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SLIPLINING DOWN THE BOULEVARD

Louisville Water is conducting the largest main replacement program in its history, with minimal impact on local residents.

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Kelley Dearing Smith, vice president of communications and marketing, and Mike Meyer, project engineer, Louisville Water Company

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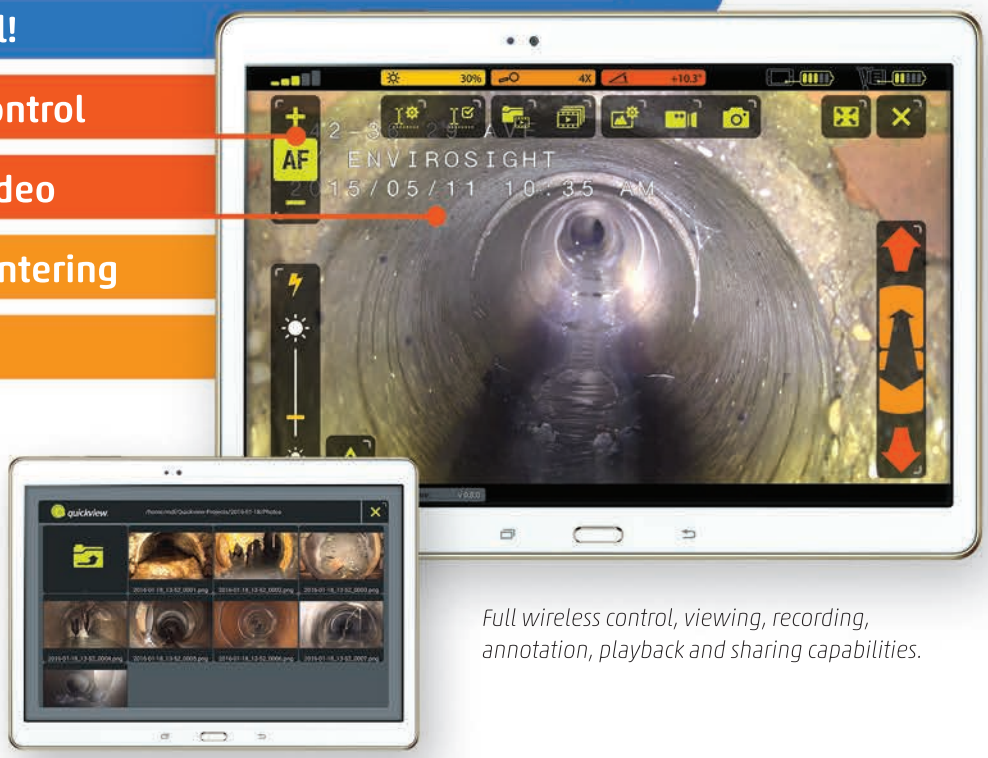

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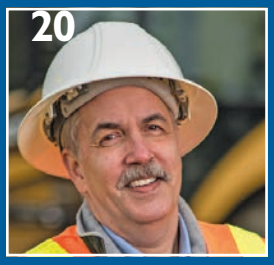

ON THE COVER: Louisville Water Company vice president of communications and marketing Kelley Dearing Smith and project engineer Mike Meyer have both played important roles in the city's Eastern Parkway project. The first phase of the project, in which new steel pipe is being sliplined into an old 48-inch cast-iron transmission main, wrapped up this spring. (Photography by Nathan Cornetet)

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Sewer and water systems form an outline of your city's past and future

FROM THE EDITOR

Luke Laggis

Your water and wastewater systems are closely intertwined with the history of your communities, and they quite literally lay the groundwork for your future.

In many ways, your systems tell the story of how your communities developed. Like an old map of planned development — following streets and rail corridors, running through backyards and green spaces; even wooded areas where planned streets were never built — your systems tell a history. They are a source of life.

Maintaining and modernizing those buried systems without disrupting much of what's sprouted and grown above ground can be a challenge.

The Louisville (Kentucky) Water Company is meeting that challenge head-on. Louisville, profiled in this issue of *MSW,* was forced to address an old and failing transmission main. After three catastrophic breaks, the 48-inch cast iron main had to be replaced.

The 6.4-mile Eastern Parkway Project is complicated by the fact that it follows an historic and heavily traveled boulevard through established neighborhoods, a shopping district and popular recreation areas. The utility didn't want to cause major traffic or service disruptions, or damage the tree-lined character of the corridor.

To meet the objectives, Louisville Water scheduled the work for winter, engaged in a thorough public outreach campaign, and most important, the old pipe is being sliplined with steel to keep the above-ground impact to a minimum.

Along the way, crews unearthed an enormous water valve, 12 feet high and weighing more than 100,000 pounds, that had been buried for more than a century. It's now on its way to the city's Water Works Museum, located in the city's original pump house No. 1 along the Ohio River and dedicated to exhibiting the history of the water infrastructure that serves the area.

The project is preserving the character of the neighborhoods above, the history of quality service, and now, unexpectedly, an actual piece of cast iron history.

Up in Ottawa, Ontario, the Public Works and Environmental Services Department is preserving some history as well. The utility, also profiled in this issue, serves Canada's capital city. The city has made significant progress against CSOs in recent years, but overflows to the Ottawa River have led to construction of a combined sewage storage tunnel to retain as many as 11.3 million gallons of sewer overflow for treatment.

The importance of water quality in the city's Rideau Canal is also significant, as it is a UNESCO World Heritage Site and the oldest continuously operated canal system in North America. In addition to protecting the canal, the tunnel system had to be designed to protect several other historic landmarks.

Both cities have taken steps to preserve their history, and just as important, to ensure a healthy future. In a general sense, all water and wastewater utilities are charged with that task. That's what makes the work you do so important.

You might not ever have to preserve the water quality for a UNESCO World Heritage Site or slipline a major sewer line down the middle of an historic boulevard without disrupting anything on the surface, but you're still protecting history and building a future.

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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PUBLIC OUTREACH

Utilities Engage Customers on Water Issues in a Variety of Ways

Educating customers on what it takes to bring clean water to the tap is oftentimes one of the most challenging tasks for a utility. But it's a task worth pursuing. A knowledgeable customer base can be more accepting of rate increases when they become necessary, and has a better understanding of how their water use practices play into the bigger picture. National Drinking Water Week in May provided utilities with a prime opportunity to do some customer education. Read about how utilities across the country marked the occasion, and see if it gives you some ideas for your utility's public outreach efforts. **mswmag.com/featured**

SECOND LIFE

From Pumping Wastewater to Serving Up Food

Wastewater infrastructure is built for a specific purpose. Being given a second life when that purpose comes to an end is rare — certainly food service doesn't come to mind. But that's what is in store for a former lift station in Milwaukee, Wisconsin. The nearly 70-year-old structure is being turned into a seasonal walk-up eatery as part of a larger neighborhood development project. **mswmag.com/featured**

OVERHEARD ONLINE

> "We're losing hundreds of thousands of acre-feet of water each year to the ocean in places like Los Angeles and San Diego and San Francisco, and that's water that if we make the proper investments, can be captured and used."

— Bill Could Bolster California Stormwater Capture **mswmag.com/featured**

A BETTER WAY

Contractor Helps Municipalities Tackle Manhole Issues

Brad Steenhoek has grown his Iowa-based company quickly in the last seven years and all by offering only a single service — manhole rehabilitation. "Everyone has manholes and everyone has issues with them," explains Steenhoek. Using a variety of methods, including the Mr. Manhole tool, he has built his business around helping utilities solve a chronic problem. If your utility struggles with manhole issues, check out Steenhoek's story and see if it can inspire a solution. **mswmag.com/featured**

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SLIPLINING DOWN THE BOULEVARD

Louisville Water is conducting the largest main replacement program in its history, with minimal impact on local residents

By Jim Force

Infrastructure replacement projects tend to draw the ire of anyone who is inconvenienced by traffic delays or service interruptions, but Louisville Water has found a way around that.

The Louisville Water Company is replacing 6.4 miles of old cast iron water main in the midst of the city, and doing so with a surprisingly minimal impact on affected neighborhoods.

The $23 million Eastern Parkway Project follows a busy tree-lined boulevard that features historic homes, spacious yards, parks and commercial developments. The project's success is predicated on three main points:

- The work is taking place in three phases during winter months only, so that summertime water use — when demand is highest — is not affected
- Citizens in the affected area have been closely involved in preconstruction communications and meetings so their concerns could be heard and plans shared
- Perhaps most important, the old pipe is being sliplined with steel to avoid large excavations and major traffic disruptions

"We're doing this without anyone losing water," says Kelley Dearing Smith, vice president of communications and marketing for Louisville Water. "We are keeping Eastern Parkway open. We are preserving the beauty and character of the area."

Traffic detours are being kept to a minimum, she adds.

Out with the old

The old cast iron pipe is 48 inches in diameter and dates to the 1920s. Wall thickness is 1.75 inches, with sections joined by "leadite" — a non-metallic resin. It carries water from the Crescent Hill water treatment plant

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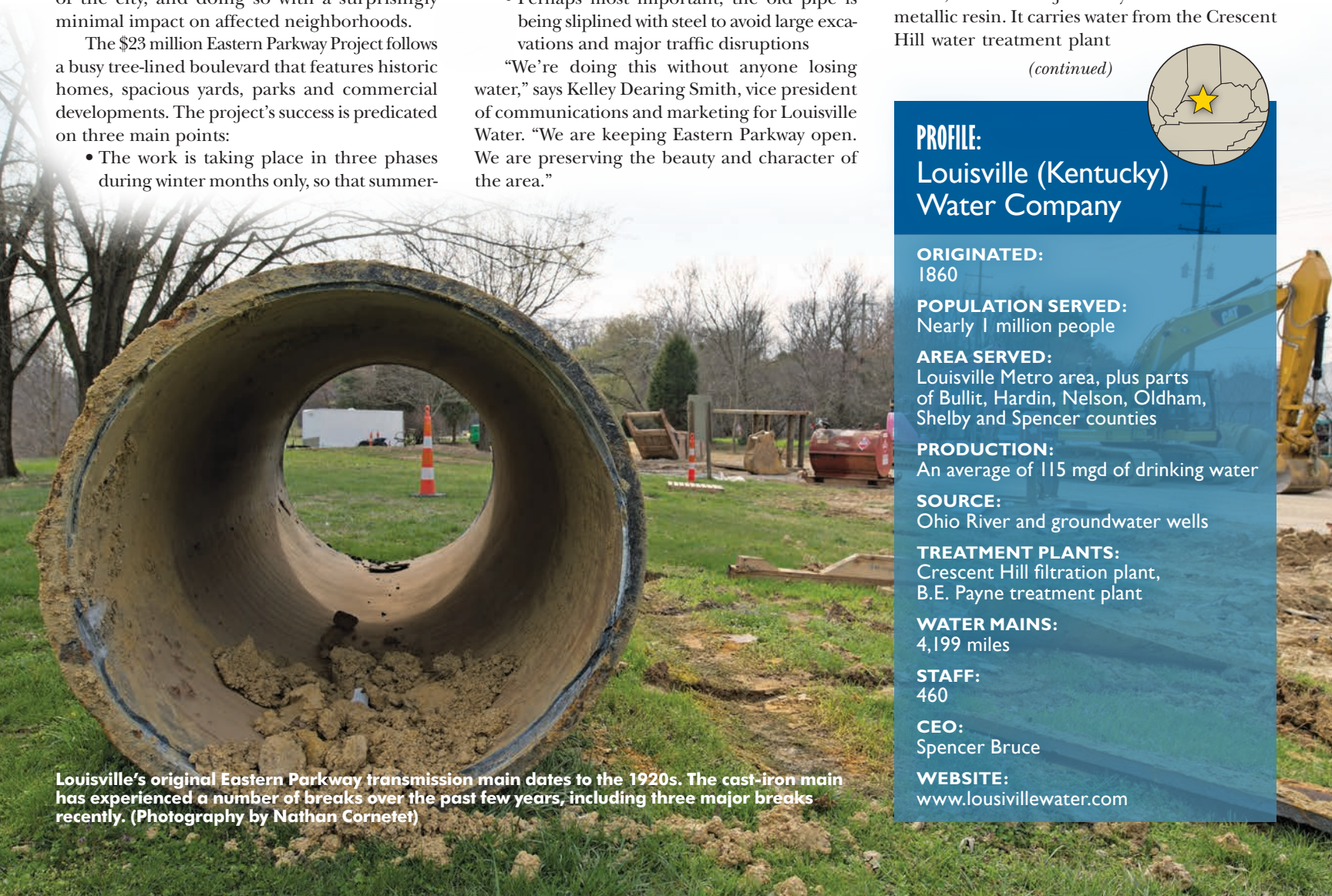

Louisville's original Eastern Parkway transmission main dates to the 1920s. The cast-iron main has experienced a number of breaks over the past few years, including three major breaks recently. (Photography by Nathan Cornetet)

PROFILE: Louisville (Kentucky) Water Company

ORIGINATED:
1860

POPULATION SERVED:
Nearly 1 million people

AREA SERVED:
Louisville Metro area, plus parts of Bullit, Hardin, Nelson, Oldham, Shelby and Spencer counties

PRODUCTION:
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SOURCE:
Ohio River and groundwater wells

TREATMENT PLANTS:
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WATER MAINS:
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STAFF:
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CEO:
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New sections of pipe are staged for sliplining along the Eastern Parkway Project in Louisville.

"Opencut would have been a nightmare. It would have taken much longer and caused more disruption."

– Mike Meyer

to a 25-million-gallon underground reservoir, and has experienced a number of breaks over the past few years, three major breaks only recently.

"We examined the pipe using robotic technology from Pure Technologies," explains Mike Meyer, project manager for Louisville Water. "The technology looks for leaks, air pockets, and pipe wall stress areas."

"We also televised it," Meyer adds. "The breaks were not in the walls themselves, but at the joints. There were breaks where the joints had cracked."

Meyer attributes the cracks to stress brought on by temperature changes over the years. "The leadite joints expanded and contracted differently than the pipe itself."

Once the decision was made to replace the 6.4-mile section of old pipe, Louisville and its design consultant, HDR, looked at alternatives.

"Opencut excavation would have been very disruptive," Meyer says. That made sliplining the choice. Meyer says Louisville looked at a number of liners — including PVC and HDPE pipe, before settling on steel. "Our concerns were about wall thickness and inside diameter size," says Meyer. "We didn't want to lose capacity."

In the end, Louisville went with a 42-inch O.D. steel pipe, to be inserted inside the old 48-inch O.D. host pipe. Meyer says the smaller bell and spigot size on the steel pipe also figured heavily in the analysis. "That allowed us to maximize the interior diameter of the liner pipe."

Eastern Parkway is not only the largest water main repair project in Louisville Water's history, it's the first time the company has used sliplining. "Opencut would have been a nightmare," Meyer says. "It would have taken much longer and caused more disruption."

Mike Meyer, project engineer, and Kelley Dearing Smith, vice president of communications and marketing, pose together in front of the Louisville Water Company's main office.

How they did it

Louisville initiated the first phase of the slipline project last fall, after awarding the project to Garney Construction, headquartered in Kansas City. In the process, the contractor digs 30-foot push pits at points where 25-foot-long sections of the liner pipe (supplied by American Steel Pipe) are to be inserted into the host pipe. Then, a hoist drops a jacking machine into the pit, where it is mounted on a set of rails. Spacers are attached to the pipe sections, and the sections are placed into the pit and pushed by the jacking machine into the old pipe. Inside the pit, the machine can also be turned around to push pipe in the other direction.

"The jacking machine is basically a jack-and-bore with the bore unit removed," explains Meyer.

Where the pipe goes around sweeping turns or bends, shorter 10-foot sections of steel liner pipe are used. In the case of tight turns, the section is fully excavated and the old pipe is removed before the steel pipe is put in place.

Meyer explains that the sections are fitted together, and a welder enters the pipeline and physically welds the pipe sections together at each bell-and-spigot joint. The welds are then inspected, and the pipe system is chlorinated and pressure tested. First, it is filled with chlorinated water, which remains in the pipe for a period of 25 to 50 hours, and then is flushed out. Potable water is pumped into the piping and the system is pressure tested to 150 psi. Meyer says normal operating pressure is 90 psi.

Each section of steel pipe installed in the opencut trench areas has a poly liner on the outside surface installed at the factory to prevent corrosion. Pipe sliplined through the existing 48-inch pipe is not coated and left bare steel.

(continued)

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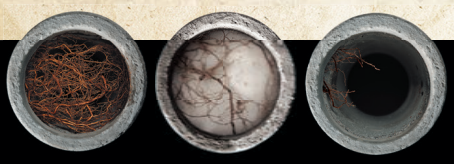

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New 42-inch steel pipe is pulled in through the original 48-inch cast-iron main.

"If there's a takeaway, it's communications. It was important that we identify the stakeholders and get them involved early on so they would know what to expect. We had all vendors at the table as well. There were no surprises. It's probably the most layered communications program we've ever done."

– Kelley Dearing Smith

Finally, the new pipe is grouted in place. Meyer says grout is pumped into the annular space between the outside of the liner pipe and the inside of the host pipe. "Grouting is last so that it doesn't cause any false readings with pressure testing," he explains.

Louisville prides itself on system redundancy, and there are several distribution connections along the Eastern Parkway water main that convey water to other specific areas. "We have multiple backups in place — a lot of redundancy — so we can remove the Eastern Parkway main from service while other mains pick up the water load," Meyer says. Where those connections exist, the open pit method is used to replace the piping because it's not possible to push the new pipe through them.

Community outreach

Both Meyer and Dearing Smith emphasize the important role that community involvement has played in the success of the project thus far.

"If there's a takeaway, it's communications," says Dearing Smith. She says Louisville Water made sure that affected citizens had a chance to hear preliminary plans and voice their concerns at meetings before the first pit was dug. "It was important that we identify the stakeholders and get them involved early on so they would know what to expect. We had all vendors at the table as well. There were no surprises. It's probably the most layered communications program we've ever done."

Effective communication is more than just a press release. Dearing Smith points out that Louisville Water is using social media, its website, signage, face-to-face meetings, and even drone videography to facilitate the flow of information back and forth.

"We've had some complaints, but not as many as we thought we'd have. Most have involved vehicles speeding through the neighborhood."

Traffic is a big deal with projects like this, but since Eastern Parkway is a four-lane boulevard with a wide median strip, disruption was minimized. While work took place on one side of the

A BIG PIECE OF HISTORY

Louisville's Eastern Parkway Project turned up an unexpected bit of history — a 12-foot-high cast-iron water valve weighing more than 100,000 pounds. The valve, carrying an 1888 patent date, is now going on display at the city's Water Works Museum.

For more than 100 years it was out of sight, buried underground in Louisville Water's distribution system.

Soon, it will be on display for thousands to see and examine at Louisville's Water Works Museum.

"We've had some complaints, but not as many as we thought we'd have. Most have involved vehicles speeding through the neighborhood."

– Kelley Dearing Smith

road, traffic was diverted to the other two lanes, traveling in both directions. In cases where complete intersections required work, they were shut down from 8 p.m. Friday to 6 a.m. Monday.

"We worked very closely with Metro Parks, Metro Public Works, and the Kentucky Transportation Cabinet on these plans and diversions," says Dearing Smith.

Now that phase 1 is complete, citizens who will be affected by phase 2 — scheduled for next winter — can see what to expect. "We're doing the site restoration in phases, too," she says. "They can see the new curbs, pavement, trees and landscaping (that follow the pipe replacement)."

The next phase will pass through the University of Louisville campus, close to the school's highly regarded engineering department. Dearing Smith sees this is an opportunity.

"The existing pipeline goes through the center of the campus," she explains. "So we're talking with the university about realigning the pipe and going through an area that they've just begun to develop."

She envisions lectures, classroom presentations, photos in the campus library, and pipeline parties. "What better way to get the schools and the students involved in the project?" she asks.

As of April 1, Louisville Water was wrapping up the first phase of the sliplining project and preparing to put the Eastern Parkway water main back in business. And just in time.

"We have something pretty big here the first Saturday of May," Meyer notes. "It's called the Kentucky Derby." ✦

It's an enormous water valve, 12 feet high and weighing more than 100,000 pounds, carrying a patent date of 1888.

According to Kelley Dearing Smith, public information officer for the Louisville Water Company, the valve was manufactured by the Rensselaer Valve Company in Troy, New York. It was installed along with the original cast iron pipe, which ran along Eastern Parkway and was discovered as crews worked to repair the Eastern Parkway water main.

Smith says the huge valve is being cleaned up and will soon be on display at the Water Works Museum, located along the Ohio River and dedicated to exhibiting the history of the water infrastructure that serves the area. The museum is located in the city's original pump house No. 1, and includes the city's first water tower on its property. Exhibits include historic photographs, films and memorabilia that demonstrate the company's contributions to safe drinking water and innovations in science and engineering. Special exhibits rotate throughout the year.

Thousands of people visit annually, including students on field trips, group tours and individuals. The facility can be rented for weddings and other special occasions.

The historic valve will have some historic company when it's placed in the museum. The exhibits also include a 1919 Allis-Chalmers pump.

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Diversity of thought can challenge assumptions, spark new ideas and make your utility more efficient

By Ken Wysocky

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.

For too many organizations, workplace diversity is a numbers game where the winner is determined by a formula that might look something like this: Hire X number of minorities; achieve a specific percentage of genders and sexual orientations; attain a certain mix of ages, ethnicities and backgrounds; and congratulate everyone involved for a job well done.

But in reality, achieving diversity is a lot more complex than that. In short, it's not only the numbers that count — it's all about creating a culture that welcomes and invites the ideas and perspectives that these employees bring to the table. And too often, they're sitting at that proverbial table, but like children at a nice dinner party, they're only present to be seen, not heard.

"It's no longer enough for organizations to look around (at the numbers) and say, 'Good. we have diversity here,'" says Beth Wagner, a master facilitator at Fierce Inc., a leadership-development consulting firm *(www.fierceinc.com)*. "It has to go much deeper than that — include all voices and encompass all diversity of thought and multiple perspectives, so that organizations can make the best possible decisions as well as truly engage their workforces."

The benefits of diverse thought within utilities include more engaged employees, lower turnover, increased collaboration and better decision-making. Moreover, the workforce at large increasingly is demanding it. In fact, in a recent Fierce survey of millennials — the largest generational cohort in today's workforce — half said that the companies they work for would benefit from greater thought diversity. They also believe that divergent perspectives result in greater innovation, Wagner points out.

In addition, Fierce facilitators have noticed a trend in client surveys in which affiliation groups within companies — whether they're women or African-Americans, for example — want to engage in more dialogue with other internal groups. "Even those groups inside organizations want to talk more with each other — encourage diversity of thought," says Stacey Engle, executive vice president of marketing for Fierce.

Another factor to consider: Organizations that aren't as diverse as their clients will find it more difficult to understand those customers' needs.

This type of interaction and relationship-building is difficult to achieve without mutual trust. To succeed, utilities must build what Wagner calls a culture of curiosity, in which employees are invited to share their opinions. And just as importantly, managers and supervisors must authentically listen to and value those perspectives. The value of this approach has been documented by a notable corporate-research firm, which found that organizations with employees who feel they're trusted outperform organizations with employees who don't feel that way, Wagner says.

"You can't build a culture of curiosity and encourage diversity of thought without trust," she emphasizes. "Trust is a byproduct of doing those things well."

"If you look at what will result in the best possible decisions, one perspective does not create the reality of an organization. So while we may be wired to orient ourselves with people who think like us, it's not the best way to generate creativity or innovation. You have to try to shift behaviors."

– Beth Wagner

Few things can ruin trust-building attempts more than ignoring those who could bring thought-diversity to the forefront. Something as simple as a weekly meeting could bear significant benefits if managers break the habit of always inviting the same people to attend — their "go-to" employees. Often this isn't done intentionally, Wagner notes; it's more a factor of how people are naturally hardwired to seek out things that are familiar to them.

"If you look at what will result in the best possible decisions, one perspective does not create the reality of an organization," she points out. "So while we may be wired to orient ourselves with people who think like us, it's not the best way to generate creativity or innovation. You have to try to shift behaviors."

To do that, Wagner recommends using a team model based on a beach ball. The idea is that every employee from a different level in a company has their own colored section of the beach ball. Symbolically, no single person holds the whole truth. Instead, they hold just a single sliver — or colored section — of the beach ball. And the only way to form a complete beach ball is to consider everyone's ideas and perspectives, she says.

This model provides a more inclusive approach to planning as well as conducting meetings. And it can yield tangible results, Engle notes, pointing to a large not-for-profit charitable organization that parlayed a

beach-ball conversation into more than $321,000 in savings. The organization now uses beach-ball conversations to dig into other problems and gather more innovative ideas and solutions.

What can utility leaders do to encourage more thought diversity? You can start by interrogating your own realities and questioning your assumptions. In other words, don't use meetings as a mindless herd-think forum to reach a conclusion already determined ahead of time. Invite other perspectives and truly listen to new ideas.

Part and parcel to that is using the beach-ball model to invite the right people to meetings. That doesn't mean inviting every possible employee — this invites "collaboration constipation," in which so many voices chime in that nothing good gets accomplished. Instead, be conscious about inviting people from pertinent areas of the organization, as well as those who will challenge conventional assumptions and perspectives, Wagner suggests.

Just as importantly, truly listen to opposing perspectives. That includes being aware of how body language — checking a cellphone text message while someone is talking or not making eye contact, for example — can easily undermine good intentions at listening. In addition, the dreaded, "Yes, but…" response to someone's opinion or idea is also a trust killer. "When you say something like that, what is the likelihood of that person ever sharing another perspective?" Wagner asks. "You've effectively closed down any chance of that happening again.

"Listening is the precursor to curiosity," she adds. "Asking questions (after someone speaks) also is a powerful tool."

In the end, the goal is to eliminate group-think and encourage creativity and innovation along with fresh insights and perspectives. To do otherwise and make diversity just a numbers game is a losing proposition. ✦

Tualatin Valley Water District CEO Mark Knudson on a job site in Beaverton, Oregon. (Photography by Ethan Rocke)

LEADING WITH PERSPECTIVE

A lifetime of service pushes Mark Knudson to help build support for the essential role of water and wastewater operations

By Jim Force

The two years Mark Knudson spent at the Cowlitz County (Oregon) Water Pollution Control Plant made all the difference in his career.

As CEO of the Tualatin Valley Water District, a recipient of the George Warren Fuller Award for distinguished service from the Pacific Northwest Section and the AWWA, and a former member of the AWWA board of directors, he says those early years taught him the importance of operations and maintenance, and the roles operators play in successful water management.

"I'd gone to college, gotten a master's degree, and was doing exactly what I wanted to do, designing water and wastewater systems," Knudson remembers. "But I realized that operations was the missing link. I needed to understand the operator's perspective."

He says he was fortunate to get the job in Cowlitz because it gave him tremendous perspective on how operators were the key to success: "That experience has stayed with me through my career."

Engineering background

Knudson was named CEO of the Tualatin Valley district in 2013, where he had served as chief engineer since 2007. The district serves more than 200,000 customers in Beaverton, Hillsboro, Tigard and unincorporated Washington County, Oregon.

Before joining the district, Knudson worked for Carollo Engineers, the Portland Water Bureau and the Clackamas River Water District. A native of Tigard, Oregon, he earned a bachelor's degree

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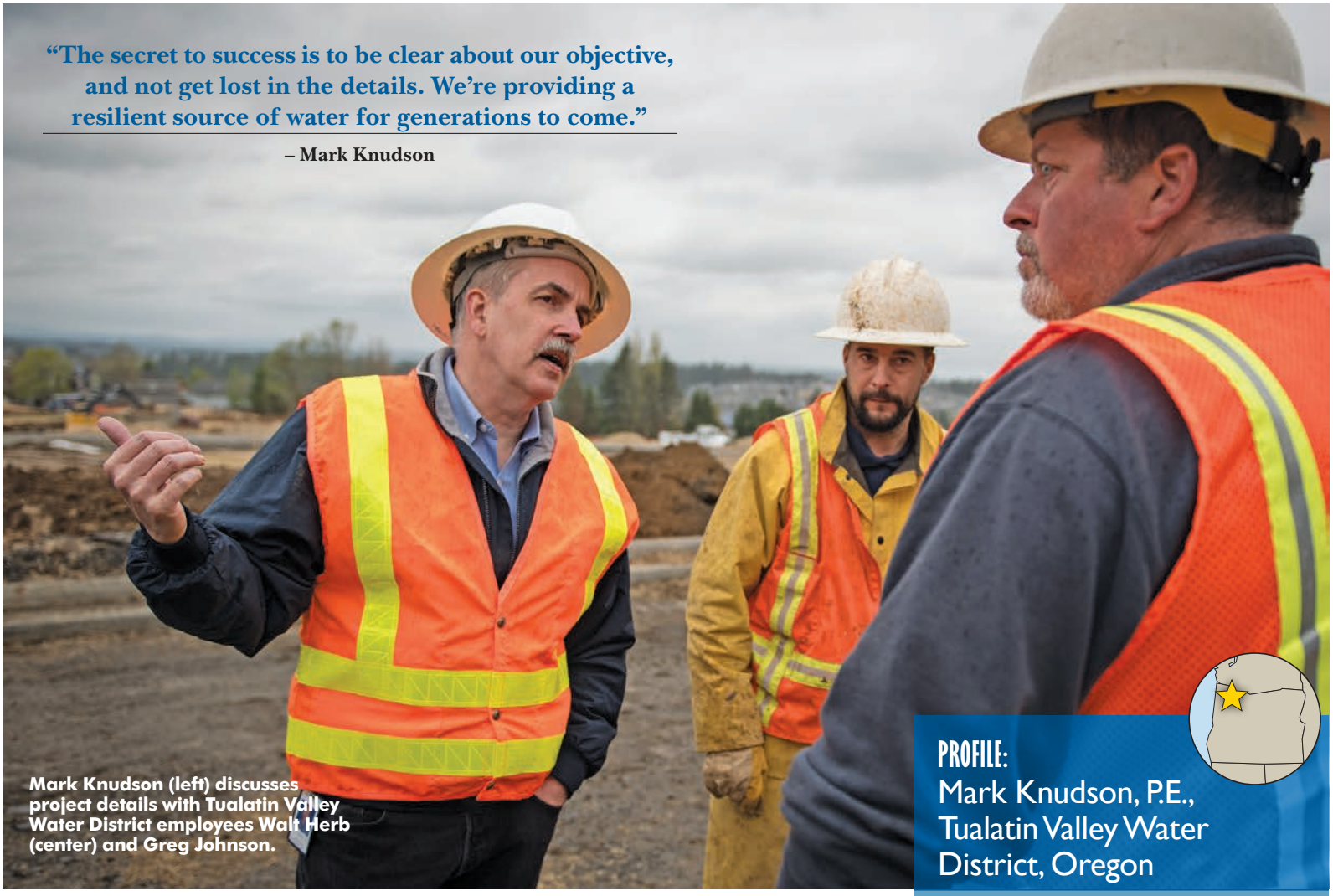
"The secret to success is to be clear about our objective, and not get lost in the details. We're providing a resilient source of water for generations to come."

– Mark Knudson



Mark Knudson (left) discusses project details with Tualatin Valley Water District employees Walt Herb (center) and Greg Johnson.

PROFILE:
Mark Knudson, P.E., Tualatin Valley Water District, Oregon

POSITION:
CEO

EXPERIENCE:
30-plus years in the industry

RESPONSIBILITIES:
Oversee and direct second-largest water utility in Oregon

EDUCATION:
Bachelor's degree civil engineering, master's degree environmental engineering, Oregon State University

CERTIFICATIONS:
Certified Operator, Water Distribution Level 4 and Water Distribution Level 3 of Oregon

GOALS:
Provide quality water and quality service and ensure a reliable, sustainable supply

in civil engineering and a master's in environmental engineering from Oregon State University.

He received a 2014 Award of Recognition for Service to the Water Profession from the AWWA and a 2005 Powell-Lindsey Citation for Outstanding Service from the Pacific Northwest Section AWWA. He is a registered professional engineer and certified water distribution and treatment operator in Oregon.

Making a difference

How did he decide on the water profession? "My father was an electrical engineer," Knudson says. "He worked for a Portland-based consultant who designed water and wastewater facilities." That gave him exposure to treatment plants and water management at an early age and led to his education in water engineering.

He has no regrets about his early career decisions. "The initial reward came through the technical side, optimizing treatment processes, increasing efficiency and performance, simplifying operations and improving reliability," he says.

He was also motivated by the idea of making a difference in the environment: "Early in my career, I began to appreciate the public service nature of what we do. The experience at Cowlitz County allowed me to better appreciate the public health significance of the role of the treatment operator."

As his career developed, Knudson was challenged by security issues around 9/11, and the need to harden facilities against the risk of major earthquakes in the Northwest. Now as general manager, he's in a position to put all the pieces together: operations, engineering, environment, public service, public health and safety, and organizational management.

"He has extraordinary administrative skills," says Jim Doane, who serves on the district board and has known Knudson for more than 30 years. "He has so many balls in the air. He has a good staff. It's unusual to find someone with his credentials who has also been an operator. We go where he leads us."

Security and 9/11

On Sept. 11, 2001, Knudson was director of operations and maintenance for the Portland Water Bureau. The terrorist attack changed his own and the entire water industry's focus. "I was driving to work when I heard about the planes crashing into the towers," he recalls. Immediately, his attention switched to security.

"We mobilized security, developed a command system, and implemented a security plan. Suddenly we recognized how precarious the water system could be, at Portland or anywhere." At the time, Portland had large, open-water reservoirs. Recognizing their vulnerability, the bureau hired security services to monitor them. Over time, Portland formed its own security team to guard key facilities.

Oregon also needs to protect water systems

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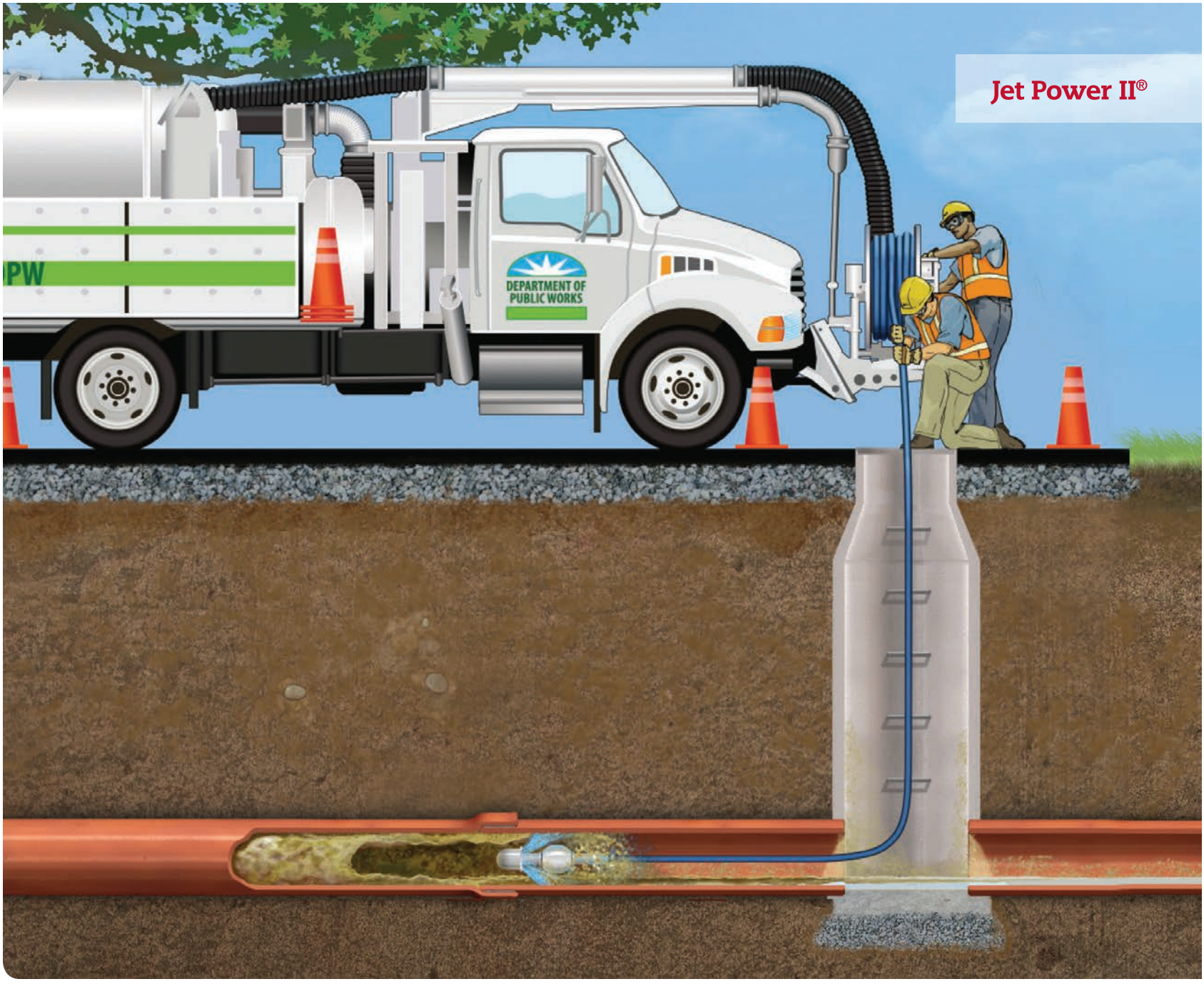

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"In the Portland area we average 37 inches of rainfall a year. Water falls from the sky and the public assumes it should be cheap. We need to continue to remind people that their public health and safety depend on clean water."

– Mark Knudson

against natural disasters, including earthquakes. Knudson helped lead development of seismic hardening plans for the state. He made presentations on the vulnerability of water systems before the Oregon Seismic Safety Policy Advisory Commission. And when the state legislature authorized preparation of an Oregon Resiliency Plan, Knudson became co-chair of the work team to identify seismic vulnerabilities and resiliency strategies for water and wastewater systems.

"Historically, the Northwest wasn't considered especially vulnerable to a large earthquake," Knudson says. "But recent research shows it's at significant risk. It's imperative that we plan for a Magnitude 9 earthquake in the next 50 years in the Northwest. It would be similar to the 2011 earthquake in Japan, and the impacts on our communities would be catastrophic.

"We aren't able to upgrade everything, so we focus on developing a resilient backbone of key facilities and pipelines that are designed to withstand such a quake. Pipelines represent some of the biggest challenges. They need special protection, especially at the joints."

Going regional

Knudson is putting his planning experience into practice as part of a new regional water supply program the Tualatin Valley district is managing. It's a 100 mgd supply system that includes transmission pipelines, a treatment plant and reservoirs that will draw water from the Willamette River to supply the district and five other partnering agencies.

"Our district gets about half its water from the Portland Water Bureau, which is expensive, and much of that system was built before we understood the seismic risks," Knudson says. The new system will take advantage of the district's previous investment in an intake on the Willamette. The new supply system will cost about $1.2 billion and employ "awesome technology" to meet the region's needs, Knudson says. The project must be operational by June 2026.

The success of the regional project has required open communication and cooperation. "It has been a six-way conversation," Knudson says. "The secret to success is to be clear about our objective, and not get lost in the details. We're providing a resilient source of water for generations to come."

Reaching the public

Public outreach is one of the most important factors in the Willamette regional supply system and in successful water management overall, Knudson believes: "We need to be open and honest to maintain the confidence of our customers and the trust of our regional partners."

He notes that people often don't understand that basic services like firefighting require a safe, reliable municipal water system: "In the Portland area we average 37 inches of rainfall a year. Water falls from the sky and the public assumes it should be cheap. We need to continue to remind people that their public health and safety depend on clean water."

Knudson observes that for years, the water industry has been a silent service: "We've done great work for decades, but haven't talked about it." He believes it's time for the industry to speak up and share the good news by making better use of communication tools and strategies that respond to customers' concerns and needs: "Use a video rather than a bill-stuffer."

And focus on the value of water: "Water rates could triple and people would still pay less for it than for cable TV. We need to build support for the essential nature of our service. We can't afford to wait for a disaster, like an earthquake, to begin making investments in reliability." ✦

The Tualatin Valley Water District team includes (from left) Greg Johnson, Walt Herb, Mark Knudson, J.T. Keating and Ryan Hansen.

FACING DOWN CHALLENGES

Mark Knudson sees little difference between his personal and professional challenges: "I've done water management my entire life, and now they're really one and the same."

At the top of the list he puts partnerships with other water jurisdictions, followed by personnel, and then customer expectations. Historically, water supply has centered around independent systems that sometimes behave in a parochial manner.

Today, Knudson believes systems need to rely on multiple sources and interconnections to achieve the resiliency they need to continue providing quality water. That and the need for rate efficiencies are driving water agencies toward regional solutions.

"Technology is the easy part," he says. "The real need is for cooperation and coordination among boards and councils of multiple jurisdictions. They need to surrender a little bit of control in order to achieve the greater public good."

Finding great people is another challenge: "Good isn't good enough. We need people who are bitten by the public service bug and get personal satisfaction from meeting a critical community need as opposed to receiving a big salary. We need to grow the future leaders and our industry."

As for meeting customer expectations: "We tend to be a conservative industry and slow to change. At the same time, the expectations of our customers regarding billing, account access, updates and social media are evolving rapidly."

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THE POWER TO DO MORE

Water jet cutting system removes solid obstructions that would otherwise require pipe replacement

By Luke Laggis

A 24-inch sewer main under one of your city's busiest downtown streets is backing up. You send a camera in and discover someone has dumped concrete into the line. Your jetter or rodder isn't going to solve the problem.

Even if you find the culprit who dumped the concrete and can recoup the costs, you're still going to have to dig up the street, reroute traffic, and inconvenience everyone in the area. It's not a good situation, but historically, there haven't been many other options.

The WJ Series precision jet cutting system from ID-TEC is a no-dig solution to that exact scenario. The truck- or trailer-mounted system uses extremely high pressure and specialized nozzles, along with CCTV for operational guidance, to remove the hardest of buildups without damaging the pipe and without digging up streets.

Municipal Sewer & Water magazine recently talked to ID-TEC President Rudy Ellgass, about the new system.

TECH CLOSE UP

PRODUCT:
WJ Series precision jet cutting system

MANUFACTURER:
ID-TEC
503/504-8474
www.sr-series.com

APPLICATION:
Extreme high pressure and specialized nozzles removes concrete from main sewer

BENEFITS:
Removes the hardest buildups without damaging pipes and without digging up streets

MSW: What was the idea behind the design of the ID-TEC precision jet cutting system?

Ellgass: The precision jet cutting system was developed as a specific and targeted application for removing deposits from pipes and lateral connections. We wanted a technology that is suitable, reliable and powerful for removing tree roots, hardened fat, cement, calcium buildup and over-poured concrete from within sewer pipes. In addition, it also needed to be safe for the host pipe or when encountering a cross-bore situation.

MSW: What's the difference between this technique and a typical jetting system?

Ellgass: Precision jet cutting uses a transporter (crawler), equipped with a camera and a pan-and-tilt nozzle. Because of the camera, the operator has a continuous view of the operation and can aim the water blast directly at the problem while adjusting the water pressure to changing conditions. Choosing the right angle of attack for the water blast will remove deposits without damage to the pipe.

A typical jetting system uses low pressure and high volume to flush out debris and other deposits. Our system uses low volume and high pressure with pin-point aim.

MSW: What type of work is the system designed to do?

Ellgass: It is designed to remove hardened fat, grease, massive tree roots, cement, calcium buildup, over-poured concrete and other deposits from pipelines and lateral connections.

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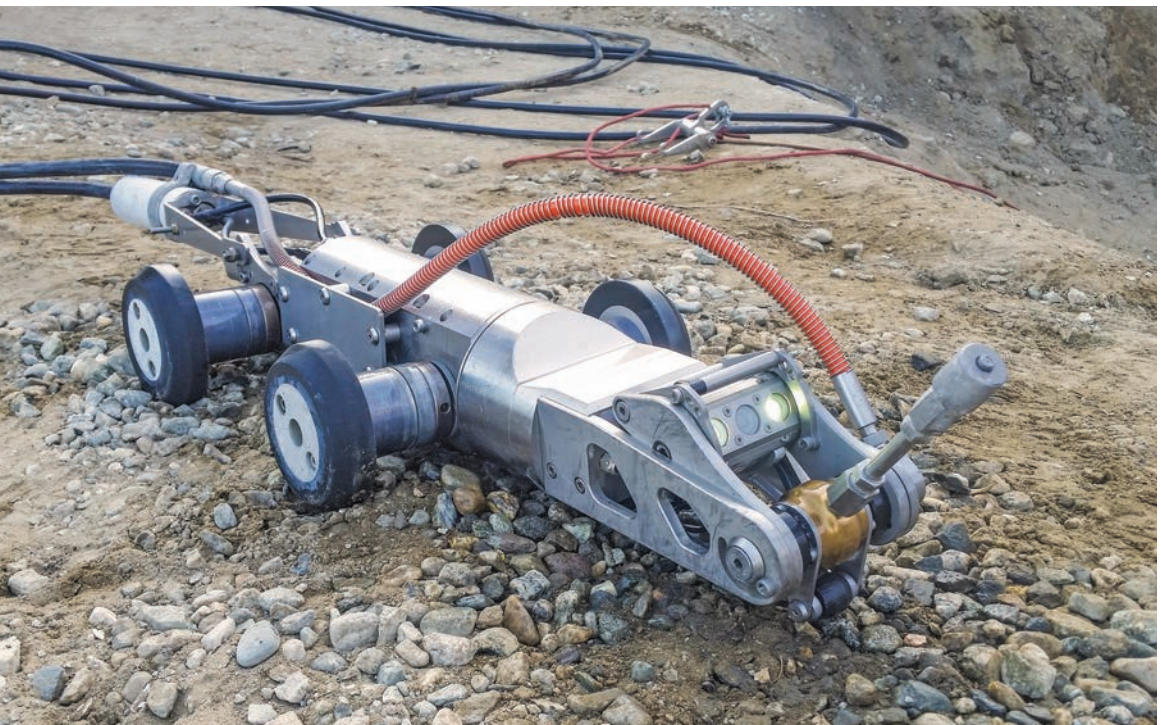

The precision jet cutting system uses a crawler equipped with a pan-tilt camera and a specialized high-pressure nozzle for removing hardened deposits like concrete and calcium buildup.


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The precision jet cutting system was only recently introduced in the U.S., but it has already been used to clean pipes that would have otherwise required open-cut replacement at much greater cost and inconvenience.

MSW: What sort of pressure and flow can the system produce?

Ellgass: ID-TEC offers three standard pressure units with maximum pressures ranging from 7,250 psi, 14,500 psi and up to 32,000 psi. Flows range between 4 and 6 gpm.

MSW: Can it be used for traditional lower pressure, high flow-rate sewer cleaning?

Ellgass: The system's specific purpose is to attack the hard deposits that conventional cleaning methods are unable to remove. It does not replace traditional pipe cleaning at all. However, it is usually the last no-dig effort that, if not successful, may end up in pipe replacement.

MSW: How does the operator control and guide the system during operation?

Ellgass: The operator uses two four-axis joysticks and a touch-screen monitor and PC, along with our special operating software. The operator drives the transporter, steers the nozzle, adjusts the water pressure and feeds or retracts both cable and hose reel while watching live video from the transporter.

MSW: Is any special training required?

Ellgass: A four-day operator training is mandatory. The training provides an understanding of the technology and educates new users on the operation and maintenance of the system, as well as high-pressure safety procedures.

MSW: Are the nozzles system-specific, or can it be used with other nozzles?

Ellgass: The nozzles used for precision jet cutting are system-specific and differ widely from conventional jetting nozzles.

MSW: There are three modules for precision jet cutting, the WJ160, WJ180 and WJ190. Can you explain the differences?

Ellgass: The WJ160, WJ180 and WJ190 modules are all compatible with the 8-inch transporter. The WJ160 features a compact design with a front-placed camera. This module can only be used with select nozzles and water pressure up to maximum of 14,500 psi. It is applicable for inspections with minor root infiltrations in 8- to 12-inch pipelines.

The WJ180 and WJ190 are made of stainless steel and have the nozzle below the camera. Different types of nozzles can therefore be used with water pressures up to 32,000 psi. The WJ180, without ram, is typically used in 8- to 18-inch pipelines and the WJ190 with ram in 12- to 40-inch lines.

The new 6-inch transporter with the WJ125 precision jet cutting module is available for 6- to 12-inch pipelines with pressures up to 32,000 psi.

MSW: Are there other modules available?

Ellgass: This modular system is designed around one single transporter, which is adaptable to several job-specific modules. Besides precision jet cutting, we have reinstatement cutting and CCTV inspection spot repair modules. Reinstatement cutting modules feature a hydro-powered cutting motor for reinstating laterals, smoothing joint offsets and cutting off protruding taps. The CCTV inspection and spot repair module is for mainline inspection and working with spot liner and mechanical point-repair packers.

MSW: What equipment comes with the system?

Ellgass: The precision jet cutting system includes the transporter, precision jet cutting module, cable reel, high-pressure hose reel, high-pressure unit, control unit and operating software. Available upgrades include the reinstatement cutting and inspection modules, PACP software and chemical root- and grease-control dosing unit.

The system is capable of removing over-poured concrete from pipes without causing damage.

What size pipes and what types of materials is the system designed to clean?

Ellgass: The system is designed for pipe diameters ranging from 6 inches up to 40 inches with the appropriate transporter, module and wheel setup.

MSW: This technology has been used in Europe for over a decade. Why is it just now coming to the U.S.?

Ellgass: ID-TEC wanted to first perfect and test this technology and its main technical components long-term before introducing it to the biggest market in the world. The system had to be made easy to service and an infrastructure had to be built, together with finding a competent partner, tasked to sell, service and support all aspects of this relatively new technology.

MSW: What is the cost of a complete system?

Ellgass: The system cost ranges from approximately $200,000 to $450,000 depending on equipment modules, pressure capacities, custom features and build-out. The vehicle chassis is not included. ✦

ENDING THE STORAGE WAR

A new tunnel project will give Canada's capital city greater capacity for preventing CSOs

By Peter Kenter

Some projects protect waterways. Some preserve a city and nation's history.

As the capital city of Canada, Ottawa will play a central role in the country's 150th anniversary this year. It's fitting that the city is also ramping up its efforts to knock out combined sewer overflows.

A combined sewage storage tunnel (CSST) is being built to retain as many as 11.3 million gallons of sewer overflow for treatment. According to design parameters, it will reduce CSOs to an average of no more than two per year. For the city's engineers, a commitment to getting the right design also helped the city achieve greater efficiency in its existing wastewater system.

While the city has made significant progress against CSOs in recent years, overflows to the Ottawa River continue to be a problem. The project is driven by the city's Ottawa River Action Plan and provincial safe water regulations. The importance of water quality in the city's Rideau Canal is also significant, as it is a UNESCO World Heritage Site and the oldest continuously operated canal system in North America.

Significant progress

"CSOs have been part of the Ottawa sewer and wastewater infrastructure since the construction of the system," says Steven Courtland, CSST program manager. "Initially, 100 percent of sewage passed to the Ottawa River untreated, but we reduced that by 100 percent of dry weather flow and 97 percent of overall volume when we commissioned the interceptor-outfall sewer, CSO regulators and treatment plant in 1961."

Since then, much of the combined sewer system has been separated. In today's dollars, the

(continued)

Ottawa's Kent Street Outfall drains along the Ottawa River Pathway, with the Canadian Parliament buildings in the background. (Photography by Howard Whiting)

PROFILE:
Public Works and Environmental Services Department, Ottawa, Ontario, Canada

YEAR DEPARTMENT ESTABLISHED:
2016

YEAR CITY SEWER SYSTEM ESTABLISHED:
Late 1800s

POPULATION SERVED:
867,000

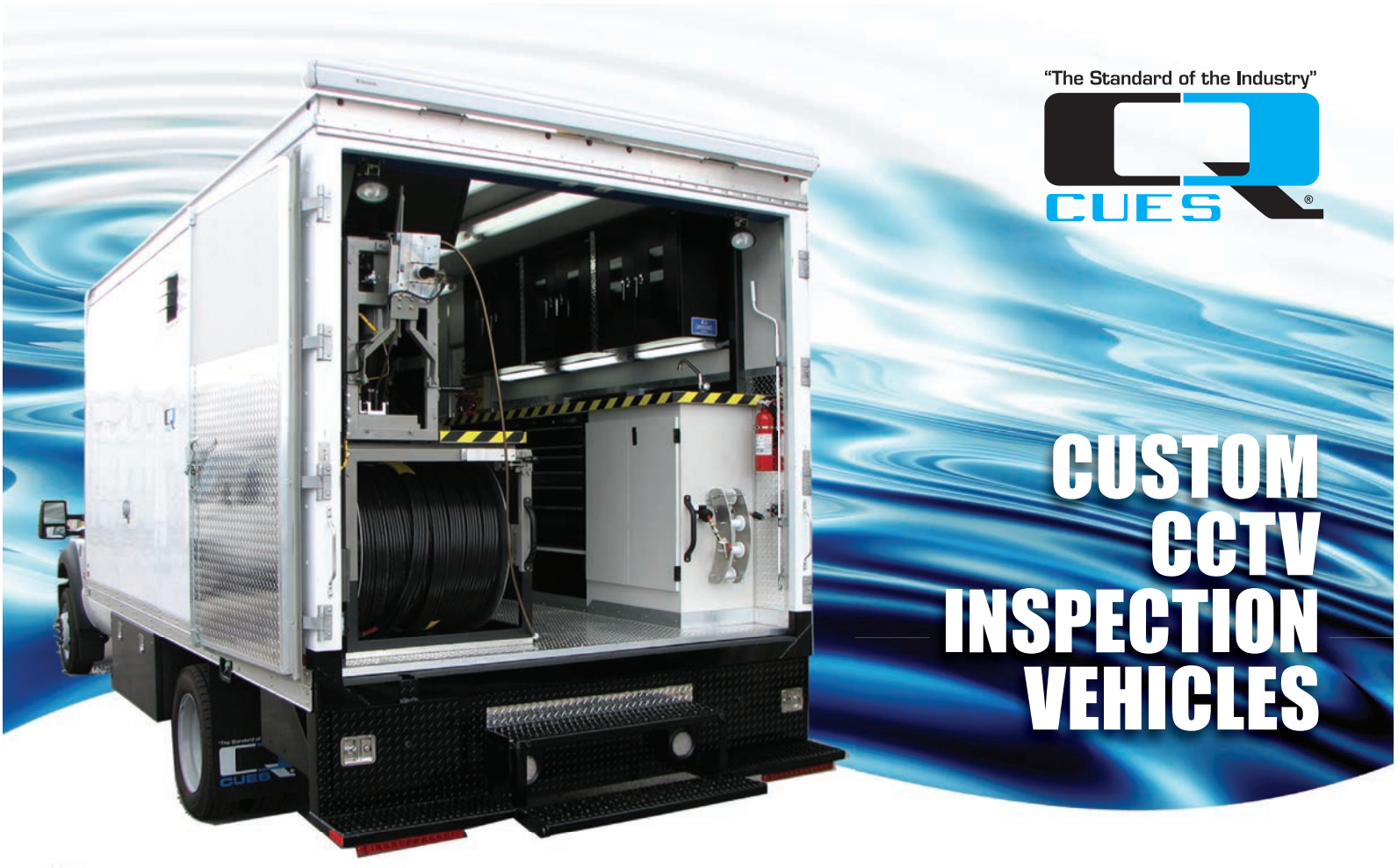
AREA SERVED:
150 square miles

DEPARTMENT STAFF:
Water and wastewater operations — 405

INFRASTRUCTURE:
Water — 1,925 miles; sewer — 1,800 miles; stormwater — 1,800 miles

ANNUAL WASTEWATER OPERATIONS BUDGET (2015):
$18 million

WEBSITE:
ottawa.ca/en/residents/water-and-environment



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– Louis Julien

The Chamberlain shaft will serve as the main access shaft for the tunnel boring machine during construction of Ottawa's new combined storage and sewer tunnel.

city has already invested more than $750 million in that effort.

Today, 3.4 square miles of the city are still served by combined sewers.

"Of that remaining area, 2.5 square miles will remain combined," says Louis Julien, senior engineer of Water Resources. "Part of the reason is simply the difficulty of separating that section. Another is the fact that the topography tilts toward the Rideau Canal. Because it's a UNESCO heritage site, it's out of bounds to our stormwater. The nearest suitable outlet for that stormwater would be more than a mile away at the Ottawa River, so a combined system remains the most efficient solution for that area."

Maintaining efficiency

Operation of the city's infrastructure, including water, wastewater, stormwater, roads and solid waste collection are the responsibility of the recently consolidated Public Works and Environmental Services Department, which serves 900,000 citizens. Maintaining an efficient sewer system is part of the effort to control CSOs.

The city rates the condition of its sewer system as "fair to good," although its SCADA system is probably due for an upgrade, says Courtland.

Pipe materials include asbestos cement, concrete, brick, cast iron, steel and PVC with pipe diameters ranging from 4 to 118 inches in diameter.

Many of the pipes are dug to the depth of the limestone rock underpinning the city. When older sewer pipes supported by soil are replaced, they're also lowered into bedrock to provide an improved level of service. While the city performs routine maintenance with in-house crews, it outsources major construction and cured-in-place pipe rehabilitation projects.

The city plots GIS coordinates using ArcGIS by Esri, and employs InfoWorks by Innovyze and PCSWMM by Computational Hydraulics International to analyze and model its wastewater infrastructure.

Storage solution

Temporary storage was always the top-of-mind solution for reduction of the remaining combined flow, whether that storage took the form of a tunnel, tank or chamber. In order for that plan to go forward, however, the city realized it first needed to rehabilitate the CSO regulators that direct flow to the interceptor system and treatment plant, or to the Ottawa River. It allocated $25 million to the project, which included major upgrades to five CSO regulators, and capability for continuous, real-time adjustment of gate positions at three of those regulators.

"The city implemented the real-time control system by early 2011," says Courtland. "The surprise was that, as a result of implementing those controls, it improved the city's capture rate and reduced the overflow volumes by about 65 percent and the frequency of overflows by 25 percent."

There's a good reason for that. Julien explains that the large interceptor constructed in the 1960s

(continued)

"The city implemented the real-time control system by early 2011. The surprise was that, as a result of implementing those controls, it improved the city's capture rate and reduced the overflow volumes by about 65 percent and the frequency of overflows by 25 percent."

– Steven Courtland

Once the access shaft is complete, a tunnel boring machine will carve two 10-foot-diameter tunnels through the limestone bedrock for a total length of about 4 miles. The tunnels will range from a depth of 40 to 100 feet below the surface.

SENSITIVE NEGOTIATIONS PART OF TUNNEL DESIGN

As Canada's capital, a large part of the city is managed by the National Capital Commission, a federal agency that oversees federally designated lands. Designing and building the city's new combined sewage storage tunnel has involved intricate negotiations with the NCC.

The access shaft required to launch the tunnel boring machine on the east-west tunnel is being excavated in the NCC-managed Stanley Park and will emerge in the city's LeBreton Flats neighborhood, also overseen by the commission. Construction of a significant access shaft and diversion chamber will take place in Confederation Park, a national historic site.

The north-south tunnel will pass under both the city's Parliamentary Precinct and its Judiciary Precinct. The Judiciary Precinct is home to the Supreme Court of Canada, which sits high above the Ottawa River, with its back to an imposing cliff.

"The tunnel will connect with an existing storm sewer outlet tunnel," says Steven Courtland, CSST program manager. "The boring machine will actually emerge from the cliff face next to an existing outfall and allow us to replace and aesthetically improve it with something more low-profile."

As the borer emerges from the cliff, tunnel construction crews will load it onto a truck and transport it across the city to begin work on the east-west tunnel site.

"Operating in Ottawa, we're always mindful of the fact that this is Canada's capital," Courtland says. "After many years of negotiations with various departments of the federal government, we have agreements in place to make sure this project runs smoothly."

collects wastewater from seven major contributing sewers with combined or formerly combined areas. Each was allocated a portion of the interceptor's total capacity.

"If any one of the seven contributing pipes reached its allotment during a rainstorm or heavy snow melt it raised a mechanical float," he says. "Under those conditions, it was assumed that the interceptor was at full capacity, with all contributing sewers reaching their allotment simultaneously and that flow was discharged to the river. In other words, we were over-controlling and shunting water to the Ottawa River when the interceptors weren't actually at capacity. The mechanical regulators were rehabbed with a real-time control system to better make use of the interceptor's capacity by having the outfalls talk to each other."

Following the success of the real-time control project, engineers overhauled the storage project design. The idea of building CSO storage tanks at the end of each outfall was eliminated in favor of a design where all outfalls could share common storage volume for later treatment at the Robert O. Pickard Environmental Centre.

Intersecting tunnels

Ottawa project manager Randy Dempsey saw the project through its design phase. The final configuration involves the construction of two intersecting tunnels: a 2.5-mile east-west tunnel through the city's downtown core, and a 1.25-mile north-south tunnel, which joins up to exist-

Steven Courtland (left) and Louis Julien of the Ottawa Public Works and Environmental Services Department oversee progress from a platform above the Chamberlain shaft.

ing wastewater infrastructure, just behind the Supreme Court building.

The tunnel construction project bid was awarded to a joint venture between Dragados Canada and Tomlinson. The total project budget is $232 million, with the city picking up about $108 million and the provincial and federal governments splitting the remainder at $62 million each.

"We also factored in additional volume for possible future climate change and additional development in the downtown core," says Julien. "The north-south tunnel was added as a dual-purpose feature. It will double as a flood protection outlet for an at-risk area."

A tunnel boring machine will carve two 10-foot-diameter tunnels out of limestone rock formations for a total length of about 4 miles. The tunnels will range from a depth of 40 to 100 feet below the surface, allowing gravity to take the wastewater to the treatment facility. The project will also include the construction of four odor control facilities.

The boring machine will be lowered into an entry shaft, where the rotating cutter will chip away at the rock while conveyors transport the material toward the back of the machine. Tunnel "muck" will be carried back to the launch shaft via electric train for reuse in other construction projects.

Sealing the tunnels

Limestone is porous, so precast concrete liners made up of five segments will be placed in rings behind the machine. Each segment will be gasketed and the outer perimeter will be sealed with grout. That's less to keep wastewater in as it is to ensure groundwater from above doesn't seep in during construction, which could dewater and destabilize sensitive overburden clay soils.

"We're currently excavating the borer launch shaft for the north-south tunnel," Courtland says.

Thinking ahead, the city constructed the last portion of the project first — the exit tunnel of the east-west shaft. The project was handled by the contractor building the city's light rail system because the exit point to the municipal sewer system is located at the flank of one of the newly built light rail stations.

"At the north end of the first tunnel the boring machine will emerge from a cliff face behind the Supreme Court of Canada building," Courtland says. "It will then be used for the east-west tunnel." (See sidebar).

Construction of both tunnels should be completed by late 2019, with commissioning scheduled for mid-2020.

"In 2015, our total capture rate was 99.8 percent, with only 0.2 percent untreated overflow," Julien says. "Our wet weather capture rate is 95 percent. We have reason to believe that figure is competitive with any city in the world. When the tunnel is completed, we'll be doing even better." ✦

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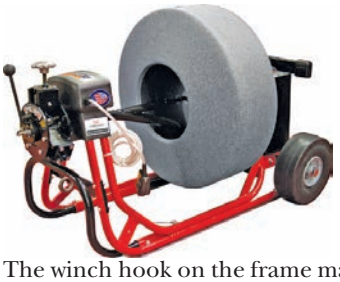
CHEMICAL AND MECHANICAL ROOT CONTROL

By Craig Mandli

CABLE MACHINES

Duracable Manufacturing DM55



The **DM55** from **Duracable Manufacturing** has a continuous-weld frame constructed from an aluminum alloy that is as strong as steel. The sled design allows service technicians to operate the machine in either a vertical or horizontal position. To help protect the operator, the unit's electrical wiring runs through the frame. The winch hook on the frame makes it easy to lift the machine with a loading ramp or crane. It can fit four different styles of 26-inch reels with open-spoke metal or enclosed polyethylene drum options. Depending on which reel is used, it can run 110 or 150 feet of 11/16-inch cable. **877/244-0556; www.duracable.com.**

Electric Eel Model C

The **Model C** dual-cable sectional drain and sewer cleaner from **Electric Eel** runs up to 200 feet of 1 1/4-inch self-feeding dual cable in 8- or 10-foot sections that require no handling when rotating. It spins cable at twice the rpm of a continuous cable machine for maximum cleaning power in 3- to 10-inch-diameter lines for distances up to 200 feet. One-man operation means less time and labor expense. A heavy-duty 1/2 hp motor comes standard, and 3/4 and 1 hp motors are also available. A custom-designed gearbox ensures higher quality, lower cost and parts availability. The heavy-duty, fully adjustable safety clutch keeps cable and tool breakage to a minimum and provides overload protection. Separate fold-down and carry handles allow for easy transportation, better balance, storage and use in crawl spaces. **800/833-1212; www.electriceel.com.**

Gorlitz Model GO 68HD

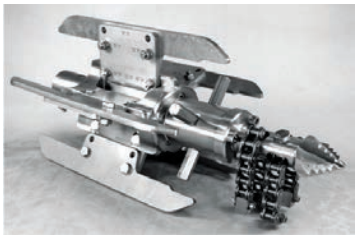
The **Gorlitz Model GO 68HD** heavy-duty electric drain cleaning machine is available in two different versions, either with an open steel reel or enclosed polyethylene drum, and can be outfitted with an optional power feeder. It comes with a standard configuration of 150 feet of 11/16-inch hollow-core cable, which should reach most blockages with a single reel. It weighs 185 pounds, and adding a loading ramp and electric winch to any vehicle makes transportation quick and simple. It is designed to clean pipes from 3 to 8 inches in diameter. **877/446-7548; www.gorlitz.com.**

CUTTING NOZZLES

Enz USA Bulldog 37 Series Cross Jet Nozzle

The **Bulldog 37 Series Cross Jet Nozzle** from **Enz USA** can be operated with both recycled and freshwater. The Cross Jet is designed to open completely blocked lines, frozen pipe and interlaced root intrusions. An integrated oil-free braking system results in low-wear-and-tear operation, with a controlled number of rotations, creating efficient and economic pipe cleaning. It is designed for cleaning roots, grease and solids, and is available in 1/2- and 3/4-inch connecting threads to clean 2 1/2- to 8-inch pipe. **877/369-8721; www.enzusainc.com.**

KEG Technologies heavy-duty chain cutters



KEG Technologies heavy-duty chain cutters are high-speed, high-torque, water-powered cutting tools. Their rugged stainless steel construction requires only soap and water to clean. Along with root cutting, they are designed to remove protruding laterals, mineral deposits, grease and concrete. The roller chain is forgiving on pipe walls, and chain blocks are available for tough roots and hardened deposits. Users can vary the rpm and torque output by changing the spinner length along with jet size, pressure and flow. They are available in three models — 150, 200 and Supernova — and work in pipes from 6 to 48 inches when equipped with proper skids and distance plates. **866/595-0515; www.kegtechnologies.net.**

NozzTeq Lumberjack

The **Lumberjack** cutting nozzle from **NozzTeq** is a low-torque, high-speed cutter for use with high water pressures. It is effective at cutting roots, but is also commonly used to remove grease, tuberculation, protruding laterals and other buildups. Because it's low-torque, it's unlikely to cut through host pipes. The bearings are sealed, grease-lubricated, water-cooled, and largely maintenance-free — water-cooled bearings are long-lasting and don't need additional lubrication. The cutters rotate at a minimum speed of 10,000 rpm with flow rates from 10 to 250 gpm at varying pressures. They operate in pipes from 3 to 48 inches. All models clean with chain links, with optional cutting blades for severe blockages. All models come with a propelling jet housing, and some have tow rings. **866/620-5915; www.nozzteq.com.**

Root Rat

Root Rat cutting nozzles are used with jetters from 11 hp to large truck-mounted models. The cutters are made of hardened stainless steel and come with a toolbox with two interchangeable rotors — one with cables and the other with chains. The combination kit includes extra chain, cable and bearings. They need no repair or rebuilding other than bearing replacement, which can be completed in less than two minutes for under $10 in parts. **800/288-7873; www.rootrat.net.**

StoneAge WHR Switcher

The **WHR Switcher** from **StoneAge** has the same action as the WGR Switcher, but is designed for smaller pipes. The nozzles are engineered to allow operators to remotely switch between pulling and cleaning jets while the tool is in the pipe. When the pump is idled down and brought back to pressure, the tool will switch the water flow back and forth between two different jet patterns — a rear jet pattern for maximum pulling or flushing, and a side jet pattern for effective cleaning and cutting. This allows the same tool to switch between pulling and cleaning, reducing the time and water usage required to make multiple runs with different nozzles. It has a 3/4-inch hose inlet connection, navigates pipes 6 to 18 inches in diameter, and handles pressures up to 8,000 psi and flow rates up to 50 gpm. **970/259-2869; www.stoneagetools.com.**

TAG Nozzles KROKO

KROKO root cutters from **TAG Nozzles** can be used to help clean pipes from 4 to 24 inches in diameter. Powered by a turbine, it rotates on two high-quality bearings. Working with only water pressure, it requires minimal maintenance and no lubrication. It is made of resistant steel and the removable jets are made of stainless steel. It shreds wood, roots, grease and mineral deposits up to 800 feet away. The MINI KROKO can be used in pipes from 4 to 10 inches, and operates from 1,800 to 3,000 psi and 35 to 60 gpm. The KROKO can be used in pipes from 8 to 24 inches, and operates from 1,800 to 3,000 psi and 50 to 80 gpm. **418/838-2195; www.tagnozzles.com.**

USB-Sewer Equipment Corporation Turbo Chain Cutters

Turbo Chain Cutters from **USB-Sewer Equipment Corporation** are made of tempered stainless steel and offer continuously adjustable guide skids. The chain retainer is driven by a high-performance turbine to remove roots, grease and mineral deposits from 4- to 48-inch sewer lines. The cutters feature optimized 3-D hydromechanics and ceramic nozzle inserts for use with fresh or recycled water. They can be used as barrel cutters with diamond bits for smooth removal of protruding laterals, and for removing heavy mineral deposits with carbide bits attached to the specialized chain. **866/408-2814; www.usbsec.com.**

JETTERS

American Jetter 51T Series Hot Jetter

The **51T Series Hot Jetter** from **American Jetter** offers up to 74 hp of hot-water cleaning power and flows from 8 to 24 gpm up to 4,000 psi. Dual or triple diesel burners offer maximum water heating capability. Consistent power is provided by a 37 hp Kohler gas engine. A dual-engine option provides 74 hp. Low-water shutoff prevents pump damage if the 330-gallon tank runs low. Standard hose reel speed control allows for precise cleaning in both directions. The wireless remote option allows for water ON/OFF, engine shutdown and hose reel control. The heavy-duty square tubing trailer offers standard electric brakes on both axles. **866/944-3569; www.americanjetter.com.**

GapVax GJet

The **GJet** truck jetter from **GapVax** offers 500- to 3,000-gallon stainless steel water tank options and 40 to 100 gpm water pump options along with a front-mounted hose reel, various toolbox options, room for a vice or crane and 10-foot tube trays. **888/442-7829; www.gapvax.com.**

RIDGID KJ-3100

The **RIDGID KJ-3100** portable water jetter offers 3,000 psi of working pressure and 5.5 gpm of flow for fast, effective cleaning of large commercial and industrial lines. The jetter propels a flexible and lightweight hose through 2- to 10-inch lines, blasting through sludge, soap, grease and sediment blockages. As the hose is pulled back, it power scrubs the line, flushing debris away and restoring drainlines to their full, free-flowing capacity — all without the use of chemicals. Pulse action allows for easy negotiation of difficult bends and traps. It has a removable hose reel and Triplex pump with corrosion-resistant, forged brass head. It comes on a two-wheeled cart that easily fits through standard-size doors and negotiates tight turns with ease. **800/769-7743; www.ridgid.com.**

More Stories at **MSWMag.com**

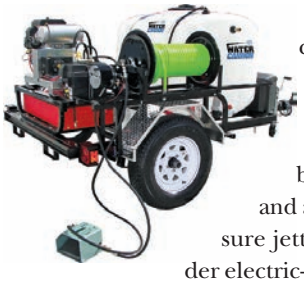
Super Products SuperJet

The **SuperJet** truck-mounted jetter from **Super Products** has a double-acting, single-piston hydraulically powered water pump that offers 1-1 oil-to-water ratio and rated design capacity of 100 gpm and 3,000 psi continuous duty. Its modular water tank setup easily accommodates capacities from 1,000 to 3,200 gallons. It has a single-engine design that emits lower sound levels, reducing fuel use by 40 percent compared to dual-engine units. Its rear compartment is heated with an 80 mBh heater that enables year-round operation in freezing environments. An easy-to-use control panel performs a number of functions including adjustable engine throttle with water pressure speed dial; on/off water pump PTO; water pressure gpm; and hose reel joystick, pay-in/pay-out with speed control. **262/796-5939; www.superproductsllc.com.**

Vector Technologies VecJet

The **VecJet** line of powerful, compact trailer-mounted jetter machines from Vac-Con, in cooperation with **Vector Technologies,** feature a high-pressure water jet system with a Vac-Con hose reel. They come standard with a 99 hp Kubota diesel engine, a 500- or 700-gallon water tank, 500 feet of 1/2- or 3/4-inch jetter hose, and water flow of 25 gpm at 4,000 psi or 40 gpm at 3,000 psi. **800/832-4010; www.vector-vacuums.com.**

Water Cannon 16T55



The **16T55** trailer jetter from **Water Cannon** comes with an onboard 200-gallon water tank capacity and customizable jetter hose up to 500 feet. It is mounted on a two-wheel commercial jetter trailer. It comes with a poly toolbox, lights, a front jack with wheel, safety chains and aluminum fenders. The commercial high-pressure jetter is powered by a Honda GX690 twin-cylinder electric-start engine with V-belt drive, trailer-mounted skid, and 15-gallon EPA and CARB-approved poly fuel tank. Its TS Series General triplex plunger pump offers 8 gpm at 3,500 psi, with a pump-mounted jetter pulse valve and foot valve with 8-foot jumper hose. Three jetter nozzles, including the Penetrator, Flusher and De-Greaser/De-Icer are included. **800/333-9274; www.watercannon.com.**

MECHANICAL ROOT CUTTERS

Nu Flow Micro-Cutter

The **Micro-Cutter** from **Nu Flow** is a pneumatic cutter used to clean and remove calcite and roots from the inside of a variety of pipes, including steel, cast iron and orangeburg. The system rotates at approximately 2,000 RPM and will negotiate turns of 90 degrees in pipes down to 2 inches in

diameter. It runs at 40 cfm and allows for multiple cutting heads to be attached. The heads can cut through dense corrosion and root intrusion that is commonly found in drainlines and can be challenging to clean. The drill tip has an adjustable spline available in various sizes to match different pipe diameters. **800/834-9597; www.nuflowtechnologies.com.**

Sewer Equipment rodders

Rodders, including continuous and sectional designs configured in truck or trailer packages from **Sewer Equipment** offer the ability to cut roots all day with little fuel and without using a drop of water. Rodding machines excel at clearing roots and other obstructions, climbing long or extreme grades and cleaning in temperatures below freezing. They include features such as NEMA 4-rated wiring for watertight electrical component storage, locking shroud doors for increased operator safety and a one-piece shrouded enclosure designed to maintain cosmetic and functional integrity throughout its life. **877/735-4640; www.sewerequipment.com.**

Southland Tool S906M1-AK

The **S906M1-AK Advanced Kinetics** hydraulic maximum-duty root cutter motor from **Southland Tool** is built from the same platform as the S906-M-1, but upgraded internal parts make it smoother, improving hydraulic performance and nearly eliminating internal corrosion. The finish improves the friction coefficient, allowing parts to run smoother while reducing drag and saving water. Denser metal wards off corrosion and wear. It is designed for lines from 6 to 30 inches in diameter. The motor can accommodate hose sizes of 3/4, 1, 1 1/4 and 1 1/2 inches without being brushed down or up. It can handle flows from 40 to 170 gpm and pressures from 1,500 to 3,000 psi. It is rated up to 288 pounds of torque maximum, and 220 pounds continuous. **714/632-8198; www.southlandtool.com.**

ROOT CHEMICALS

Duke's Root Control RazoRooter II

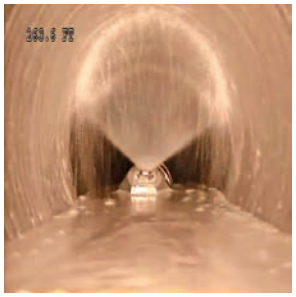
Diquat-based **RazoRooter II** root-control herbicide from **Duke's Root Control** is registered by the U.S. Environmental Protection Agency for controlling nuisance tree roots in sanitary sewer collections systems, and received a classification of "evidence of noncarcinogenicity for humans." In 2014, the EPA further approved an amendment of labels to lower the signal word

from "warning" to "caution." Crews insert a hose from manhole to manhole, preparing to fill the affected sewer pipe with herbicide. The foam is released, compressing against pipe surfaces and penetrating cracks, joints and connecting sewers. Roots are killed on contact, decay naturally and slough away. Application is designed to prevent root-related stoppages for two to three years. **800/447-6687; www.dukes.com.**

Lenzyme/Trap-Cleer foaming root control

Foaming root control from **Lenzyme/Trap-Cleer** has double the active ingredient dichlobenil of previous solutions and a latex base that helps it stick to roots longer. It is easy to apply and provides a slower foaming action designed to coat the entire pipeline and eliminate fast-foam-over messes. **800/223-3083; www.lenzyme.com.**

RootX chemical root control



Chemical root control from **RootX** is a long-term solution to pipeline root intrusion, as it stunts new root growth without damaging the pipe, clearing pipeline roots that can cause blockages resulting in sanitary sewer overflows. It's been verified to have no harmful effects on water treatment systems. The simplicity of the application means crews can perform root control on demand or as scheduled preventive maintenance. It is registered with the EPA for both sanitary and storm use (EPA Reg. No. 68464). **800/844-4974; www.rootx.com.**

Vaporooter Jet-Set Commander

The **Jet-Set Commander** from **Vaporooter** has automated chemical injection technology that makes effective root control simple and easy. Users can apply root-control foam in sewers with just a flip of a switch and touch of a button. It can easily be added to any hydrojetting equipment, allowing crews to clean sewers and perform chemical root control. **800/223-3684; www.vaporooter.com.** ✦

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

NEVER STOP LEARNING

Downtime is a great time to catch up on the latest in trenchless technologies

By Ted DeBoda

During these lazy dog days of summer, many of us take a break from our hectic lifestyles and get away for family vacations. If you are anything like me, however, you may find it very hard to completely let go. Along with the beach chair and sunscreen, I usually pack up back issues of *Municipal Sewer and Water* and other magazines I haven't had the time to read.

Part of the reason I never quite let go is because I love the work I do. For me, keeping up with underground infrastructure news is not a burden, it's a pleasure. In addition to magazines and websites, there is another resource available from any place, at any time, and on any web-enabled device: NASSCO webinars.

Over the years we have archived these informative presentations at www.nassco.org to educate and — for those of us who get excited about learning new technologies — entertain. This summer, I encourage you to spend some time learning more about trenchless technologies and specifications by visiting our library of webinars at www.nassco.org/training-and-education/webinars. There, you will find valuable resources and webinars including:

NASSCO standard specification guidelines for CIPP, manholes and more

This webinar provides an overview of how the preparation of effective bid specifications are critical to project success. It also provides guidelines to help prepare quality specifications for trenchless technologies. Both CIPP and manhole rehabilitation specification guidelines are discussed, along with the importance of performance-based specifications.

Engineers turn to injection grouting to stop sewer infiltration

As wastewater utilities struggle to control inflow and infiltration in sewer infrastructure, engineers are re-examining trenchless solutions to maximize infiltration reduction, minimize costs and deliver long-term solutions. This webinar examines causes of infiltration, injection chemicals, procedures, specifications, opportunities for value engineering and the role of the inspector to ensure long-term removal of infiltration from the collections system.

Laterals – assessment, rehabilitation and results

Watch this webinar and learn why the Washington Suburban Sanitary Commission (WSSC) chose to perform lateral inspections and rehabilitation, and discover how they performed the work. Highlights include lessons learned along the way and how the process was improved as a result.

The webinars listed above are just a sampling of the many educational resources available to you at www.nassco.org. You can also find educational videos, including a three-part introduction and overview of PACP; an introduction to sewer cleaning with jetting equipment; and a trailer for a documentary titled *Liquid Assets,* which tells the story of essential infrastructure systems: water, wastewater and stormwater. Produced with the general public in mind, this video, in particular, is one that does an excellent job of explaining what we do and why it's important to our communities. You might even convince your family to watch this one with you.

We plan to continue building this library of resources and are considering other technologies as topics for future webinars, including pressure pipe and laterals. Why do we believe these resources are so important? Because NASSCO's mission is to set standards for the assessment, maintenance and rehabilitation of underground infrastructure and to ensure the continued acceptance and growth of trenchless technologies, which relies on all of us staying involved and informed. ✦

Contractor uses cutting tool to clean construction debris

Problem:

Sylvan Tieger offers a full range of plumbing and drain cleaning services to commercial, residential and institutional customers in the New York City area. Much of that is new construction. Tieger noticed that construction debris — like plaster and cement powder — often deposited in drainlines. He needed a way to easily clear those drainlines.

Solution:

Tieger tried the **ClogChopper** cutting tool from **General Pipe Cleaners.** With six self-sharpening blades, the ClogChopper digs into encrusted debris and root masses, easily grinding up stoppages, scale and crystallized urine — without risking pipe damage. It works in both directions — all in one operation. The spherical design maneuvers around tight bends and traps, thoroughly and safely cleaning metal, plastic and clay pipes. Available in 1-, 1 1/2-, 2-, 2 1/2-, 3- and 4-inch sizes, it can be used to clear stacks, downspouts and mains — as well as for pipe lining jobs.

RESULT:

"You quickly get a buildup of hardened material inside pipe walls," says Tieger. "ClogChopper makes short work of those problems." **800/245-6200; www.drainbrain.com.** ✦

Product Spotlight

Cretex provides a lighter option for manhole grade adjustment

By Craig Mandli

Getting manholes on grade with a resurfaced street is often a difficult task. Heavy concrete risers are often used to build up the chimney so the cover and its frame can be raised, but those rings are cumbersome and require heavy machinery to install.

As an alternative, Cretex Specialty Products offers the PRO-RING system, a series of lightweight expanded polypropylene (EPP) risers. These rings come in various shapes and sizes, including round, square and rectangular. The round rings are available in a variety of inner and outer diameter configurations, the latest version with an inner diameter of 24 inches and an outer diameter of 34 inches. According to Cretex general manager Lee Haessig, the new size is a fit for several Midwestern states.

"We were seeing municipalities in Illinois and eastern Iowa with this-size manhole cone, so it made sense for us to offer our riser system in that size as well," he says.

The key to the riser's ease of use is its construction material, engineered plastic foam that is lightweight and has a very high strength-to-weight ratio. It withstands repeated impacts without significant damage, resists water, chemicals and most oils, and performs in temperature extremes from -22 to 230 degrees F.

One man can install the PRO-RING system in just minutes to within a quarter-inch of finished grade, and they are watertight. Where concrete rings break and may cause injury, the PRO-RING eliminates the hazard, helping minimize the risk of injury. The system is also designed to dramatically speed up manhole installation and repair time.

"When you factor in less weight for hauling, ease of install and durability, this is a system that is going to be more cost-effective in the long term," says Haessig. "This is a durable system with a 50-year design life."

Haessig notes that while it can take up to four men to lift some concrete grade rings, a 6-inch-thick PRO-RING unit weighs 14 pounds. One man can install the system in a few minutes, allowing a site to be closed in one day at 20 to 30 percent reduced cost versus conventional methods, according to the company. No water, sand, mortar or bricks are needed.

Haessig pointed out that while the rings are intended for use in municipal water and sewer systems, they are a fit for other utility uses, and have even been utilized as septic system risers.

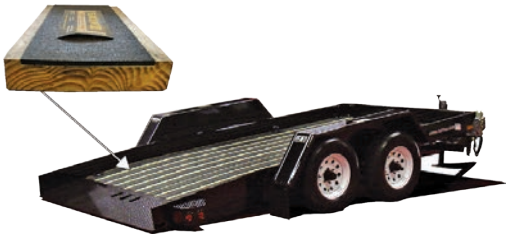
"Basically, they are going to be a good fit for anyone working with an underground structure with manhole-type access." **800/345-3764; www.cretexseals.com.**

1.

1. Agru America AGRULINE large-diameter HDPE

The AGRULINE product group from Agru America offers a complete, high-quality product range of pipes, fittings, valves and customized components made from polyethylene for high-volume flow applications such as cooling water intakes for power plants, large sewage systems, seawater desalination or mining jobs. The company produces systems from PE 100, PE 100-RC or PE 4710 resins in dimensions up to O.D. 98.4 inches and 1,968 feet in length. The long-term hydraulic properties are based on a high resistance to corrosion, wear and tear, and UV radiation. **800/373-2478; agruamerica.com.**

2.



2. Felling Trailers Blackwood decking

Felling Trailers added Blackwood Lumber to its trailer options. The lumber starts with treated southern yellow pine and each board has 1/4 inch milled out of the topside. Once milled, a 6 mm-thick layer of rubber from reground tires is infused into the boards. The rubber is above flush with the surface of the lumber so the rubber always makes the first contact with equipment. The rubber doesn't fade or crack, doesn't stain and can be easily cleaned with water. **800/245-2809; www.felling.com.**

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3. Vactor Mattracks 400 Series track conversion system

The extreme terrain configuration of the Vactor HXX Paradigm features a Mattracks 400 Series rubber track conversion system for pipeline, utility and construction applications. The hub-mounted design of the system facilitates a fast conversion, approximately 45 minutes in a shop, from tires to tracks. It features a rubber torsion anti-torque system and a 20-inch-wide front track and a 30-inch-wide rear track, and has a steering assist and a rocker suspension. **800/627-3171; www.vactor.com.**

4. Reelcraft's spring-retractable high-capacity hose reels

The G9000 Series high-capacity hose reels from Reelcraft are designed to be compact and allow for longer lengths of larger-diameter hose. The redesigned gooseneck can be removed from the reel for easier hose attachment. An external drive spring allows for convenient access to the spring components and improved servicing of the reel. The roller bearing inside the pillow block produces a smoother spool rotation and easier operation. Models are available for 1 1/2-inch I.D. by 50-foot low-pressure air and water hose, 1-inch I.D. by 75-foot and 3/4-inch I.D. by 75-foot medium-pressure oil hose. **800/444-3134; www.reelcraft.com.**

5. Sewer Pro Shop Blue Star sewer nozzles

Sewer Pro Shop's Blue Star sewer cleaning nozzles are manufactured with optimized 3-D hydromechanics by Intersewer, located in Germany. Water coming from the pressurized sewer hose is first divided by a conically-shaped piece and turned around in the nozzle chamber, then guided directly to the stainless steel nozzle inserts via 5-axis CNC precision. The nozzles are made in one piece, reducing the chance of failure under pressure for greater safety and performance. Utilizing case-hardened steel, stainless steel and ceramic inserts, the nozzles can also be used with recycled water. **877/864-9394; www.sewerproshop.com.**

6. Plastiflex Hi-Vac LTW Sewer/Septic Pumper Hose

The Hi-Vac LTW Sewer/Septic Pumper Hose from Plastiflex is designed for moderate to heavy-duty suction service. Engineered with a new polymer resin blend and enhanced profile design, it provides durability for a variety of service applications, including sewer, septic, environmental and marine pumping. The over-molded cuff assembly offers direct cuff-to-hose mating for continuous leak-free performance. **423/534-2044; www.plastiflex.com.** ✦

Vacuworx honored with 2017 Governor's Award

Vacuworx received the 2017 Governor's Award for Excellence in Exporting for the second time in four years. The award, created to recognize the achievements of Oklahoma-based organizations that have successfully entered the worldwide marketplace, was presented April 13.

Tim Van Putten

Correction:

Trelleborg's Tim Van Putten was misidentified as Bill McDowell in the Industry News section of June *MSW*. We apologize for the error.

Sherwin-Williams opens entries for annual Impact Award

Sherwin-Williams Protective & Marine Coatings has opened the entry submission process for its annual Water and Wastewater Impact Award. The program recognizes application contractors, specifiers and owners for excellence on North American water and wastewater projects that demonstrate a long-lasting impact on the industry. Eligible projects were completed from Jan. 1 through Dec. 31, 2016, and applications will be accepted until July 15.

Woolpert selected to design sewer rehabilitation project

HRSD, a wastewater treatment utility that serves 18 cities and counties in southeastern Virginia, has selected Woolpert to provide study, design and administration services for a project to rehabilitate about 1 mile of sanitary sewer infrastructure in the city of Newport News.

Chemline launches contractor services

Chemline announced a new dedicated sales team and web page specifically for contractors. Chemline offers in-house technical services to train contractors and they can also deliver equipment and replacement parts.

ARS Rescue Rooter partners with Columbia Fireflies

ARS Rescue Rooter announced their partnership with the Columbia Fireflies for the 2017 and 2018 seasons. Tim Tebow, an outfielder for the Fireflies, has a relationship with ARS as a partner with his foundation and an endorser.

Fox-Marrs named president of JCB North America

Richard Fox-Marrs

JCB announced the appointment of Richard Fox-Marrs as president and CEO of JCB. He will be responsible for JCB operations in North America, including sales and support for the construction, agricultural, rental, government and defense industries. Additionally, he will oversee production at JCB North America's Savannah, Georgia, headquarters.

Uptake partners with Caterpillar on data analytics

Uptake announced it is working with the construction industry to both standardize its telemetrics ecosystem and also to provide a platform to use all of the data to increase efficiencies across the board. It launched a joint venture project with Caterpillar to drive the change.

Felling Trailers earns ISO 9001 in Minnesota locations

Felling Trailers recently received ISO 9001:2015 certification for its quality management system at its Sauk Centre, Minnesota, and Litchfield, Minnesota, operations. The certification process was carried out in partnership with Transpacific Certifications Ltd. and included a detailed assessment of the company's facilities.

Source One Environmental announces partnership

Source One Environmental announced its partnership with Vortex Infrastructure as an exclusive distributor of Pipe-Robo-Tec USA. Vortex provides a suite of services and products within the trenchless rehabilitation market, including product lines under Quades, Pipe-Robo-Tec and Schwalm USA.

Agru America opens pipe production facility

Agru America opened a new large-diameter pipe production facility in Charleston, South Carolina. The facility is producing AGRULINE pipes with dimensions of up to 98.4 inches, designed for high-volume flow applications including gas, potable water and wastewater. ✦

Every day is Earth Day.™

"I was named a Water Environment Federation Water Hero — professionals who 'protect public health and the environment by cleaning the world's water day after day.' But it was a good crew of operators who pulled together as a team. It was great to work with such fine people."

Jimmy Stewart
An Original Environmentalist

CHIEF OPERATOR (2000-08)
Shoal Creek Water Reclamation Facility,
Clayton County (Ga.) Water Authority

WORTH NOTING

PEOPLE/AWARDS

The **National Association of Flood and Stormwater Management Agencies** announced the recipients of Green Infrastructure Awards. They include:

- Small Population, first place: Manchester Stormwater Park, Kitsap County Public Works, Port Orchard, Washington;
- Small Population, second place: Durkees Run Stormwater Park, Williams Creek, Indiana;
- Medium Population, first place: Point Defiance Regional Stormwater Treatment Facility, city of Tacoma, Washington;
- Medium Population, second place: East 14th Street LID Improvement Project, city of Chattanooga, Tennessee;
- Large Population, first place: Space to Grow: Greening Chicago's Schoolyards, Metropolitan Water Reclamation District of Greater Chicago;
- Large Population, second place: Middle Blue River Basin Green Solutions Pilot Project, Water Services Department, Kansas City, Missouri; and
- Top Overall Project: Low Impact Development (LID) Best Management Practices (BMPs) Testing and Demonstration Facility, Riverside County Flood Control & Water Conservation District, Riverside, California.

Joseph Pearce is the new Public Works director for Elizabeth City, North Carolina. Previously, Pearce was a utilities administrator in Durham County, North Carolina, where he first served as stormwater division manager and then utilities division director before becoming deputy director of engineering and environmental services. Before working in Durham County, Pearce served in what is now the North Carolina Department of Environmental Quality in roles dealing with stormwater and industrial wastewater.

The city of **Cape Coral,** Florida, received a $600,000 grant from the Florida Department of Environmental Protection for stormwater improvement projects. Cape Coral said it will use the funds to upgrade about 300 catch basins and install enhanced swales in a 725-acre area west of Burnt Store Road as part of the North 2 Utilities Expansion Project. The new catch basins will enhance water quality by enabling more stormwater runoff to filter into the ground rather than flowing directly through storm drains into the canal system, and ultimately into Charlotte Harbor. Charlotte Harbor is a natural estuary and the state's second largest bay.

Lauren McLean, a councilwoman in Boise City, Idaho, was named to the second annual Grist 50, a list of "fixers — bold problem-solvers working toward a planet that doesn't burn and a future that doesn't suck." Among her many responsibilities, McLean helps manage LIV District, an initiative that has deployed more than $5 million in public funding toward stormwater infrastructure, geothermal expansion and park entrances for bikes in the Central Addition neighborhood.

The **Jefferson Park Constructed Wetland** project in Waynesboro, Virginia, won the 2017 Best Urban BMP in the Bay Award, presented by the Chesapeake Stormwater Network. The awards recognize the best BMPs that have been installed in the Chesapeake Bay Watershed. Waynesboro and the Timmons Group worked together to construct the Jefferson Park Constructed Wetland Project.

Protecting the Little Miami River, the **Bellbrook-Sugarcreek Park District** in Xenia received the Governor's Award from the Ohio Parks and Recreation Association for its environmental approach to replacing its agency headquarters parking lot. Environmental elements incorporated into the new parking lot include a rain garden, bio-swale, permeable pavers, oil interceptor and trench drain, and more than 1,000 native perennial plants from 12 species.

The city of **Wilmington,** North Carolina, was recognized for three different initiatives to clean up stormwater runoff. The Lower Cape Fear Stewardship Award Coalition presented the city with awards for these projects:

- Stormwater Demonstration Site in Anne McCrary Park: The park is an educational site for people to learn about ways to capture and naturally clean stormwater with soil and plants. The site includes a rain garden, native plants, shade trees, grassy swales, rain barrels, pervious walkways and pavement that allows water to drain through to the soil.
- Raintree Stormwater Wetland: A drainage ditch on city property was converted to a functioning wetland in the Raintree Neighborhood. The wetland absorbs and filters polluted runoff from the neighborhood, allowing it to soak back into the ground instead of running off into Hewletts Creek. The wetland is also helping to alleviate some nearby flooding.

- DREAMS Bioretention Area & Pervious Pavement: The city, North Carolina State University and DREAMS collaborated on a federal grant to install pervious pavement, a large rain garden and native plantings in order to naturally clean stormwater before it flows into nearby Burnt Mill Creek. DREAMS, located on city property at 10th and Fanning streets, is a nonprofit agency serving Wilmington youth.

LEARNING OPPORTUNITIES

Florida

The American Water Works Association is offering a seminar titled Effective Utility Management on Sept. 21-22 in Orlando. Visit www.awwa.org.

Wisconsin

The University of Wisconsin-Madison is offering Essentials of Hydraulics for Civil and Environmental Professionals seminar on Oct. 11-13 in Madison. Visit epd.wisc.edu. ✦

CALENDAR

July 16-19
American Society of Agricultural and Biological Engineers 2017 Annual International Meeting, Spokane, Washington. Visit www.asabe.org.

Aug. 4-6
American Society of Civil Engineers' Younger Member Leadership Symposium, ASCE Headquarters, Reston, Virginia. Visit www.asce.org.

Aug. 6-9
American Society of Civil Engineers' Pipelines Conference, JW Marriott Phoenix Desert Ridge Resort & Spa, Phoenix. Visit www.asce.org.

Aug. 27-30
American Public Works Association PWX (Public Works Expo), Orange County Convention Center, Orlando, Florida. Visit www.apwa.net.

Aug. 27-31
StormCon: North American Surface Water Quality Conference & Exposition, Meydenbauer Center, Seattle. Visit www.stormcon.com.

Sept. 18-20
National Rural Water Association WaterPro Conference, Reno, Nevada. Visit 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.

Nov. 5-9
American Water Resources Association Annual Conference, Red Lion on the River-Jantzen Beach Hotel, Portland, Oregon. Visit www.awra.org.

Nov. 6-9
American Society of Civil Engineers' Operation & Maintenance of Stormwater Control Measures, Denver. Visit www.asce.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.*

classifieds

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AERATORS

For Sale: Lightly used 2015 GridBee AP7000 mixer. Includes: 300' sinking air hose; 2 air compressors; 36" extension legs; 5 buoys and chain. All equipment for $15,000 or best offer. Contact: 209-753-2409 or info@lakealpinewater.com (M07)

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Used and rebuilt cable machines in stock: RIDGID K-7500, K-40, K-60, K-1500, Spartan #1064, #300, #100, Electric Eel model #C machines. The Cable Center: 800-257-7209. (CBM)

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Looking for a job in the water/wastewater industry? New career opportunities are posted daily at www.WaterDistrictJobs.com (M07)

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Honda horizontal GX engines, new in-the-box w/warranty. GX200QX - $399; GX270QAG - $579; GX390QA - $599 delivered price. 800-363-9855 or GXParts.com (MBM)

Industrial Pressure Washer - New w/warranty $9,500. 2,000psi, 18gpm. 999cc Kohler & AR pump. Will deliver. 321-800-5763 (MBM)

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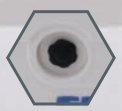

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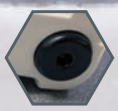

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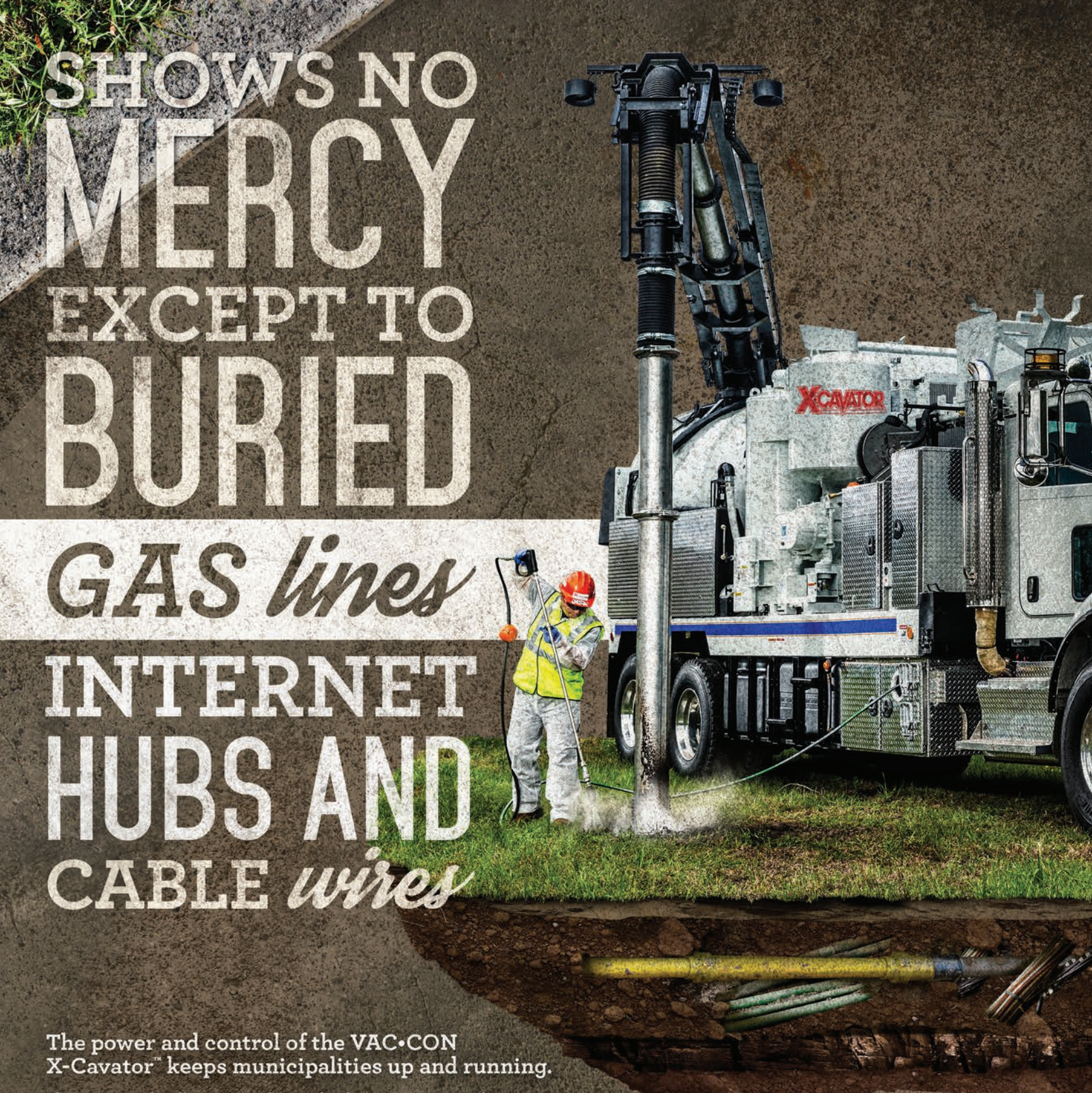

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