, allowing it to open large and gear-operated valves. The ERB-800 is similar to the SD-800, but on a horizontal axis. It also features a pivoting head, simplifying connection to the valve wrench. 800/544-2518; [www.ring-o-matic.com](http://www.ring-o-matic.com).

## StoneAge Wireless Tracked Striker



The Wireless Tracked Striker from StoneAge is an automated shotgunning system for hands-free surface preparation. The system enables safe, precise shotgunning on blast pads, walkways and platforms, inside vessels, boilers and other difficult-to-access locations. The modular design adapts to a wide range of applications with plug-and-play accessories. And the remotely steerable tracked base allows for continuous cleaning without needing to reposition. 866/795-1586; [www.stoneagetools.com](http://www.stoneagetools.com).



## Water Cannon undercarriage cleaner

Steel Eagle undercarriage cleaners from Water Cannon are designed to simplify pressure washing vehicle under-



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sides. A 13-inch wheel assembly has two 0-degree nozzles and two 15-degree nozzles providing 24 inches of cleaning area. The unit handles pressures up to 4,300 psi and temperatures up to 250 degrees F. The handle adjusts from 33.5 to 60 inches of reach and the unit can be used for vehicles with 14.5 inches of ground clearance. 800/333-9274; [www.watercannon.com](http://www.watercannon.com).

## Envirosight's ROVER X inspection crawler



The ROVER X sewer inspection crawler from Envirosight offers handheld controls so you can perform inspections, measure defects, overlay text, record video, gather PACP data and generate reports. Its versatile design meets challenges with rapid wheel changes, a camera lift and extra

lamps. Its six-wheel-drive, proportional steering and zero-turn radius make it agile in tight conditions. The ROVER X's compact size fits in any vehicle and runs off generator or inverter power. A 1,000-foot reel with auto-cable management simplifies operation. Request a demo today. 866/936-8476; [www.envirosight.com/demo](http://www.envirosight.com/demo). ♦

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### Agru America expands East and West coast manufacturing facilities

Agru America has extended its manufacturing capabilities with additional production lines at the company's Georgetown, South Carolina, and Fernley, Nevada, facilities. "Agru has added the increased manufacturing capacity to better service the U.S. East and West Coasts for our geomembrane business," says President Robert L. Johnson. "The expanded production capability of our quality geosynthetics will allow us to keep pace with the ever-expanding demand and technological advances in plastic extrusion for years to come." The company also supplies geosynthetic clay liners, vertical barrier systems and large-diameter piping systems for the U.S. and international civil/environmental markets.

### Apex Tool appoints Ross Porter Jr. as senior vice president and president

Apex Tool Group has appointed Ross Porter Jr. to its executive leadership team as senior vice president and president of its Global Power Tools business unit. Prior to joining Apex, Porter held senior executive roles at both Newell Brands and Chamberlain Industries.



Ross Porter Jr.

### Cretex announces new regional manager

Cretex Specialty Products announced that Dave McArthur joined their management team as regional manager, effective Oct. 24. McArthur will oversee sales and marketing and will expand product specifications and use through promotional efforts to engineers and municipalities and support for contractors. He will also further develop the company's distributor network in the eastern U.S.

### Legacy Building Solutions Top 600 Contractor for third consecutive year

Legacy Building Solutions has recently been ranked on the *Engineering News-Record* Top 600 Specialty Contractors list for the third year in a row. Legacy's 2016 ranking is 540, an increase from each of the previous two years. The article accompanying the Top 600 list highlights two growth trends that have helped fuel Legacy's growth: expansion of services, and design-build and design-assist technology. While Legacy has always offered engineering, fabric manufacturing and installation services, a 2016 addition allowed the company to fabricate steel beams at their South Haven, Minnesota, office. In addition to the Top 600 Specialty Contractors designation, Legacy was named to the *Inc. 5000* list this year, another sign of consistent growth.

### Super Products adds used equipment section to website

Truck-mounted vacuum equipment manufacturer Super Products LLC has created a used equipment section on its website. It features a listing of available used units and provides access to equipment details and specifications.

### Leslie joins Trio Vision as vice president of sales

Guy Leslie joined Trio Vision as vice president of sales. He will help grow the CCTV inspection manufacturer's portfolio of regional, national and global markets. ♦



Guy Leslie

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## PEOPLE/AWARDS

The U.S. Environmental Protection Agency awarded \$150,000 grants to five cities for technical assistance to develop long-term plans for stormwater management. Those cities include **Hattiesburg, Mississippi; Chester, Pennsylvania; Santa Fe, New Mexico; Rochester, New Hampshire;** and **Burlington, Iowa.**

The **Northwest Regional Planning Commission** in Vermont received a \$25,000 grant from the U.S. EPA for its Stormwater Education for Watershed Resiliency project. The grant is part of the 2016 Healthy Communities Grant Program. The project seeks to design and conduct an education

and outreach campaign geared to address water quality and climate resilience concerns in rural areas resulting from stormwater, erosion, flow redirection and pollutants.

**Trish Ouei** received the 2016 Ginger Tatom Award from the Arkansas Department of Environmental Quality. Ouei is a Benton County Extension Service urban stormwater educator for the University of Arkansas System Division of Agriculture.

## LEARNING OPPORTUNITIES

### Wisconsin

The University of Wisconsin Department of Engineering Professional Development is offering **Using WinSLAMM v.10.2: Meeting Urban Stormwater Management Goals** on April 20-21 in Madison. Visit [epdweb.engr.wisc.edu](http://epdweb.engr.wisc.edu). ♦

## CALENDAR

### Feb. 7-10

The Utility Management 2017 Conference, presented by the Water Environment Federation and the American Water Works Association, Tampa Marriott Waterside, Tampa, Florida. Visit [www.wef.org](http://www.wef.org).

### March 4-6

National Utility Contractors Association 2017 Convention, Palms Casino Resort, Las Vegas. Visit [www.nuca.com](http://www.nuca.com).

### April 23-26

American Public Works Association 2017 North American Snow Conference, Iowa Events Center, Des Moines, Iowa. Visit [www.apwa.net](http://www.apwa.net).

### April 30-May 3

American Water Resources Association 2017 Spring Specialty Conference, Snowbird Ski and Summer Resort, Snowbird, Utah. Visit [www.awra.org](http://www.awra.org).

### June 11-14

American Water Works Association Annual Conference & Exposition, Pennsylvania Convention Center, Philadelphia. Visit [www.awwa.org](http://www.awwa.org).

### June 25-28

American Water Resources Association 2017 Summer Conference: Climate Change Solutions, Sheraton Tysons Hotel, Tysons, Virginia. Visit [www.awra.org](http://www.awra.org).

### June 26-29

National Association of Flood and Stormwater Agencies Annual Meeting, Belmond Charleston Place, Charleston, South Carolina. Visit [www.nafsm.org](http://www.nafsm.org).

### July 16-19

American Society of Agricultural and Biological Engineers 2017 Annual International Meeting, Spokane, Washington. Visit [www.asabe.org](http://www.asabe.org).

### Aug. 27-30

American Public Works Association PWX (Public Works Expo), Orange County Convention Center, Orlando, Florida. Visit [www.apwa.net](http://www.apwa.net).

### Aug. 27-31

StormCon: North American Surface Water Quality Conference & Exposition, Meydenbauer Center, Seattle. Visit [www.stormcon.com](http://www.stormcon.com).

### Sept. 18-20

National Rural Water Association WaterPro Conference, Reno, Nevada. Visit [www.nrwa.org](http://www.nrwa.org).

### Oct. 8-11

American Society of Civil Engineers 2017 Convention, New Orleans Marriott, New Orleans. Call 800/548-2723 or visit [www.asce.org](http://www.asce.org).

### Nov. 5-9

American Water Resources Association Annual Conference, Red Lion on the River-Jantzen Beach Hotel, Portland, Oregon. Visit [www.awra.org](http://www.awra.org).

**Municipal Sewer & Water** invites your national, state or local association to post notices and news items in this column. Send contributions to [editor@mswmag.com](mailto:editor@mswmag.com).

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