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October 2008

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WATER: A STRATEGIC APPROACH
DRIVES MAINTENANCE
IN BUFFALO, N.Y.

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JETTER FROM SPARTAN TOOL

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A DOWNHILL BATTLE

The City of Duluth meets the challenges
of hilly topography and cold winters

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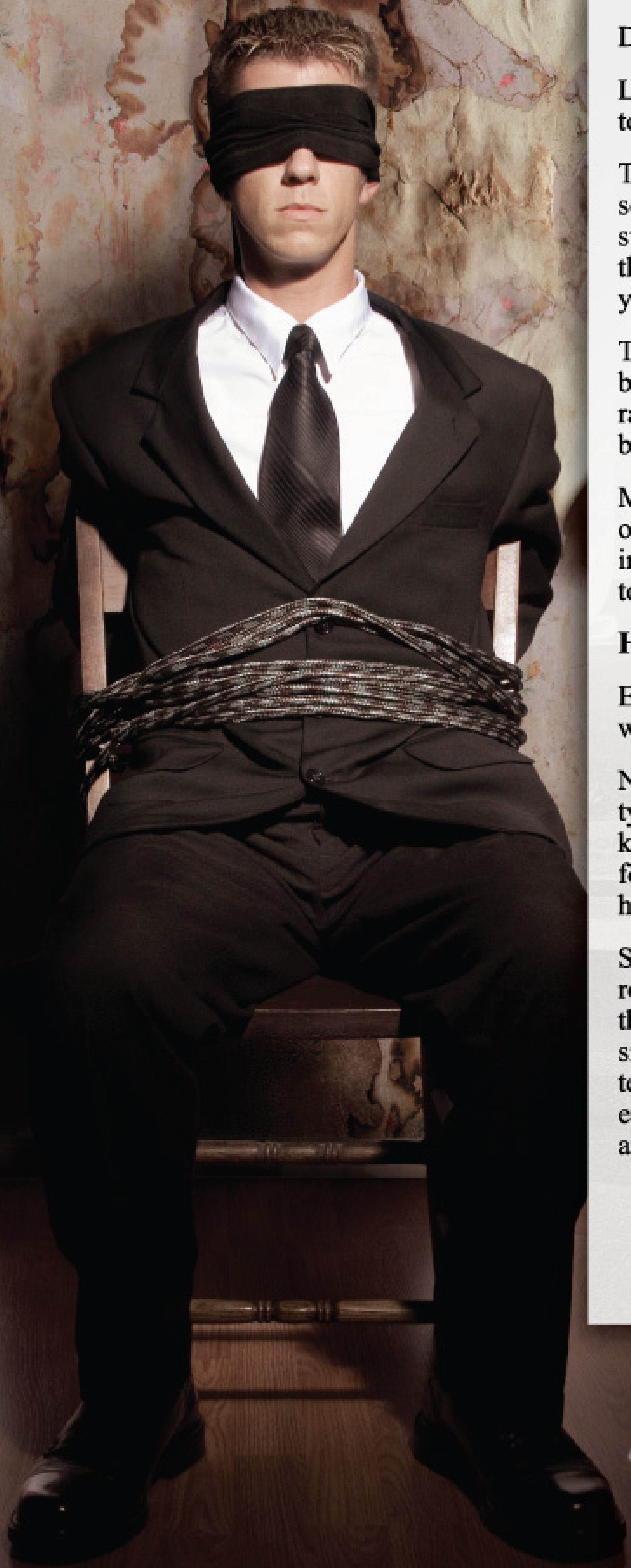
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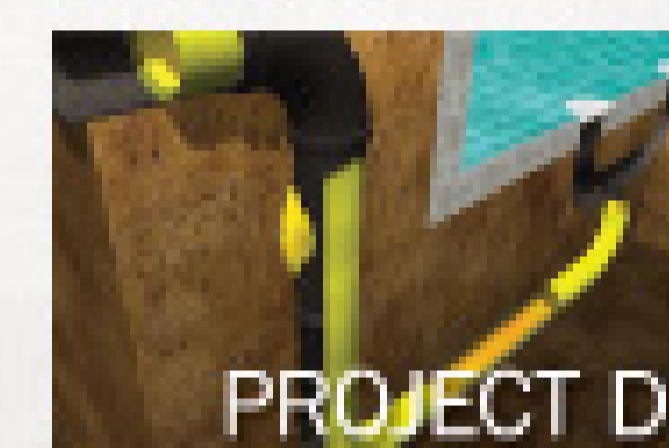
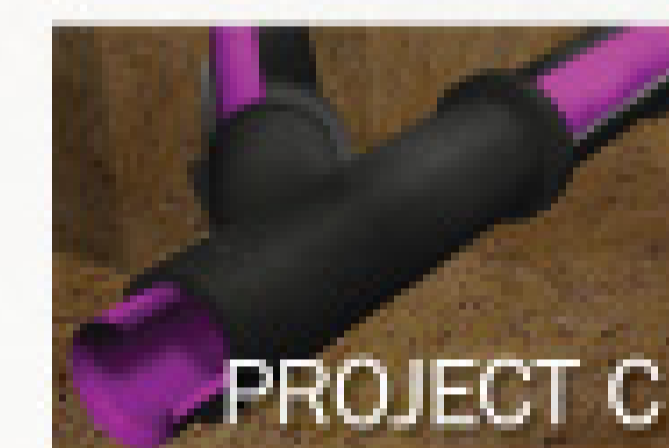
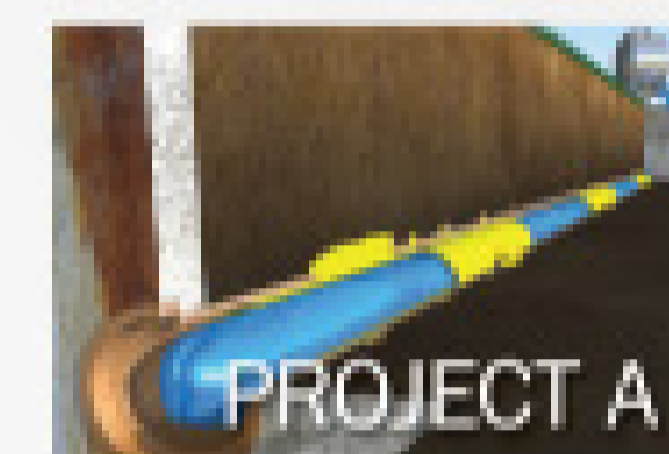
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INSIDE:

CLEANING AND MAINTENANCE STRATEGIES



COVER:

Hilly terrain makes stormwater management a challenge in Duluth, Minn., on the shore of Lake Superior. Cold winters add to the challenge. Here, city workers Perry Webster and Jess Clynch use a CCTV camera to inspect a sewer line in a hillside neighborhood. (Photography by Derek Montgomery)



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Special Issue: Location and Leak Detection

- ◆ Water: Leak detection initiatives in Birmingham, Ala.
- ◆ Sewer: Leak detection and rehab in Westlake, Ohio
- ◆ Storm: Wetland treatment system in Gresham, Ore.
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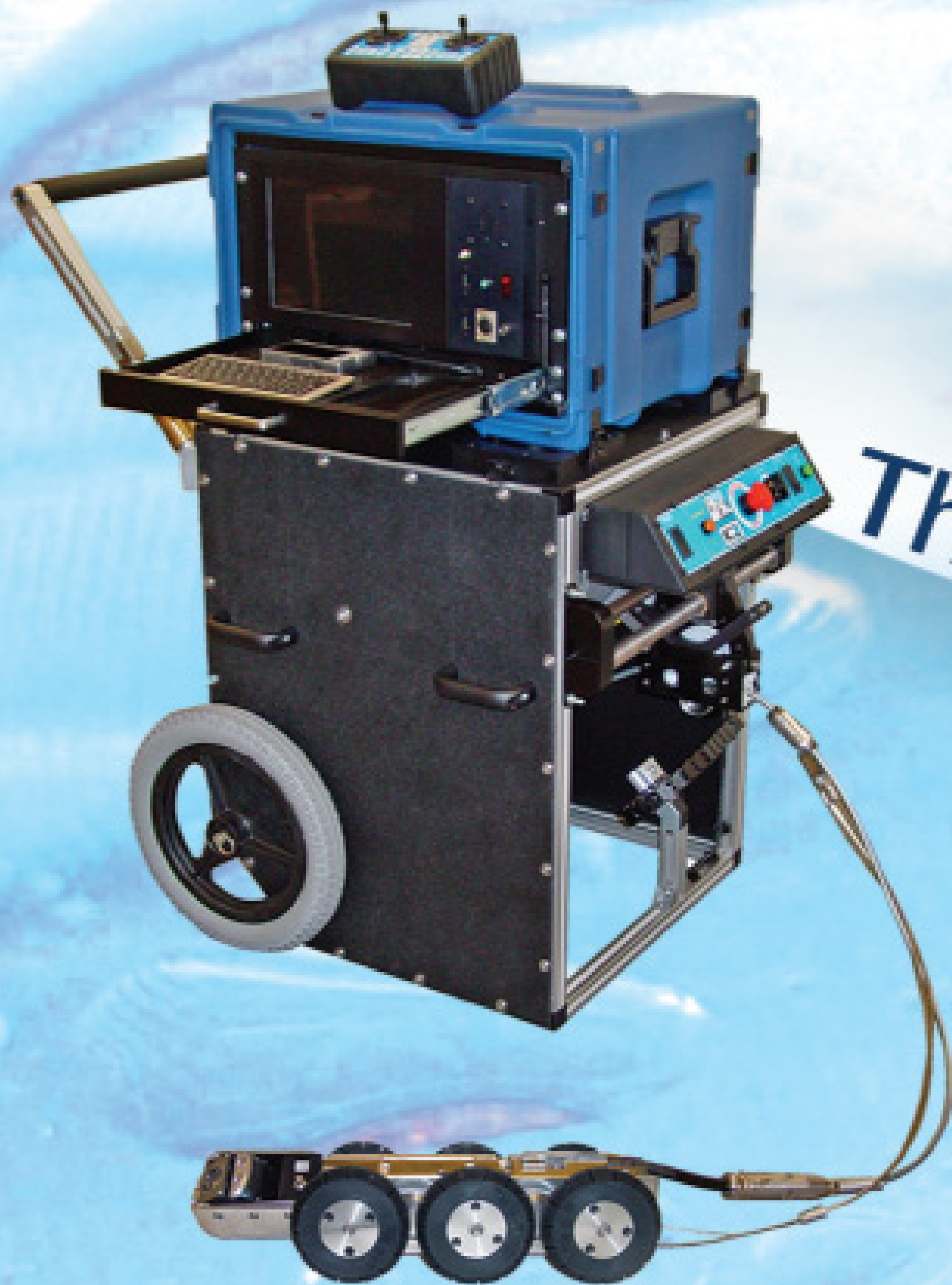
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It's an axiom that it costs more not to do maintenance than to do it. So why is maintenance so often first to come under the budget knife?

“A

nother flaw in the human character is that everybody wants to build and nobody wants to do maintenance.”

Kurt Vonnegut

Most of us can name a time when failure to do maintenance cost us. For me, it was the time 30 years ago when, as I drove in a downpour on a two-lane highway, the balding tires that I had delayed replacing hydroplaned.

The car spun, spray blinded the windows, objects inside went flying, and I waited an eternal few seconds for the impact that would send me to the hospital, or worse. As luck would have it, the car stopped with a thud — in the manner of Dorothy's house in “The Wizard of Oz” — against a clay bank. I was all right and so was the car, except for a smashed taillight.

All the odds said another car should have hit me on that state highway, or that I should have left the road into a ditch and flipped over. I drove off resolved to buy new tires the next day, and I did so.

Neglected maintenance isn't always that potentially disastrous, but it is always costly. I hesitate even to say almost always costly. The hard reality of life is that when we don't take care of things, they break. Taking care of things is cheaper.

Waiting to happen

Deep down, almost all of us know this. And yet, when we get to serve on a city council, county board or village board, we easily forget or ignore it.

How often have we seen maintenance get deferred when budget times get tight? It's a decision that looks good today but will look very bad tomorrow. It's false economy. Penny wise, pound foolish.

The theme of this month's *Municipal Sewer & Water* is cleaning and maintenance strategies. We highlight the City of Raleigh's steadily expanding preventive maintenance program, which keeps the sewer system in top condition and measurably reduces sanitary sewer overflows. And we describe how the City of Buffalo assigns priorities to make the best possible use of dollars to care for the water distribution system.

There's a lot to learn from these examples, and yet I suspect that if asked, managers in both communities would say they could do a great deal more if given money for more and better equipment.

How often have we seen maintenance get deferred when budget times get tight? It's a decision that looks good today but will look very bad tomorrow. It's false economy.

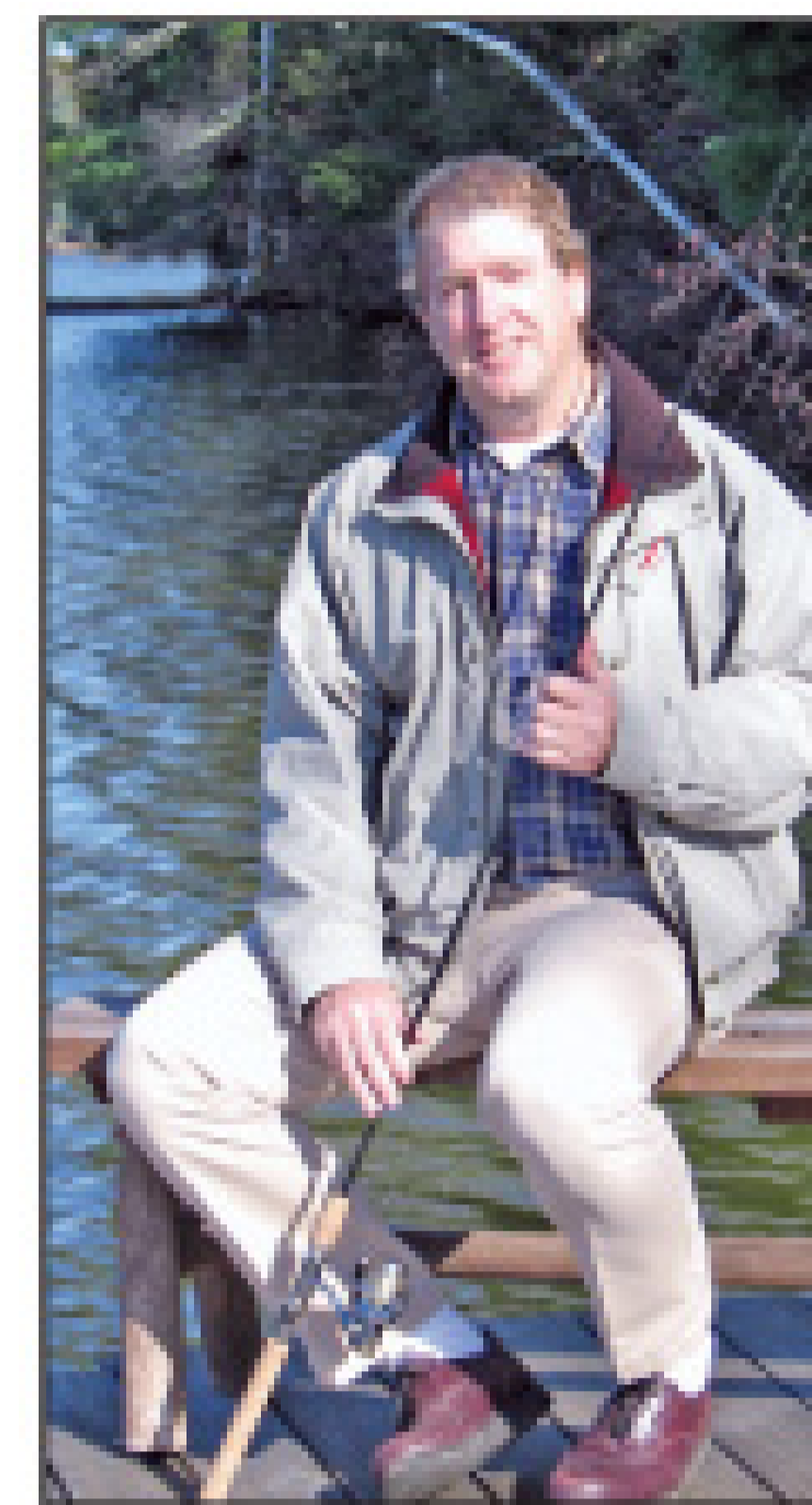
Penny wise, pound foolish.

The trouble with deferred maintenance on a municipal scale is that it's not like deferred maintenance on a car, where if you don't service your cooling system, you'll wind up some day hunched over a steaming radiator along the freeway. No, the effects are more insidious: more untreated wastewater spilling into the environment, more blockages than usual, more middle-of-the-night main breaks.

Some of these undoubtedly affect customers directly, but absent a basement full of sewage or some other calamity, many may write them off as part of city living.

Making the case

Of course, like facts, the costs of poor maintenance are stubborn things: They don't go away just because you ignore them. And so, here many water and sewer system managers stand,



FROM THE EDITOR

Ted J. Rulseh

knowing they need to do more, but are under-equipped and under-funded. And in the meantime, who knows what manner of disaster lurks beneath the streets?

So, what to do? One thing managers like those in Raleigh and Buffalo have in common is the ability to justify maintenance spending. In Raleigh, for example, sewer collections superintendent Hunter Stanley diligently made the case to his council until he won approval for a long-term program of building up his cleaning, inspection and maintenance fleet.

Department heads and council members may be careful with a dollar, but they understand costs and benefits, and in the end, so do the taxpayers they represent. If you can clearly compare the cost of doing what's needed against the cost of doing too little, it's surprising how the purse strings can loosen.

Are you satisfied that your community does enough maintenance? If you are, *Municipal Sewer & Water* would be glad to tell your story so that others can learn from your example. Just drop a note to editor@mswmag.com and tell us briefly what you're doing, how you made the case to your community's leaders, and what you've accomplished as a result.

You'll be helping lots of your counterparts in the sewer and water system maintenance field. Because after all, the mechanic in that old oil filter commercial had it right: “The choice is yours. You can pay me now or ... pay me later.”

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

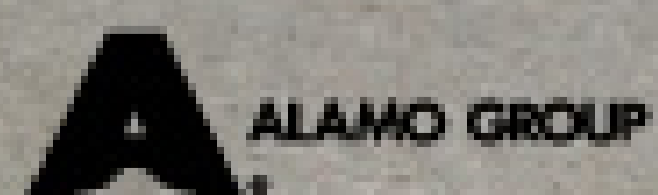
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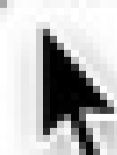
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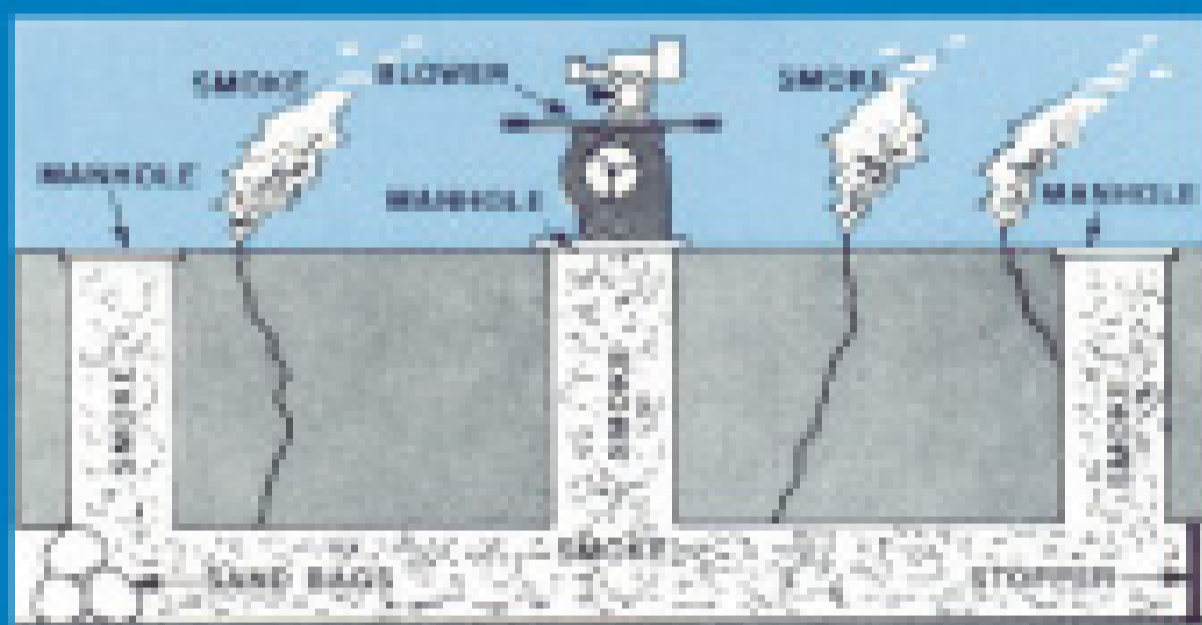
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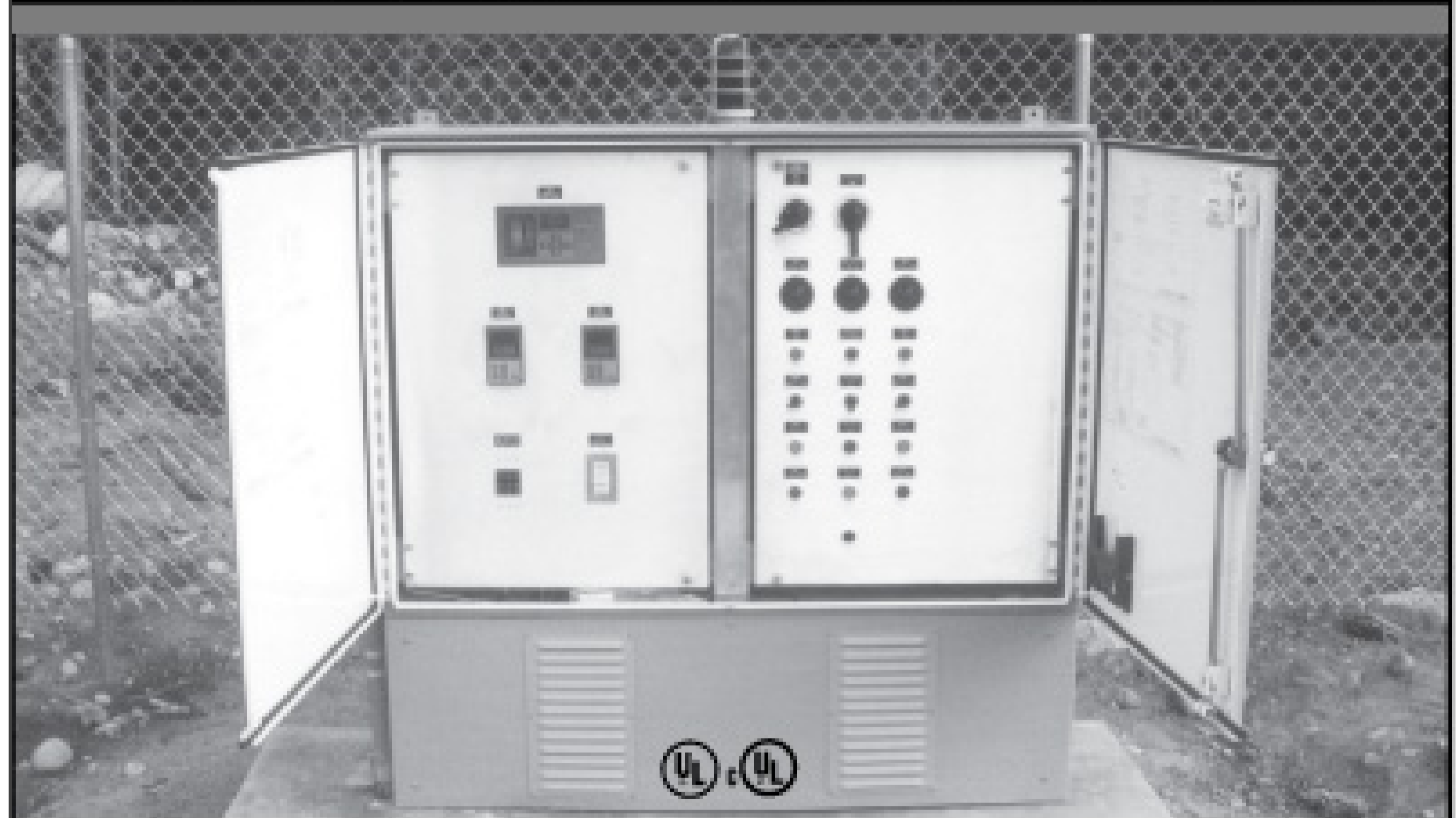
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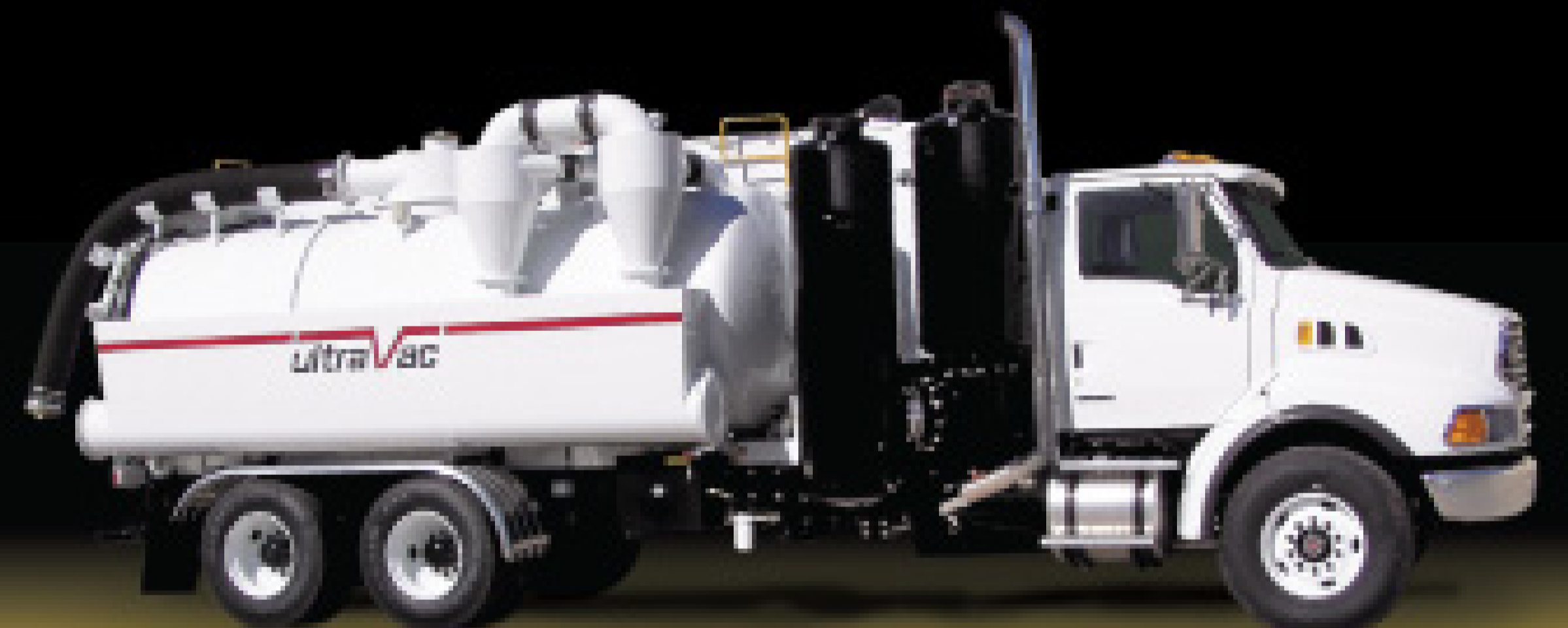
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PERSISTENCE PAYS

An aggressive and steadily expanding preventive maintenance program in the North Carolina capital reduces SSOs to keep sewer lines in optimal condition

By Suzan Marie Chin



Preventive maintenance for the City of Raleigh includes CCTV inspection of sewer lines. Service vehicle graphics emphasize the importance of keeping grease out of the system. (Photography by Tracey Washburn)

Determined to reduce sanitary sewer overflows (SSOs) and make its collection system perform at optimal levels, the City of Raleigh Public Utilities Department has built a comprehensive cleaning, root control and inspection program that achieves solid results on a consistent basis.

The preventive maintenance program didn't just happen. Over the last 10 years, the utilities department in North Carolina's capital has steadily and consistently added equipment and personnel, building a fleet and team considered large for the city's size.



PROFILE:
City of Raleigh,
N.C., Public Utilities
Department

POPULATION:
430,000

CUSTOMERS:
170,000 connections

EMPLOYEES:
84 (sewer maintenance)

INFRASTRUCTURE:
2,300 miles of sanitary sewer

ANNUAL BUDGET:
\$6 million

WEB SITE:
www.raleighnc.gov

City vehicles serve as rolling billboards, reminding residents of the \$50 reward for calling in to report sanitary sewer overflows.

Raleigh's aggressive plan incorporates three key components:

- Regular and concentrated cleaning, which has reduced emergency calls and improved system function.
- CCTV inspection, which helps monitor system health and measures the effectiveness of the cleaning crews.
- Community outreach through "billboards."

All these have helped the city bring the system's number of SSO incidents down to fewer than one-third the national average of systems of comparable size.

Making the case

To develop the program and build the required fleet and team, sewer collections superintendent Hunter Stanley knew he had to convince the city council and department management. "There's an old saying that I put to our city and the agency management," he



"We have found that by keeping our PM crews focused on one area until it is complete, we are able to stay ahead. When you jump around, it is almost impossible to ever catch up on the work that needs to be done."

Hunter Stanley

says. "You can pay me now or you can pay me later."

"We can either budget now to get the equipment we need to stay ahead, or later on the federal government could come in here and tell us we're going to get the equipment and put us on a mandatory

program. If we don't have the tools and means to clean the lines, we are going to have a lot of SSOs, and that's not where we want to be."

Heeding Stanley's advice, the council and his superiors agreed that over time, Stanley would procure equipment and hire personnel to build an aggressive and proactive preventive maintenance program for the region's 2,300-mile collection system.

Beginning in 1997 and every year until 2008, Stanley acquired new combination sewer cleaning vehicles, mechanical rodders, small flush trucks, bucket machines and CCTV inspection vehicles. The fleet now includes 16 flush trucks from Vacall Industries Inc. The largest ones carry 1,500-gallon tanks and pumps that deliver up to 80 gpm, and the smaller units have 900-gallon tanks and 60-gpm pumps.

Other equipment includes a 4x4 combination unit from Vactor Manufacturing (40 gpm), four mainline CCTV rigs from Aries Industries Inc., mechanical rodders and bucket machines from Sewer Equipment Company of America, and an easement machine that Stanley and his team designed and built from various components.

Chris Mosely (left) and Corey Gunter flush an 8-inch sewer main to remove grease buildup.



SSO REWARDS

To help speed response and correction of sanitary sewer overflows, the Raleigh Public Utilities Department launched a reward program.

It pays \$50 to the responsible citizen who reports a manhole that is surcharging. "Our thinking is that if we offered a reward, the calls about the surcharges would come in faster, allowing us to respond quicker and limit the amount of surcharge," says Hunter Stanley, sewer collections superintendent.

To promote the program and get more citizens involved, the city has had several of its sewer maintenance vehicles outfitted with laminated wrap graphics of \$50 bills and a message that tells about the reward program and where to call to report problems.

Before the reward program, some surcharges could go undetected or unreported for several weeks, increasing health hazards and cleanup costs. Now, most problems are called in almost immediately, and emergency response crews address the cause quickly.

Using the tools

In this day of technology and computerized systems, the utilities crew still relies on what Stanley affectionately calls "an ol' country boy work system." Scheduling and management is handled through an organized, manual map method.

Stanley uses a map book, extracting each page, which in turn is copied and becomes an assigned work zone for a specific crew. The crew is charged with cleaning every line in the area on the map. When they finish, they return the map to Stanley, who has a duplicate copy on the office wall, which then is marked as complete.

The crew's completed map page is then filed in a book that indicates the crew members' names, the date the area was assigned and the date it was completed. "Many



Chris Mosely uses a flusher truck from Vacall Industries Inc. to clean a sewer main as part of the City of Raleigh's aggressive and proactive preventive maintenance program.



Donald Barnes uses a CCTV rig to inspect a service line along the region's 2,300-mile collection system.

cities I speak to are sending their crews out to 'fight fires' and are working in different areas instead of concentrating efforts," Stanley says.

"We have found that by keeping our PM crews focused on one area until it is complete, we are able to stay ahead. When you jump around, it is almost impossible to ever catch up on the work that needs to be done." Between its in-house crews and an outside contractor, Raleigh consistently cleans 300,000 or more feet of sewer main per month.

The city contracts its chemical root-removal program to Duke's

Root Control Inc., and contracts planned maintenance for its sewer mains to Hydrostructures in nearby Pittsboro. "Both do an outstanding job and are very professional and honest," Stanley says.

The system includes primarily 6- to 12-inch mains made of VCP, concrete, ductile iron and PVC. Roots have been a challenge of late because of the severe drought conditions in the Southeast. A large share of the system is VCP, which is particularly susceptible to root intrusion. As a standard practice, when crews clean the lines, Stanley has them run a cutting saw through at least once after standard high-pressure waterjet cleaning is complete. This helps ensure that all roots and debris have been cleared.

For larger lines, the crews sometimes opt for bucket-machine cleaning. "Although a lot of cities don't like to do this anymore, we still do," Stanley says. "On large lines that may be filled with a buildup of sand and gravel, a flush truck could clean the line, but it takes a lot longer and sometimes it just can't get everything."

Tough to reach

To perform maintenance in hard-to-access areas, Stanley devel-

oped his own easement machine, using a John Deere tractor, a detachable hose reel with a three-point hitch, and 600 feet of hose. When it isn't required for cleaning lines, the crews can easily disconnect the reel and use the tractor for other tasks, like easement clearing.

Grease is a persistent problem in some areas of Raleigh where the population and usage are dense. Here, an effective tool is Bison chemical grease removal and control agent. Always looking for better ways to maintain the system, Stanley and his crews developed a cost-saving method for dispersing the Bison agent in place of the traditional method of loading 10 gallons of concentrate per 1,000 gallons of water directly into the flush truck tank.

The crews created a special container with a controlled-release switch that is attached to each of the cleaning trucks. The chemical is now dispersed only when needed in lines with heavy grease buildup and where the treatment will help reduce the return of buildup once the cleaning is finished. This one small innovation on the cleaning trucks is greatly reducing treatment costs and unnecessary use of the chemical.

Quality control

In addition to its own preventive maintenance and emergency response duties, Raleigh's CCTV inspection crews perform quality-control checks on cleaning crews and help monitor the overall health of the system. Periodically, the city creates a work order for one of the CCTV crews to perform a spot check on a line recently indicated as cleaned.

"With a workload as big as ours, we just can't take a crew's word for it," Stanley says. "We TV behind the cleaning crews to make sure they are doing their job. If I send a truck out there and that line has not been cleaned, and they came in with their paperwork saying that it was, somebody's going home for a couple of days. Once you get it across to your crews that you are going to check behind them, and that not doing their job will result in disciplinary action, they'll be sure to perform to the best of their ability."

Stanley is quick to give credit to assistant superintendents Tom Johnson and Phillip Maddox. "We're all on the same page when it comes to preventing SSOs," he says. "We also have excellent supervisors and crew members in this

department. Supervisor Alexander Rogers has been here for 31 years and knows the system like the back of his hand. His father retired from here with 30 years of service."

Crew performance is critical, but equally vital is equipment maintenance and reliability. To help the crews stay on target, a full-time garage with two mechanics is dedicated to the maintenance and repair of sewer-related equipment.

Consolidation of vendors also helps. For example, all Raleigh CCTV equipment is made by one vendor (Aries). By narrowing the makes and models of equipment or brands, Stanley can more easily keep sufficient spare parts on hand for repairs to be handled by in-house staff. That reduces downtime. Larry Murrin, supervisor II, is in charge of the TV crews, who repair cameras in-house and so save the city money.

Community on board

As the crews make their rounds section by section throughout the system, Stanley sees an opportunity to educate residents in a unique way.

Using large laminated wrap graphics, similar to those that display advertising on public transit vehicles, Raleigh has applied "billboard" messages to its cleaning trucks. They educate people about the proper disposal of grease and other ways they can help prevent SSOs and improve the health of the sewer system. When the trucks

"You cannot keep a large system like ours clean and performing well with a handful of trucks and people. You've got to have the right number of units and personnel. That's the secret to controlling SSOs and staying ahead of potential problems."

Hunter Stanley

are deployed in a concentrated area in a neighborhood over several days, the hope is that most area residents will notice them and read the messages.

The city's multipronged effort against SSOs seems to be working. A study by the National Association of Clean Water Agencies shows that an average of 140 SSOs occur annually per 1,000 miles in a met-

ropolitan sewer system.

As a result of its commitment to preventive maintenance, Raleigh experienced just 48 SSOs in 2007 that reached the threshold that the state Division of Water Quality defines as requiring the city to notify the public by issuing a press release (21 of those were caused by grease in the lines). That places

the city considerably better than the national average. The goal is to bring SSOs even lower as the program progresses.

"We couldn't have done it without the support of our city and management and their permission to get the equipment and personnel we needed to do the job right," says Stanley. "I have had the backing of my superiors since I have

been the superintendent, and we have had the money we need to do our job. Also, everyone in Public Utilities works very well together.

"You cannot keep a large system like ours clean and performing well with a handful of trucks and people," he says. "You've got to have the right number of units and personnel. That's the secret to controlling SSOs and staying ahead of potential problems." ♦

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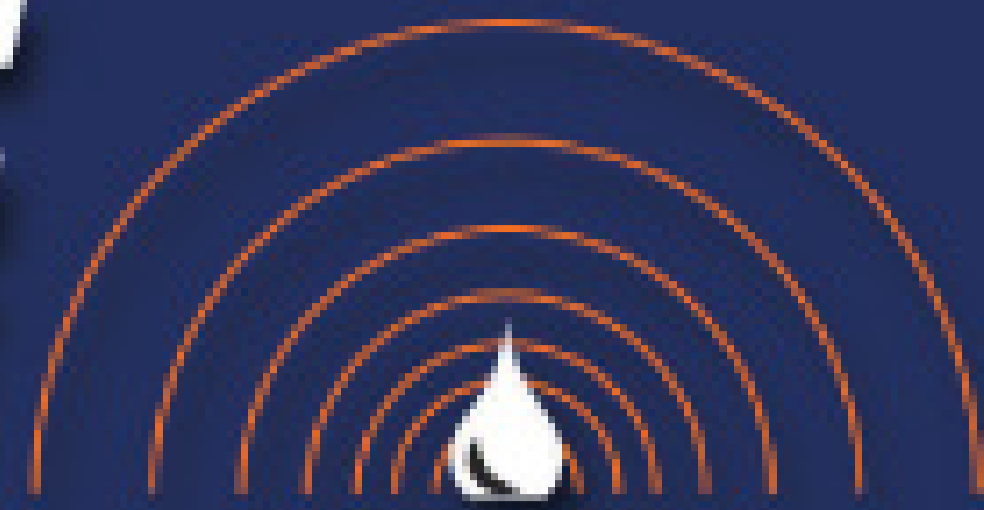
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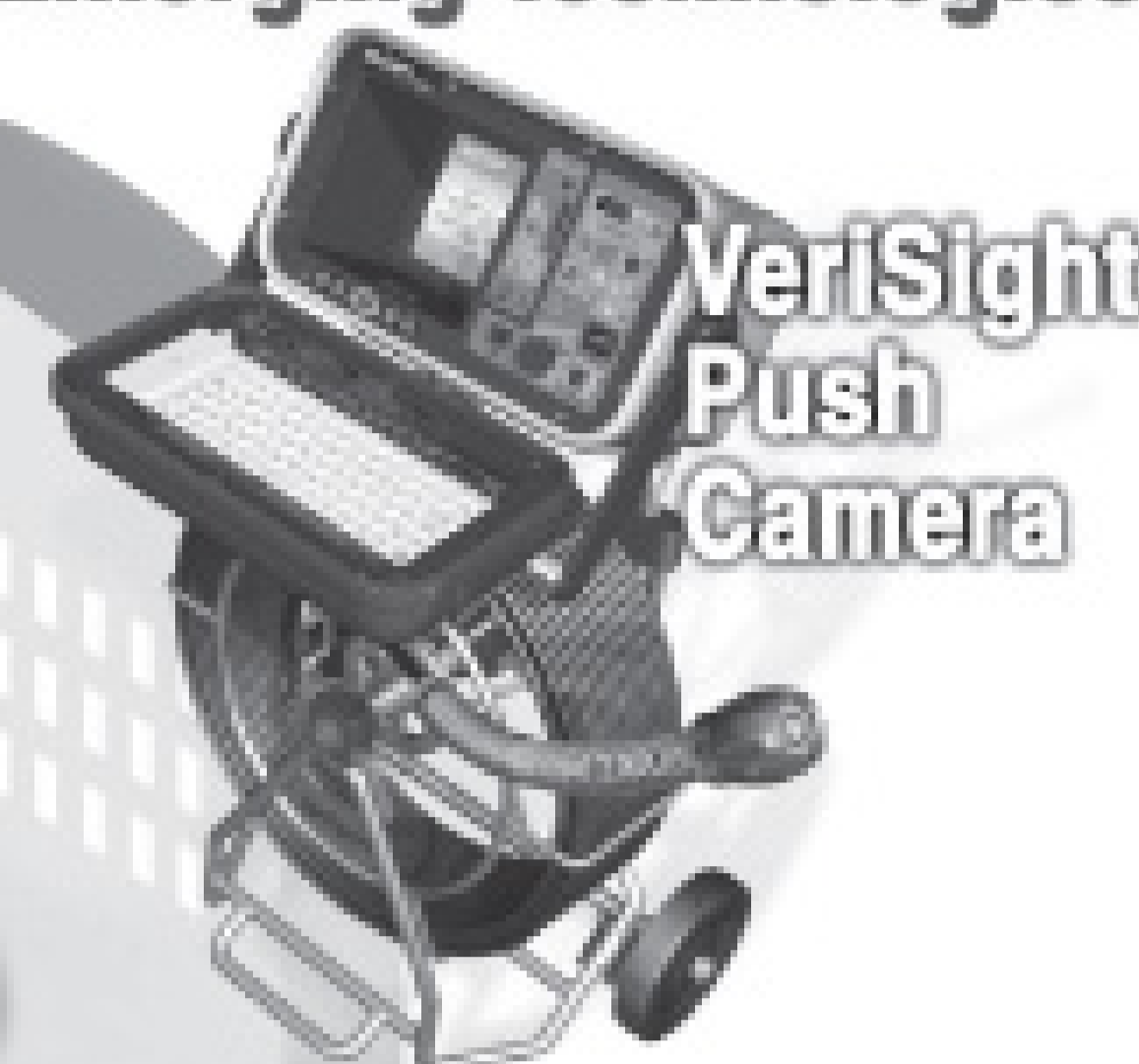
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RIGHT ON TARGET

With a shrinking customer base and aging infrastructure, the City of Buffalo used a precise, strategic approach to tame costs while improving efficiency

By Peter Kenter

The municipal water system in Buffalo, N.Y., faces three challenges: aging infrastructure, a declining customer base, and corporate and private customers who are extremely cost-sensitive.

By carefully assessing the system's weaknesses and focusing resources on problems most likely to affect service — and by establishing an aggressive collection program — the city's Division of Water has pulled off a delicate balancing act, delivering water more efficiently at a predictable price.

Keys to the city's success were upgrades to the pumping system and other improvements that helped achieve uniform system pressure, and a highly targeted program of replacing sections of water main that had been prone to frequent breaks.

Since 1997, the city and the Division of Water have worked in partnership with American Water. The arrangement has been so successful that the parties were honored with the 2008 Excellence in

Public-Private Partnership Award from the U.S. Conference of Mayors.

On the shore

The city's water systems include about 875 miles of lines covering just over 40 square miles. The city has an abundant water supply of fresh water from Lake Erie. Its lakefront location was part of the city's early success: Buffalo was once a major shipping hub and home to the largest steelmaking operation in the world.

At its peak population in 1950, the city grew to nearly 600,000 people, but declined steadily as shipping routes switched to the St. Lawrence Seaway and major industries downsized, moved or closed. The current population is 275,000.

The Buffalo Water Board launched its relationship with American Water with a five-year agreement to upgrade and maintain the water system. Under the contract, American Water handles repair and maintenance of the distribution system, treatment and pump station operation, residuals management, customer service,

billings and collection, and repair and installation of water meters.

Part of the lure for the city was the company's pledge — fulfilled — to make improvements while reducing bills by 8 percent in the first year. The company also agreed to work with local unions, reducing the workforce only through attrition.

Under pressure

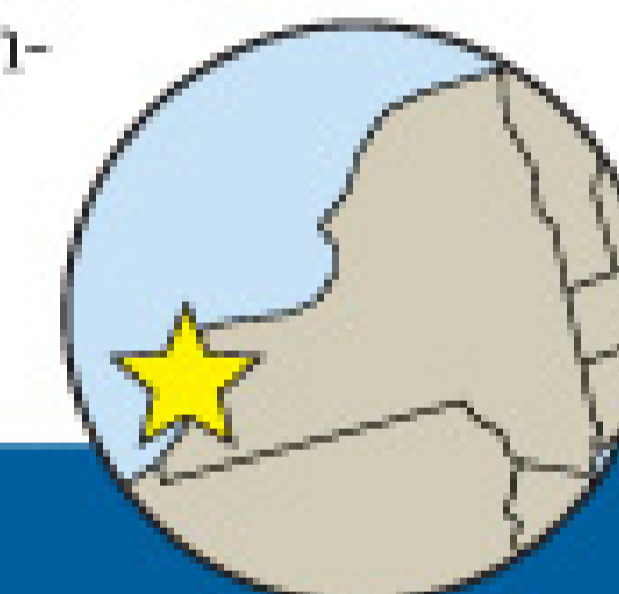
"The city had actually owned the water system until the 1970s," says Jim Campolong, project manager with American Water. "They sold the system and created the board, but they had been under a lot of pressure to make improvements, not the least of which was pressure from the state of New York to meter the service. As a Great Lakes city, there just hadn't been a lot of internal impetus for water conservation."

The mains, some more than 150 years old, mostly range from 2 to 36 inches, although some are as large as 60 inches. (The city recently received an award from the National Cast Iron Institute for the cast iron pipe with the longest continuous service.)



Buffalo's typically heavy snowfall creates an extra level of difficulty in repairing midwinter main breaks. (Photos by Peter Kenter)

The Water Board focused on capital programs that included getting the system into shape, notably by addressing severe leakage and inconsistent pressure throughout the system.



PROFILE:
City of Buffalo, N.Y.,
Division of Water

INCORPORATED:
1832

POPULATION SERVED:
275,000

AREA SERVED:
40 square miles

INFRASTRUCTURE:
875 miles of water mains

ANNUAL BUDGET:
\$40.7 million

WEB SITE:
www.ci.buffalo.ny.us

Part of the first order of business was to improve cash flow through metering and better collections. "The system had high receivables," says Campolong. "We established more aggressive collections to help stabilize rates, while creating programs to help delinquent accounts pay their bills. We were required to collect 94 percent of cash sales with our program, but we were able to collect 100 percent in some years."

Among the largest customer complaints was variable water pressure. The pumping system has capacity for 600,000 residential customers and a large industrial base, but what happens when those customers leave the system isn't pretty.

"We have a capacity to pump 310 mgd, yet the average real pump rates are around 77 mgd," says Campolong. The system relied on five 50-mgd and two 30-mgd pumps to maintain pressure, but they provided little control or finesse. The pumps were simply activated to achieve end pressure targets in whatever way worked.

Cause and effect

"It was clear that we were getting a lot of spikes and transient pressures," says Campolong. "Around



Buffalo's Ward Pumping Station (above) houses five original steam pumps (right photo) installed almost a century ago. Each pump is four stories tall and weighs more than 1,000 tons. They are no longer in use.

2002, we decided we really needed to understand the cause-and-effect scenarios that occurred with each pumping decision."

The system had no computerized pressure monitoring. Some pumps fed back electronic information through telephone lines, but the complete picture was missing. The utility took all charts showing the pumps and pumping systems and graphed, over time, the changes in pump activity against resulting changes in pressure throughout the system.

"When we overlaid the chart showing pump changes with another one showing main breaks, we realized we'd hit it," says



RELICS FROM THE AGE OF STEAM

When Buffalo's Colonel Ward Pumping Station went into operation in 1915, it was outfitted with five massive steam-powered pumps, each four stories tall and weighing more than 1,000 tons. The massive flywheels measure 20 feet in diameter. Together, the machines, built by the Holly Manufacturing Co. of Buffalo, could pump 30 mgd.

The steam pumps remained in service for more than 50 years. Too big to dismantle, they now represent the largest collection of antique steam units in the country.

"They're also noted for being in the best condition of any pump of the same vintage," says Frank Mangione, water superintendent with the Division of Water. Even the controls and signage on the pumps remain intact. When the machines were fully operational, a full-time oiler applied oil to the moving parts.

Plans are afoot to restore at least one of the pumps to full operation, minus the steam power. "If we could get one of the flywheels to turn, people could get to see just how these big guys operated," says Mangione.

"In one year, we cut main breaks in half, from about 300 annually to 150. I believe we saved a million dollars in overtime alone by avoiding emergency repairs."

Frank Mangione



John Murphy, an employee of Buffalo's Division of Water, performs a leak detection test near city hall.

Campolong. "When the pumps were switched, we'd get pressure spikes, leading to main breaks somewhere in the system. We realized that the people operating the pumping system had to change the way the system was managed."

As a test, workers installed a pressure-relief line from the pump headers to the well-monitoring vault outside a pump house near the main pumping station. Anticipating a pump change, the relief valve was manually activated to release excess pressure. The test was such a success that the city authorized installation of remote-controlled relief valves at strategic tank locations throughout the system to improve tank level management.

"In one year, we cut main breaks in half, from about 300 annually to 150," says Frank Mangione, water superintendent with the Division of Water. "I believe we saved a million dollars in overtime alone by avoiding emergency repairs."

Better data

In 2003, the utility introduced a Supervisory Control and Data Acquisition (SCADA) system to further analyze and control pressure. "We needed to get more detail back from the nodes in the system,"

"With a shrinking customer base and the city facing economic hardship, we can't sustain huge rate increases, but we can't run the system without paying for it. Our strength is finding out where money can be invested, improving the system by increments, and delivering water to our customers at a predictable price."

James Campolong

says Campolong. "We needed more information on tank levels and system pressures because we were running almost blind."

With an understanding of how the total system operated, the utility recently authorized replacement of one old 50-mgd pump with a modern 22-mgd pump. "Modernizing the pump will give us better control to match system demands," says Campolong. "It will also save energy, because running the big pump while dampered uses the same amount of electricity, no matter how much water it's pumping."

That project begins an aggressive phase of pump replacement that will provide more options to



Above, Frank Mangione, water superintendent with Buffalo's Division of Water, and employee John Murphy examine recording devices collected as part of the city's leak detection program. At right, Jim Campolong, project manager with American Water in Buffalo, instituted an aggressive collections system and launched a targeted repair program to help balance the water system's budget.

match system demands, while eliminating the need for relief valves.

Before the SCADA system, the department also had limited information on the locations of main breaks. "We were experiencing a lot of main breaks that required emergency service," says Mangione.

"At one point we asked ourselves if there was any pattern to them, but we had no effective way of monitoring the system to find out."

The utility hired a consultant to put together a matrix of the water system and chart the frequency of breaks and the age and size of the pipes. What they discovered surprised them. "We had breaks all over the system, but we noticed that the breaks were clustered around certain lengths of main," says Mangione. "We might see four or five breaks in a single year on the city block that we were repairing on an emergency basis."

Campolong observes, "Traditionally, you look at the age and



size of the pipes involved and replace a significant length of it on a certain schedule. We asked how we could get the best bang for our buck while benefiting the overall infrastructure." Rather than replace lines based on traditional factors like expected service life, the water division concentrated on replacing lines in trouble hot spots.

Lining not an option

The Water Board continued its larger capital improvement program, while the division replaced shorter lengths of problem pipe, in sections from 100 to 500 feet. While the city had some experience with cement lining, that wasn't an option in most of the problem sections, since many of the lines were already undersized.

"One of the chief complaints of our clients was water pressure, so lining those pipes wouldn't have helped achieve our overall goals," says Campolong. Ductile iron pipe was chosen to replace the damaged cast iron lines, mainly because of the material's long life and the ease of incorporating it into the existing infrastructure. Wherever necessary, mains were upsized to accommodate more predictable pressure.

The change in strategy provided good public relations, since problem areas received immediate attention in a way that was tangible to customers. Other benefits of the strategy included fewer overtime hours as construction labor was more predictably scheduled, and smaller, shorter traffic detours as the pinpoint projects were completed. On the down side, smaller contracts generally cost more per foot than larger ones.

Overall, however, the strategy is paying off as calculated surgical strikes lead to an overall renaissance of the system. "Trouble spots are decreasing as we play catch-up ball," says Mangione. "We're reporting fewer main breaks and can concentrate more effort on other parts of the system."

Continuing challenges

The region continues to face economic hardship. In 2003, Buffalo's municipal budget was placed under the authority of a control board authorized by the state of New York. Because the Water Board operated independently, its operations remained unaffected, but in 2004, surrounding Erie County made overtures to purchase Buffalo's water system in hopes of achieving greater efficiencies. With the prospect of continuous improvements to the water system, the city rejected the offer.

Other capital improvements continue. A \$5 million Main Street main rehabilitation program is underway. Because the water system has no elevated storage, the utility has embarked on a \$6 million to \$7 million back up emergency generator system project to keep water flowing during a power outage. A \$20 million investment from the New York State Revolving Loan Fund will see the city's 93-year-old Colonel Ward Treatment Complex completely modernized over three years.

"With a shrinking customer base and the city facing economic hardship, we can't sustain huge rate increases, but we can't run the system without paying for it," says Campolong. "Our strength is finding out where money can be invested, improving the system by increments, and delivering water to our customers at a predictable price." ♦

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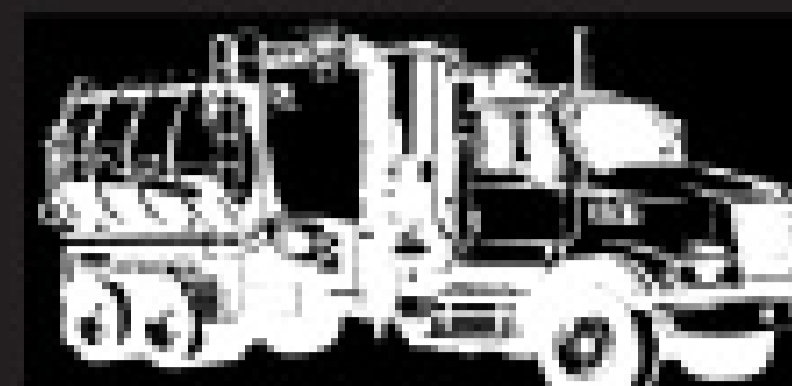
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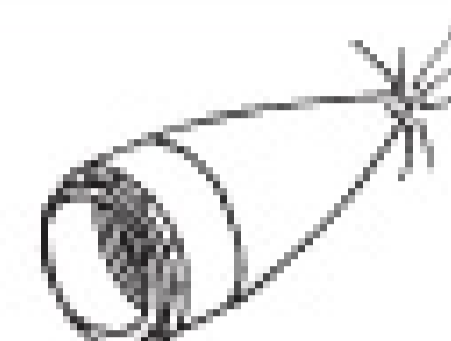
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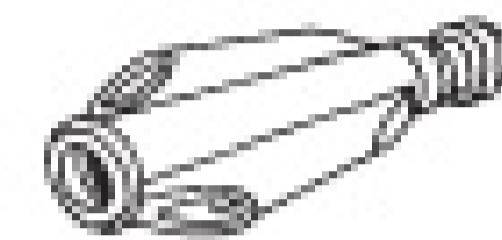
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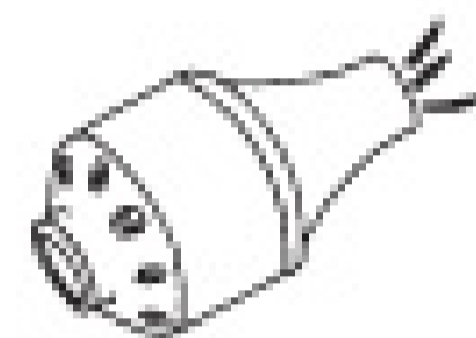
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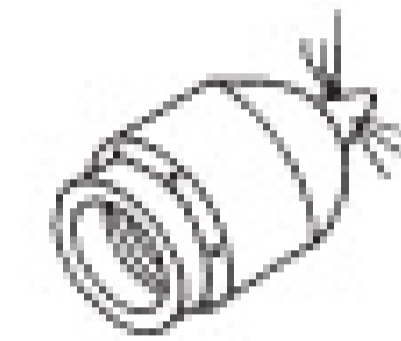


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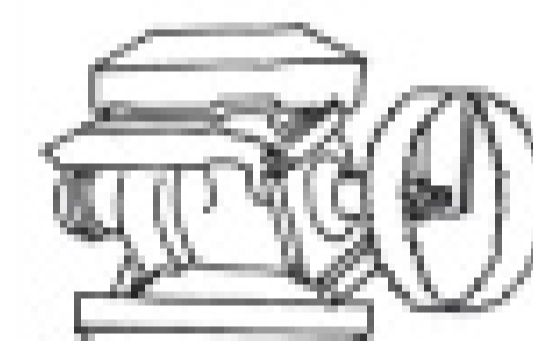


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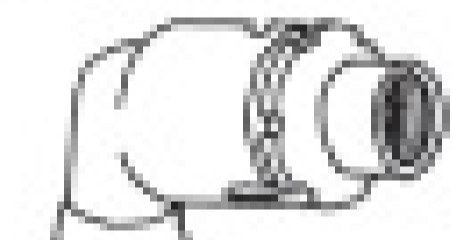
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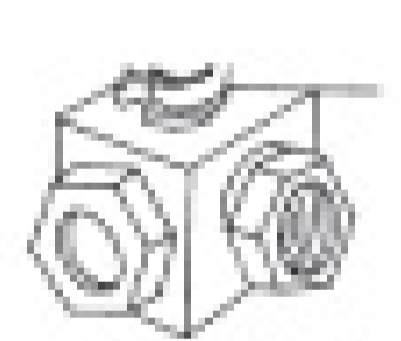


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MANAGING MAINTENANCE ONLINE

Web-based CMMS technology offers more flexibility, lower cost, ease-of-use, access from anywhere and other user benefits

By *Kris Bagadia*

A computerized maintenance management system (CMMS) is a staple of quality maintenance departments. Now, CMMS is reaching new levels of performance and convenience with Web-based access.

For years, water and wastewater utilities have used CMMS to care for assets as diverse as vehicle fleets, treatment plant equipment and in-the-field facilities such as valves and pump stations.

Years ago, staff members had to put up with systems that took a long time to install, crashed servers, were difficult to upgrade, and required expensive hardware. More challenges arose from multiple databases for different facilities or sub-departments on which data had to be synchronized. Regular maintenance and support added more cost.

With a Web-based CMMS, staff members can access maintenance data securely from anywhere in the world, as long as they have Internet access. They can log in through an Internet browser and bring up a full-featured application. This simplicity and convenience have made Web-based CMMS take off.

Steady evolution

PC-based CMMS appeared in the early 1980s. The first systems were DOS-based and were available only on a single PC. Technology gradually progressed to systems available on local area networks (LANs).

Most LANs are confined to a single building or group of buildings — limiting access to the CMMS. One LAN can be connected to others over any distance via tele-

phone lines and radio waves to form a wide area network (WAN), but even these networks permit access only through network-connected computers.

Web-based CMMS software has caught on because it provides benefits that LAN- and WAN-based systems do not. Below are a few of the main benefits.

ASP option

Web-based CMMS offers two different options. End users can install it on their own servers, or it can be hosted remotely by the vendor in a model known as application service provider (ASP). A major benefit of the ASP option is that hardware maintenance is the vendor's responsibility. ASP also minimizes the initial investment and the cost of software upgrades.

Use anywhere and anytime

Web-based CMMS allows managers and supervisors to use the program to order parts, review work requests, generate work orders and perform other tasks from anywhere — in the office, from home, from out of town or out of country, from a vehicle, etc. As long as the user has an Internet connection, a user ID and a password, the CMMS is available. Here are a few cases where this is an advantage:

Work Requests. Typically, the maintenance department receives work requests from the field by phone or e-mail. Clerical staff then enter the work order. Besides the labor this requires, there is potential for instructions to be miscommunicated, and for orders to be

misplaced or forgotten — causing delays and costing money. With a Web-based CMMS, field personnel can enter requests themselves, instantly creating work orders.

Off-hours calls. Major breakdowns can lead to phone calls from the field in the middle of the night. With a Web-based CMMS, managers can access the system at home, review the service history of the item in question, and offer

PCs and server. With Web-based technology there is very little installation cost (virtually none with the ASP model). Maintenance is also minimal, as there is no need to support software on individual PCs.

In addition, with the ASP option, there are no onsite installations, no daily backups, no hardware headaches, and no need for printer drivers at each work station (users essentially print off their

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a solution in a short time. This eliminates a trip to the site, saving time and money and minimizing downtime.

Managing remotely. Technicians servicing fleet vehicles can perform maintenance activities and record them on the spot using a laptop computer or PDA. The information is instantly transferred to the CMMS (assuming proper setup is available). The same is true for servicing in-the-field facilities like manholes and pump stations. Managers also can assign work to staff members while out of town, such as by logging on to wireless Internet at a hotel.

Lower overall cost

Another advantage of Web-based CMMS is lower overall cost. In a LAN- or WAN-based system, CMMS must be installed on both client

browsers). That means less work for IT staff.

Easier upgrades

With Web-based CMMS, the vendor will automatically upgrade the program. The user never needs to spend time installing upgrades from CDs or Internet links. Upgrades are an ongoing process; there is less risk of the software becoming obsolete.

Greater convenience

The navigation in a Web-based CMMS is based on a standard browser. Therefore, end users feel comfortable with common elements like links, buttons, forms, etc.

Less potential for viruses

Because it runs off a browser, a Web-based CMMS has no local data that can be damaged by viruses.

If a computer drive crashes because of a virus, there is nothing to worry about, because the Web-based server automatically backs up the data at all times.

Higher security

Contrary to what many might assume, there is much higher security in Web-based software. With the ASP option, the service provider usually has an enterprise-class firewall to prevent access by all unauthorized users.

In addition, when users access the system, data passes back and forth under the highest encryption available in the Internet browser. This is the same type of security that banks use for online transactions. Web-based technology also lets users take advantage of Web security protocols and products.

Another security feature is confirmation of data entry against pre-defined criteria. For example, users who forgot their password might be asked a question that only they would know. Only after answering this obscure or personal question can the employee gain access to the Web-based CMMS.

User support

With LAN- and WAN-based technology, it can be hard for a user to explain a specific problem to technical support personnel. It is common to hear a vendor support person say, "I can't really see what's wrong. Can you send your data to me? I'll take a look at exactly what's going on and get back to you." Hours or even several days can be lost in the process. With Web-based CMMS, technical support staff can log right in, see exactly what the user sees, and troubleshoot. That means faster resolutions of problems, concerns or questions.

Multiple-facility access

Multiple facilities are much easier to handle with Web-based technology. Each facility has its own database, yet managers with the right passwords have access to other facilities' data. This is a valuable feature. For example, if one facility is out of a critical part, staff members there can check other facilities' inventories. Also, multi-

ple locations can work on the same real-time data at once. There is never a need to merge, synchronize or duplicate CMMS data. Reports are always up to the minute.

Reliability

Most Web-based service providers claim 99 percent or higher uptime. That is because the service provider has excellent IT staff and a data center with substantial redundancy. Users get those benefits without having to pay for all the hardware and staff.

Data entry

With LAN- and WAN-based systems, data entry is limited to users within the network. With a Web-based system, even trusted contractors can be given limited access to the CMMS so that they can directly enter details of work they perform. This helps the system owner keep a history of the contractors' work. It also eliminates manual entry of contractors' work data.

Automatic data backup

With the Web-based ASP option, data is backed up continuously. Users who want their own onsite backup in addition usually can get it — and in fact, most organizations exercise that option. Backup at two separate locations provides redundancy in case of a disaster at one site.

Quick debugging

With Web-based CMMS, everyone always uses the same version. Bugs can be fixed as soon as they are discovered. Fixing bugs is much more complex and expensive in a LAN- or WAN-based system.

Conclusion

The advantages of Web-based CMMS are clear. It offers better-quality service at a lower overall cost, with the convenience of access anytime and anywhere. For any progressive maintenance operation, it is a technology well worth exploring.

Kris Bagadia is president of PEAK Industrial Solutions, Brookfield, Wis. He can be reached at 262/783-6260 or krisb@peakis.com. ♦

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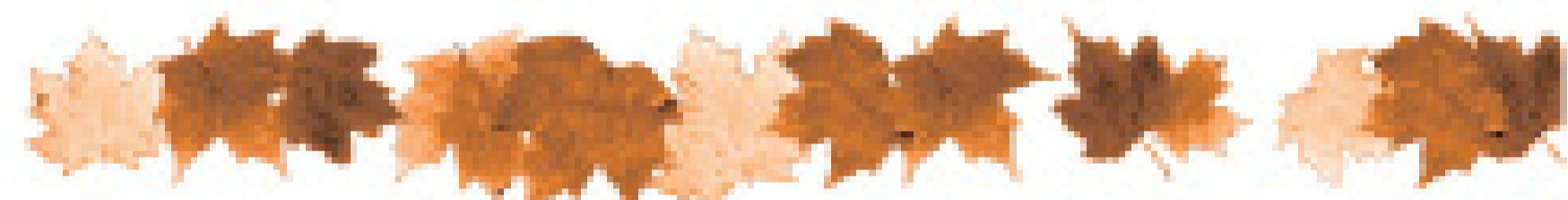
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A DOWNHILL BATTLE

The City of Duluth battles topography and cold winters in a campaign to manage stormwater and comply with national guidelines

By Jim Force



One look at the topography of Duluth, Minn., and you understand the challenges facing the city's stormwater management team.

Developed as a long, narrow strip against a ridge overlooking Lake Superior, Duluth features a steep drop of more than 880 feet from the top of Thompson Hill, its highest point, to the water's edge. The velocity of stormwater as it rushes downhill, plus the area's clay soil, can result in serious erosion, according to Chris Kleist, stormwater project coordinator.

And then there's winter. Temperatures can plummet to 40 degrees F below zero, and frost depths of 6 to 8 feet or more are not uncommon. These conditions burst pipes, freeze streams solid, and ice up catch basins and other stormwater infrastructure.

"Plus, a lot of the city is built on bedrock, so the frost can really be a problem, and water main breaks contribute to the storm flows," says Steve Lipinski, utility operations manager.

Despite these obstacles, the team is making a comprehensive effort to comply with Phase II national stormwater guidelines by improving the infrastructure and

involving the public in stormwater management, especially through an award-winning Web site.

An appreciation for clean water in this part of the country helps. "We have a high quality of water here," Kleist says. "That includes 12 designated trout streams and another 31 named streams in the city, many unnamed streams, plus Lake Superior, the largest freshwater body in the world and the most pristine of the Great Lakes. People just need to look out their window to see clean water." A tenacious program of catch basin cleaning, culvert deicing and stream maintenance also helps.



PROFILE:
City of Duluth, Minn.,
Stormwater Utility

POPULATION:
87,000

AREA:
87.3 square miles

ANNUAL RAINFALL:
31 inches

INFRASTRUCTURE:
290 miles of storm sewer,
9,500 catch basins,
17 sedimentation basins

STORMWATER BUDGET:
\$3.5 million

WEB SITE:
www.duluthmn.gov

Workers Phil Fournier (left) and Morgan Hutchinson use one of the City of Duluth's Vactor 2100 combination trucks behind the Duluth Entertainment and Convention Center. (Photos by Derek Montgomery)



Hutchinson prepares for a job using a Vactor 2100 truck, one of four the city uses to clean storm drains and more than 9,000 catch basins.

“We have a high quality of water here. That includes 12 designated trout streams and another 31 named streams in the city, many unnamed streams, plus Lake Superior. People just need to look out their window to see clean water.”

Chris Kleist

The old days

It wasn't always this way. Duluth put down footings in 1856 as a vital port city at the western tip of the Great Lakes. Its storm sewers date from about 1880, when officials piped some of the city's many creeks to allow development up the hillside and along the lakeshore.

Most storm sewers are made of reinforced concrete pipe (RCP), clay tile and corrugated metal pipe. However, a few were wooden pipes, and brick arch tunnels served to channelize the streams and discharge stormwater runoff directly to Lake Superior. “Before 1998, we didn't focus our attention on the stormwater system,” says Todd Carlson, a water-quality specialist. “In fact, our maintenance program consisted pretty much of

emergency repairs.”

Today, things are much different. The last known wooden pipes came out of the ground in 2006, and all have been replaced with RCP or metal pipe. And since the implementation of the National Stormwater Management Program, Duluth has set an exemplary pace in developing and applying best management practices (BMPs) for stormwater management.

In a key development, the city organized a separate stormwater utility within its Public Works division. “We developed a stormwater utility in 1998 to address operations and maintenance issues, in addition to providing funding to deal with water-quality issues and comply with NPDES Phase II rules,” says Lipinski.

The stormwater utility staff includes a manager, supervisor, engineer, project coordinator, two water-quality specialists, clerical staff, and maintenance, construction and CCTV crews.

Wooden storm sewer pipes were fairly common many years ago in Duluth. All known wooden sewer pipes within the city have been removed and replaced with more durable concrete and metal pipe.



Photo courtesy City of Duluth

TRACKING THE MUD

Most people don't know stormwater's impact because they can't see it. They're inside, out of the rain, or staying clear of the stream banks during the snowmelt.

In Duluth, however, they can see the impact in great detail from their home computers. The [www.lakesuperior](http://www.lakesuperiorstreams.org)

streams.org Web site has a popular feature called Data Viewer that shows a variety of parameters about area streams in near-real-time. It shows people how their actions affect water quality in streams.

Rich Axler, aquatic ecologist with the Natural Resources Research Institute at the University of Minnesota-Duluth, says the concept grew out of the National Science Foundation-funded www.WaterontheWeb.org project, where water-quality sensors traveled up and down, suspended from buoys in lakes.



Photo courtesy City of Duluth

Effective stormwater management helps sustain healthy fish populations in Duluth-area streams.

Data was relayed via cell phone each morning, so that viewers could see actual water-quality changes throughout the year and in response to storms. “That was 10 years ago, so our technology has improved. But the idea is the same, although we're now focusing on helping people understand

how streams work, and how our activities on land combine with the weather to control stormwater, and how it affects downstream water quality and habitat,” says Axler.

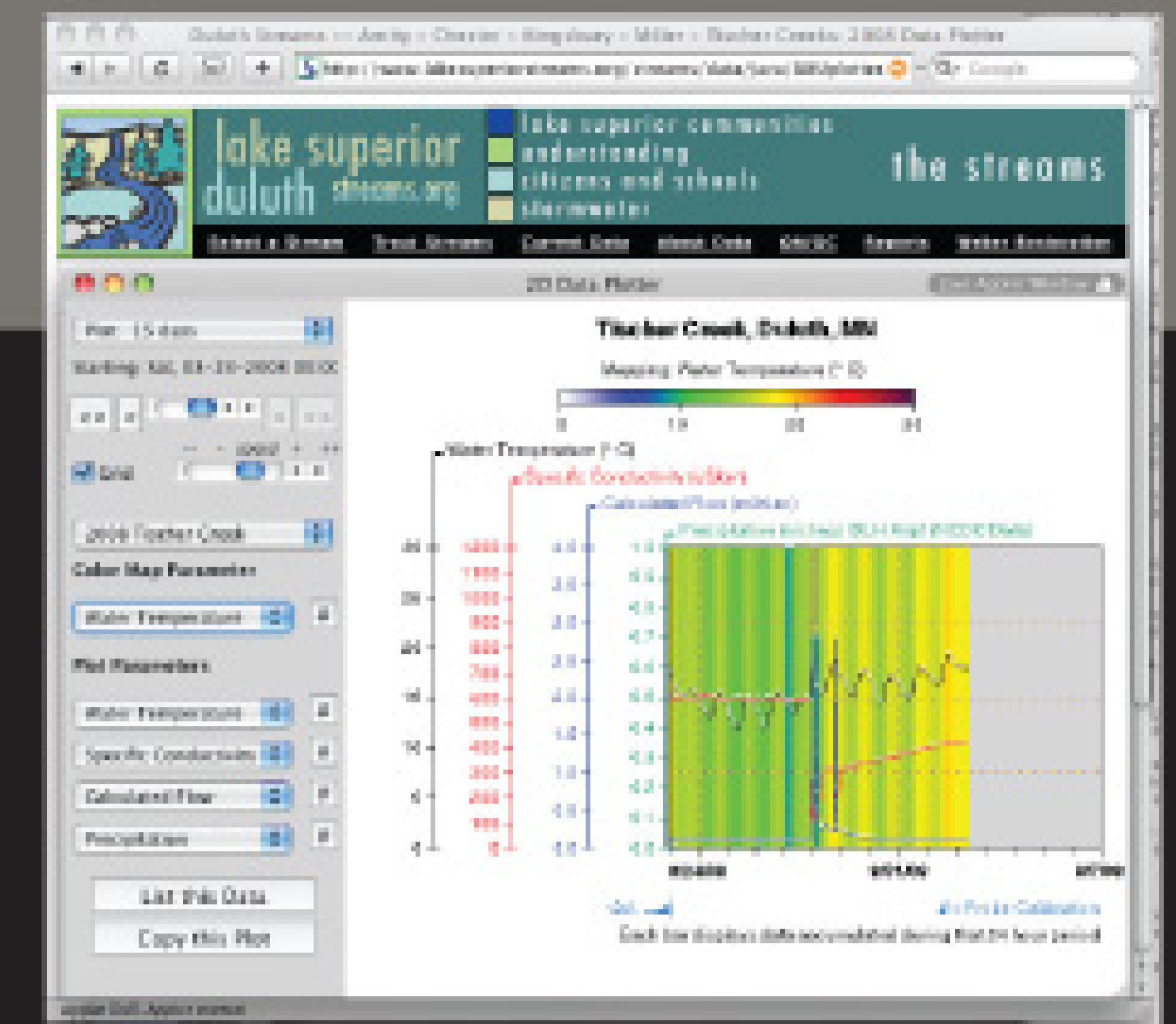
“We have sensors located in half a dozen streams that measure flow, temperature, turbidity and electrical conductivity every 15 minutes, so when it rains or we have a big spring runoff, you can really see how the data change,” Axler says. “You can compare streams with different degrees of impervious surface and development. We try to provide simple explanations for some of these representative episodes on the Web site, while also providing ways that individuals and businesses can help reduce stormwater impacts.”

The Web site and its tools are the result of a partnership among the wastewater treatment plant and the Minnesota Pollution Control Agency.

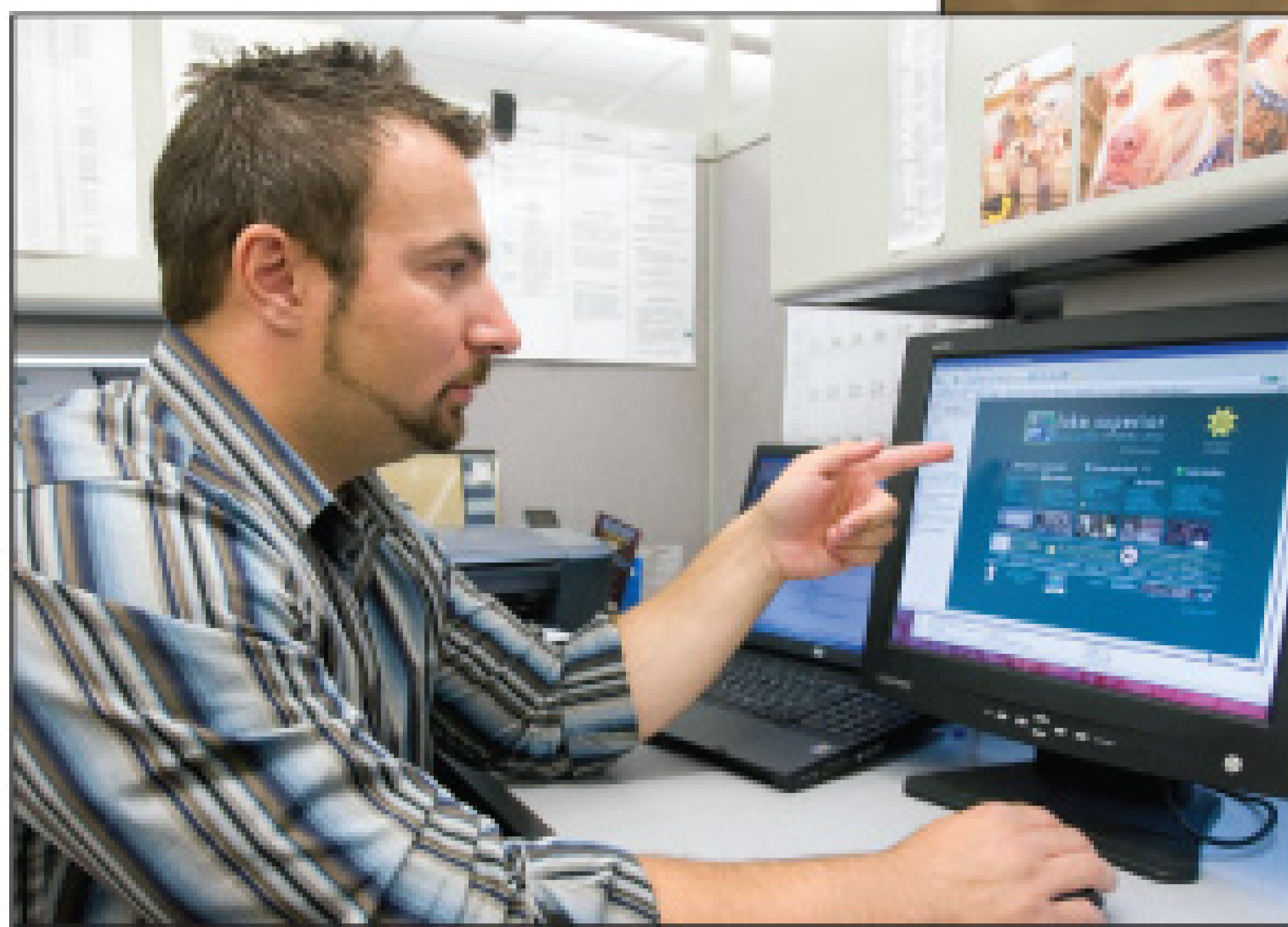
Chris Kleist, stormwater project coordinator for the city, is enthusiastic about the feature. “The public truly can see stormwater impact, visualize it, and get a feel for how things happen,” he says. “If we have excessive dirty runoff from a street reconstruction project, the data viewer can track turbidity back to the project. It's visible to residents via the Web site.”

Axler says, “We tell people that the biggest pollution problem in streams is generally the excess mud and water coming from poor land use practices and management. The mud carries other pollutants as well. Curbs and gutters are just part of the shoreline of Lake Superior.”

The Web site's Data Viewer helps make the point.



A Data Viewer feature lets residents monitor conditions in streams — in this case water temperature changes in a creek over a 12-day period.



Downtown storm sewers feed into a sedimentation basin that discharges to the St. Louis River, which flows into Lake Superior. At left, Chris Kleist explains the function of the stormwater utility's award-winning Web site.

"There are never enough dollars to do everything that needs to be done, but it ultimately depends on how much the public wants to spend, and what level of service they are willing to accept. We're playing catch up, but we're gaining on it."

Chris Kleist

An area-wide Regional Stormwater Protection Team (RSPT) meets regularly to share technical expertise and develop common educational materials. The team includes 26 Minnesota and Wisconsin shoreline communities; local, state and tribal resource and regulatory agencies; and university educators and researchers. All share an interest in the welfare of Lake Superior and its tributaries. The team has developed more than 60 BMPs for stormwater control.

The utility is also collaborating with the University of Minnesota-Duluth to determine how much runoff can be eliminated by retrofitting homes with BMPs. The study is funded by an EPA 319 (Nonpoint Source) grant that will directly compare runoff from a "treatment" neighborhood to a nearby "control" neighborhood over several years.

See it now

The area's stormwater management program is best illustrated on its Web site at www.lakesuperiorstreams.org. It was created by a group of educators and researchers at the University of Minnesota-Duluth (UMD) Natural Resources Research Institute (NRRI) and Minnesota Sea Grant College, working in col-

laboration with Duluth's stormwater utility, the Western Lake Superior Sanitary District, and the Minnesota Pollution Control Agency.

EPA funding initiated the project, and National Oceanographic and Atmospheric Administration (NOAA) Coastal Program grants have helped keep it alive and dynamic since 2005, as it has grown to encompass the north and south shores of Lake Superior.

"A bunch of us at UMD were involved — aquatic and watershed ecologists, and science educators who were using real-time data collected remotely from lakes and streams to help people understand how these water bodies work and how to keep them healthy," says Rich Axler of NRRI, one of the site's creators.

The site is rich in content, easy to use and designed with the stormwater utility's diverse audiences in mind. For example, in fulfillment of the Phase II public education and public

outreach requirements, homeowners, students, opinion leaders and others can find a multitude of useful information in the "Understanding" section:

- Tips and tutorials on rain barrels, lawn care and other "green" solutions.
- Case studies on how to slow water down and keep it clean.
- Things anyone can do to decrease runoff and erosion.

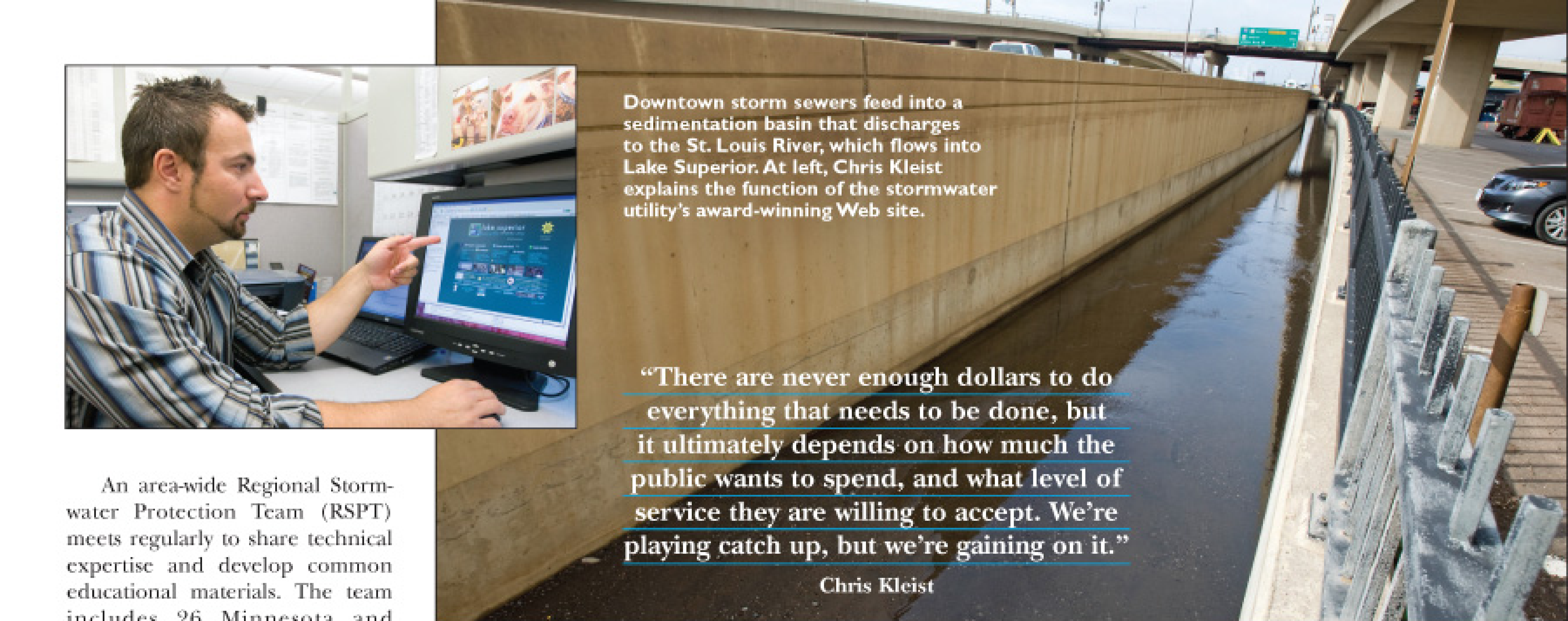
Builders and contractors, too, find information that helps them comply with the Phase II construction site and post-construction provisions, including contractor training information, how to create stormwater management plans, example stormwater ordinances, a tool kit of BMPs, and requirements for erosion control.

"We've had good acceptance among contractors," Carlson

notes. As an example, the utility staff designed a template for contractors to stamp into concrete catch basin forms that tells people not to dump waste into them. "It was a one-time thing, but now all contractors use the templates when they do street reconstruction," says Lipinski.

To bring illicit discharges to the public's attention, the site includes an interactive demonstration of illicit discharges and examples of good and bad practices. It also introduces the utility's "team of illicit discharge detectives."

Axler reports that site use is growing and averaged more than 400,000 requests per month in 2008. Site visitors come from more than 100 countries, and many schools and students use it. "We see large traffic increases in the spring and fall when school and



A Vactor 2100 vacuum truck cleans one of Duluth's catch basins.



The telescoping legs of the HS 41 Spider by the Schaeff Co. make it ideal for working in uneven terrain.

university classes are in session," Axler says.

Cleaning and steaming

Duluth's rigorous program of cleaning and deicing stormwater infrastructure may have been its most effective BMP. The goal of the department is to clean the entire stormwater collection system every eight to 10 years, but the city's unique terrain and temperatures result in much more frequent maintenance "as needed."

A fleet of four Vactor 2100 series trucks and a Vactor hydro-excavator, all from Vactor Manufacturing, help clean storm drains and the more than 9,000 catch basins in the system. Upon receiving a work order, the stormwater crew pulls the grate and vacuums and flushes the line. They work back from the line to the manhole so they don't have to block the intersection.

Duluth's team inspects all 17 sedimentation basins every year and cleans them when required. "It's a fairly intensive program, because we have several different types of basins," says Kleist. For vortex chamber basins, maintenance workers pull the manhole lid and use a Vactor unit to clean out the center section of the basin.

"One of these is below the level of the lake," explains Carlson. "We close it off with hurricane doors and dewater it with a 6-inch pump. Then we use a vacuum truck to take out floatables and sediment."

For square cistern basins with baffles, crews use a construction excavator to remove debris and sediment. Duluth also maintains open-channel basins, several hundred yards long, paralleling the expressways. Front-end loaders drive into the basins to scoop out sand and sediment. "It can take

several days to do this," says Kleist, "but these basins work really well." Material removed from the basins is dried and tested to determine the proper disposal site.

Ice is another issue. To prevent it from blocking the system and causing flooding, the city has an impressive deicing program. The crew uses three Hydro Tek SC32007KQ steamers and one truck-mounted Hydro Tek unit from Hydro Tek Systems Inc., each capable of heating water to more than 200 degrees F and producing 3,200 psi. The units can clear a 15-inch culvert, frozen solid top to bottom and end to end, in minutes.

For ice-ups in difficult terrain, the crew uses an HS 41 Spider "walking excavator," manufactured in Germany by the Schaeff Co. "It walks on telescoping legs, and it works extremely well on very steep slopes and uneven terrain," Kleist observes. "It has a gentle footprint and leaves very little disturbance on sensitive stream banks and hillsides." The machine can be operated safely on a one-to-one slope and can walk through water up to 5 feet deep.

Public acceptance

Duluth and the rest of the RSPT partners believe it makes more sense to protect existing water quality than to pay to clean it up later, and that public education is critical, especially as funds become more and more scarce.

The city bills a stormwater utility fee of \$6.08 per equivalent residential unit per month and bills commercial developments based on their amount of impervious surface, with credits for approved BMPs. "There are never enough dollars to do everything that needs to be done," says Kleist, "but it ultimately depends on how much the public wants to spend, and what level of service they are willing to accept.

"We're playing catch up, but we're gaining on it." ♦

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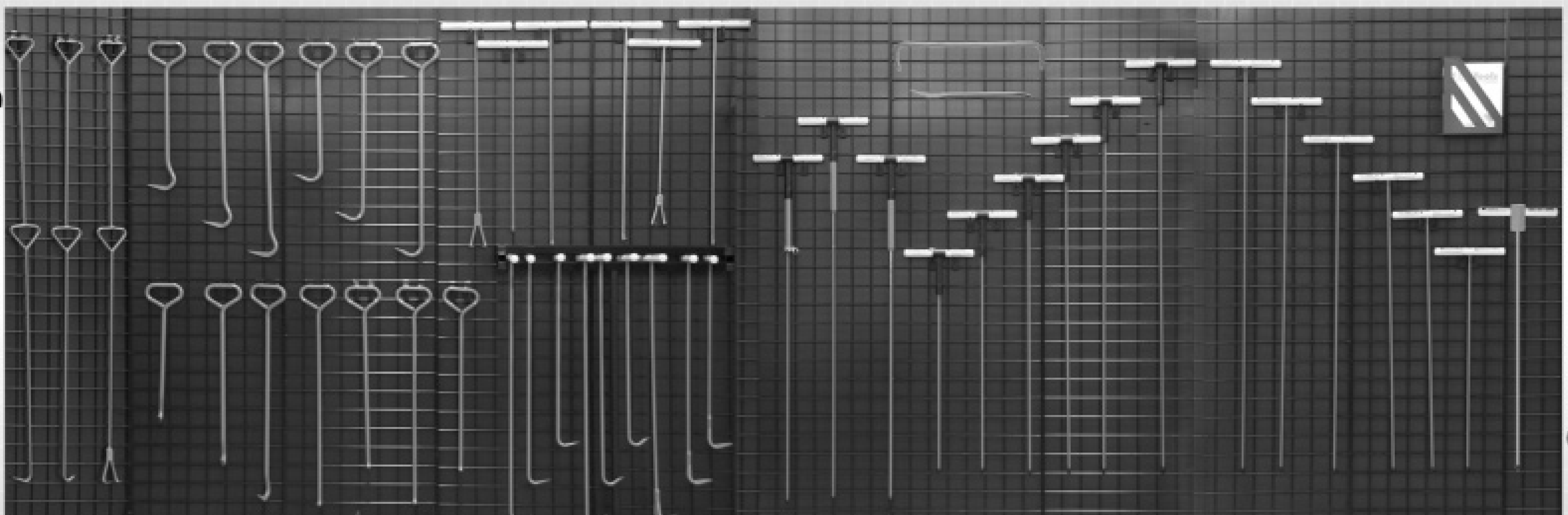
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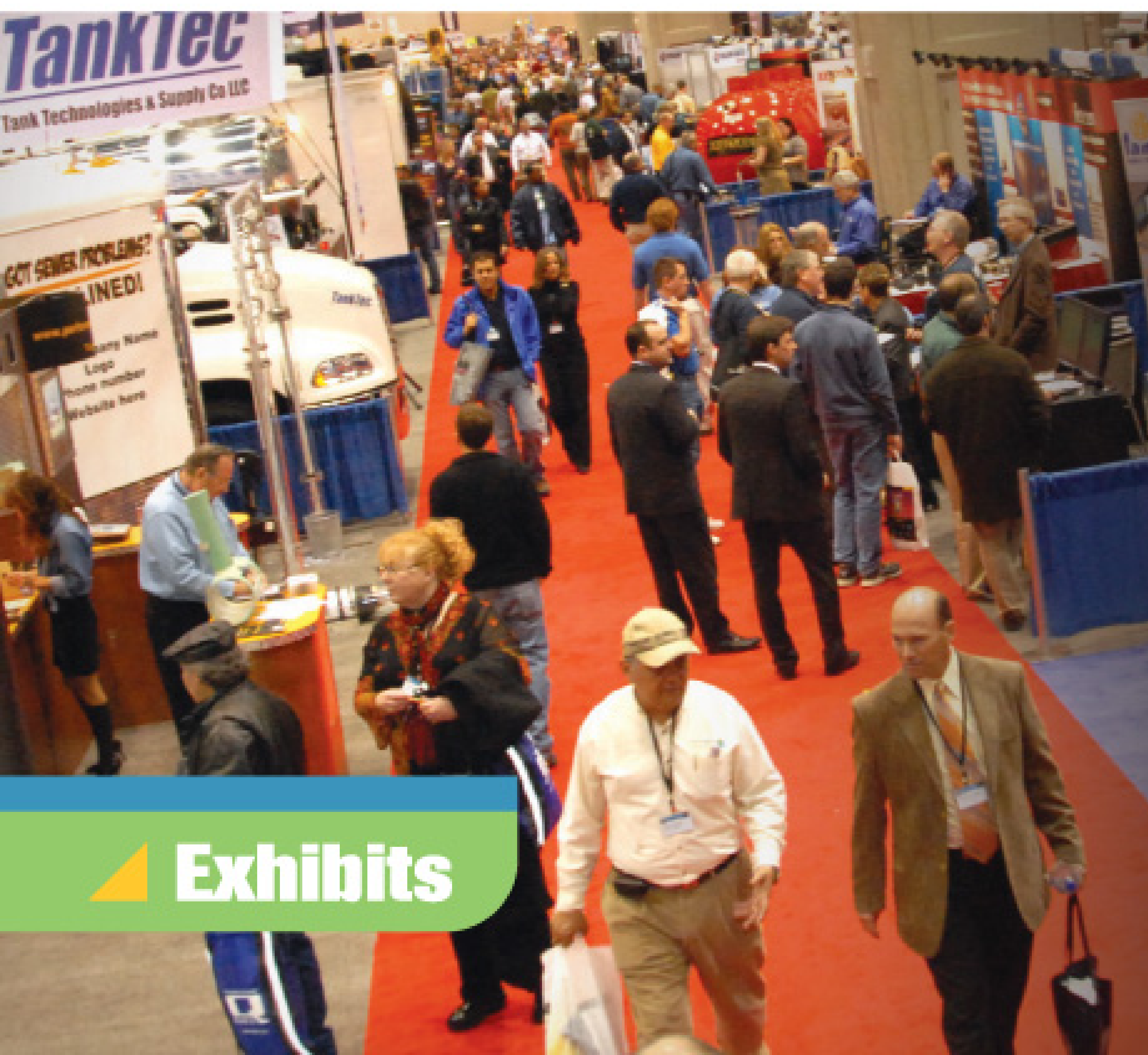
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The manhole after application of the final corrosion barrier.

PLUGGING THE LEAKS

A multilayered poly resin liner system enables a Michigan utility to conquer inflow and infiltration in manholes

By *Scottie Dayton*

“The actual lining took two hours with minimal disruption. We returned the lines to service within minutes of the application.”

Frank Renaldi

High levels of hydrogen sulfide had corroded 1/2 to 1 inch of the concrete-brick and precast concrete manholes in Kalamazoo, Mich., causing infiltration as high as 20 gpm. The worst of four targeted offenders had leaks that squirted water like leaking garden hoses.

Frank Renaldi, P.E., senior civil engineer at the Department of Public Services, researched manhole rehabilitation extensively.

“Some products are cementitious grout, which reacts with hydrogen sulfide and doesn’t provide a permanent solution,” he says. “Epoxy paint cracks over time, and the manholes continue to deteriorate behind it.”

Renaldi was familiar with Advanced Rehabilitation Technology (ART) in Bryan, Ohio, from a presentation on sealing of wet wells using a multicomponent stress skin panel liner system (SpectraShield).

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SpectraShield liner system

APPLICATION:
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BENEFITS:
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USER:
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INSTALLER:
Advanced Rehabilitation Technology, Bryan, Ohio

MANUFACTURER:
CCI Spectrum, Jacksonville, Fla.

CONTACT:
904/268-4951
www.spectrashield.com

stairs in three manholes were so corroded that they fell off when hit with a hammer. The fourth manhole had coated steel stairs in good condition.

Because the lining extends just below the lid, the men cleaned the flaking, corroded steel castings with a power chisel. Following OSHA confined-space entry specifications, Garcia entered the 12-foot-deep manholes and jetted the walls with water at 6 gpm/4,000 psi, creating a smooth, clean surface to which the layers of polymer resins could bond.

"Waterblasting removed another half inch of the walls," says Renaldi. "One interesting note is that the



Three manholes had steel stairs so badly corroded that they fell off when hit with a hammer. Note water infiltration.



The corrosion barrier was applied by a technician fully equipped for confined-space entry.

mortar held up better against the hydrogen sulfide than the concrete brick."

Screens at the bottom of the manholes trapped debris but allowed water to drain away. The city removed the material with its 2100 Series vacuum loading truck from Vactor Manufacturing. To stop severe leaks, Garcia and Kimple drilled into the bricks and injected fast-acting SpectraGrout. They plugged minor leaks with hydraulic cement.

Flexible skin

To apply the multilayered stress skin system from CCI Spectrum in Jacksonville, Fla., Kimple first sprayed on a coat of silicone-modified polyurea. This moisture barrier provides adhesion to the substrate and dries tack-free in seconds. He then sprayed a layer of tight closed-cell polyurethane foam to fill all voids and restore the surface to its original placement.

Kimple followed it with a second coat of silicone-modified polyurea, which provides the final corrosion barrier. The layers combine strength with some flexibility, enabling them to resist failures due to freeze and thaw cycles and ground movement. The system also eliminates the need for separate chimney sealing.

"The actual lining took about two hours with minimal disruption," says Renaldi. "We returned the lines to service within minutes of the application." City crews have since identified more manholes for rehabilitation using the SpectraShield lining system. ♦

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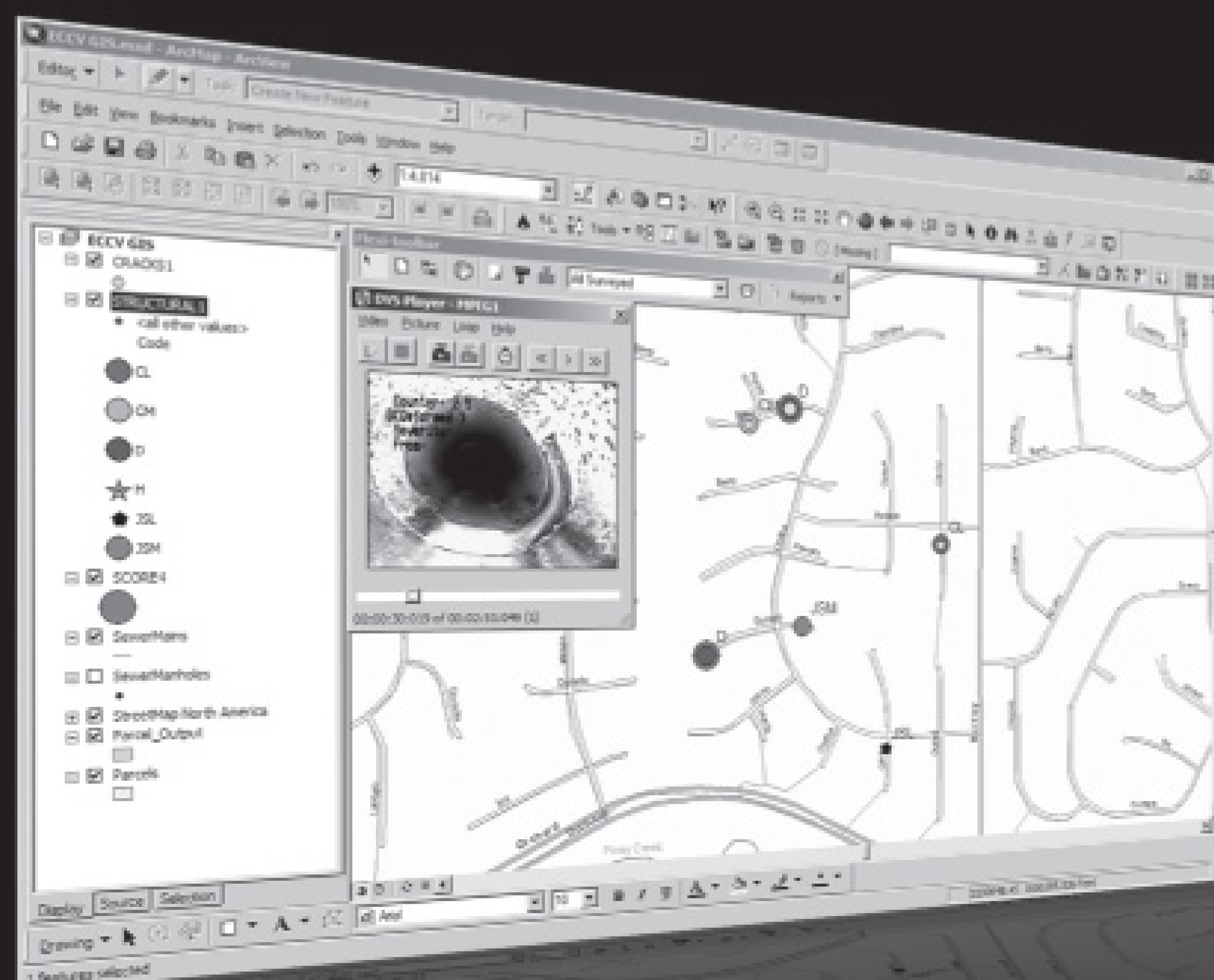
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SOUND OFF

A streamlined, sound-attenuated shell and a dual muffler enable the Warrior jetter from Spartan Tool to reduce operating noise

By Erik Gunn

Waterjetters are indispensable tools for cleaning sewer lines. Manufacturers constantly make incremental improvement in this mature technology, and one of them is making them quieter, both to respect the neighborhoods where jetters work and to reduce workers' exposure to noise.

Spartan Tool LLC has introduced the Warrior jetter, which has sound levels that fall below OSHA sound limits and so can be operated by employees without hearing protection. The machine uses the same engine and pump technologies as previous models but is

sound-attenuated.

Tom Pranka, company president, and Brian Willis, territory sales manager, demonstrated the Warrior jetter for Darin Tracey of Frinks Sewer & Drain on June 9, 2008, at a strip mall in Rockford, Ill.

Walk-around

The Warrior jetter has a white, streamlined exterior. The trailer-mounted machine rests on two wheels and is 13 feet, 4 inches long, just over 6 feet high, and 6 feet wide. The machine's molded fiberglass shell is lined with 2-inch-thick sound-insulating material. The shell splits along a lateral line



The instrument panel is located in the rear cabinet of the jetter.



A pigtail-shaped guide is used to rewind the hose.



The Warrior jetter from Spartan Tool LLC comes in a clean streamlined package. (Photography by Erik Gunn)

— the front half tilts forward to allow access to the pump and engine compartment.

The muffler system further suppresses noise from the 83-hp diesel engine, which powers a triplex ceramic plunger pump that delivers 18 gpm at up to 4,000 psi. In addition to the conventional muffler, a secondary resonator further reduces noise. "It's really like having a double muffler on your car," Pranka says.

At the rear of the jetter under a horizontal cabinet door are the controls and hose reels. The unit includes a 500-foot, 1/2-inch pressure cleaning hose, a 100-foot, 5/8-inch supply hose for filling the 300-gallon water tank, and a 75-foot, 1/4-inch hose on a separate reel that can feed a pressure washer gun for cleaning or can be used for auxiliary jetting, such as inside a building.

The jetting hose reel can swivel out from the jetter to increase flexibility in feeding and rewinding the hose. Gauges measure water and antifreeze levels as well as engine fuel, oil, temperature and battery charge level. A four-position rotary switch sets the jetting

TECHNOLOGY TEST DRIVE

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Warrior waterjetter

MANUFACTURER:

Spartan Tool LLC
800/435-3866
www.spartantool.com

LOCATION OF DEMO:

Rockford, Ill.

DEMONSTRATED BY:

Brian Willis and Tom Pranka, Spartan Tool LLC; Darin Tracey, Frink's Sewer & Drain, Rockford, Ill.

LIST PRICE:

\$33,995 as demonstrated

pressure at 1,000 to 4,000 psi in 1,000 psi increments.

The jetter uses a clutch controlled by a toggle switch that can engage and disengage the pump instead of the pump running constantly, recirculating water when the jetter itself is not in use. The clutch configuration helps reduce wear on the pump.

"When you start up a jetter, you wear a pump over time if the pump is directly coupled to the engine," Pranka says. "That pump starts turning immediately when the engine goes on. It will be cold, and the engine's not terribly efficient. And the pump starts to wear.



Brian Willis, Spartan Tool territory sales manager, feeds the jetter hose into a manhole.

Throughout operation, the sound of the machine was a dull roar that was low enough to allow conversation.

When the hood was raised, the noise rose to a level where conversation could be heard only by shouting.

Instead, with this unit, you leave the clutch off, warm the engine up, and when you're ready to jet you just put the clutch on."

The sealed marine gauges are designed to keep out water. Toggle switches allow the operator to engage and disengage the pump, turn on and off an auxiliary light, and activate or deactivate a pulsing setting.

Operation

Pranka and Willis met Tracey behind the strip mall under an overcast sky with occasional rain. The block of buildings included

operating and vacant establishments and offices. With Tracey's assistance Willis filled the 300-gallon tank from a hose attached to the strip mall property, a 20-minute task. Pranka noted that the jetter can be filled from a fire hydrant in less than five minutes.

Tracey then opened a manhole, and Willis swiveled the jetter's hose reel out, turning it 90 degrees from its resting place to enable easy feeding of the hose into the line. With the pump turned off, Willis turned on the jetter engine, then fed the jetter hose into the sewer line, flipped the toggle to



Spartan Tool president Tom Pranka maneuvers the jetter hose reel out from its resting place. Besides the jetting hose, the unit carries an auxiliary hose (lower left) that feeds a wash-down nozzle or can be used to jet in more limited spaces; and a hose for filling the tank (upper left).

engage the pump, and fed the hose upstream, running the jetter at the 3,000-psi setting. The hose traveled rapidly to 350 feet. Shortly before reaching the end of the run, the unit encountered a blockage that Tracey attributed to grease from a fast-food establishment.

Below in the manhole, the flow of wastewater had turned noticeably sluggish, emerging from the line as a dark, thick liquid. Willis flipped the toggle switch to engage the pulse control, a mode designed to break up blockages.

The toggle switch turns off the electronically controlled middle plunger of the triplex pump. This reduces the pressure but causes the hose and jetter to vibrate. "The vibration eliminates the friction between the pump and the hose by bouncing the hose as it moves down the pipe," Pranka

says. "It bounces forward against the blockage until it's cleared." After a few minutes, the character of the wastewater changed noticeably, running clear.



Upper right: The cleaning nozzle attached to the second jetting/wash-down hose. Lower right, the hose used for the wash-down nozzle or to jet in more limited spaces.

Brian Willis unhooks the fill hose from the Warrior jetter after filling the 300-gallon tank with water.

While the jetter was in operation, Pranka opened the cover to demonstrate the noticeable difference between the covered and uncovered jetter. When uncovered, he says, noise levels are about 92 to 94 decibels, which exceed the OSHA standard of 86 decibels, requiring hearing protection for the operator. Closed, noise is below 80. Throughout operation, the sound of the machine was a dull roar that was low enough to allow conversation. When Pranka raised the hood, the noise rose to a level where conversation could be heard only by shouting.

After reaching the end of the



and completed cleaning the line without incident.

Observer comments

The difference in sound between the jetter when muffled versus when unmuffled was pronounced. Tracey noted that compared to the other two Spartan jettiers his business operates, the Warrior is "a lot quieter. It would be a lot easier on the guys."

The look of the machine is simple and attractive. The instrumentation, relying on analog devices instead of electronic digital readouts, is easy to understand, and the labeling is easy to read. A streamlined body gives the unit a handsome look on the job and offers an inviting surface that the owning contractor or municipality can decorate with its logo.

Manufacturer comments


A wireless remote is available for the jetter, with a control circuit board that can be wired in plug-and-play fashion to the existing control electronics. Pranka says Spartan has seen little demand for the remote control. In addition to muffling the jetter's sound, the streamlined cover makes it easy to lock the machine, safeguarding it from vandalism or tampering when unattended, Pranka notes.

The company chose marine analog instruments instead of digital readouts out of the desire for simplicity, durability and ease of repair. "This is out in the weather all the time," Pranka says. "We wanted something we knew could take the constant water inundation. If you get too fancy with your controls, now your local guy five years from now can't fix it." ■

350-foot sewer line run, Willis reversed course, engaging the reel rewind. In the process, he threaded the jetter hose through a pigtail-shaped guide built on to the reel to help lay the hose back evenly as it rewound. Because the guide is built in rather than a detachable component, Pranka says, there is no risk of it getting lost or left behind.

Willis flipped the pressure setting to the maximum of 4,000 psi for the return trip to complete the jetting procedure. In extending the hose into the line, Willis ran at a slower speed than normal, Tracey noted. As a consequence, the unit ran out of water before the jetter had completed its return trip.

After refilling the tank, the three proceeded to a second manhole, about 250 feet downstream from the first. After warming up the engine again, Willis engaged the pump, first at 2,000 psi, then clicked the pressure control to 3,000 psi. He sent the hose into the line up to the previous manhole, this time at a higher speed. The jetter encountered no blockages




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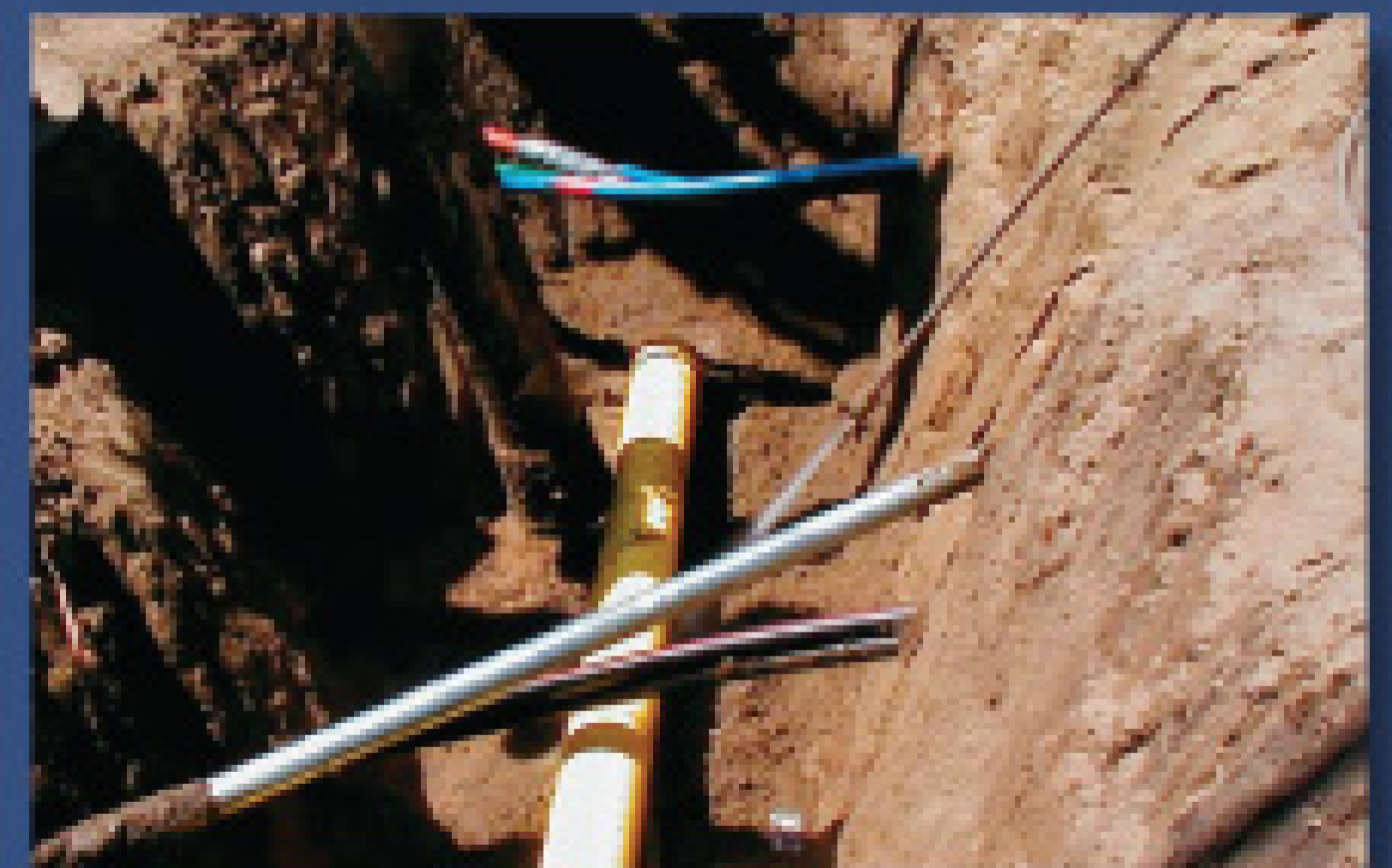
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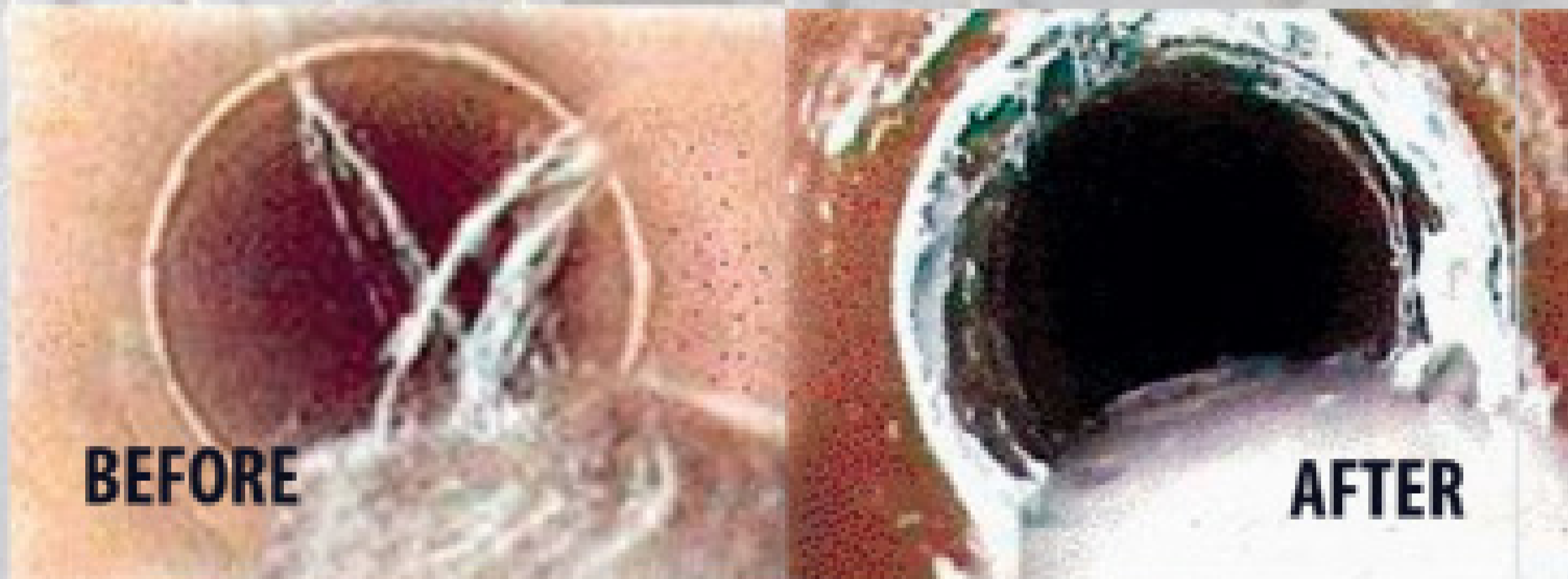


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WHAT DO EMPLOYEES WANT?

It's an important question for municipal leaders to know as the public sector prepares for a wave of retirements in coming years

By Ted J. Rulseh

It's often said that the main thing employees want is *not* necessarily more money. To the extent that's true, it's good news for leaders of municipal departments, who don't have the option of giving out big raises and bonuses to top performers.

But if money isn't employees' chief desire, then what is? And what can cities, villages and towns do to make themselves attractive to the people they need to replace an aging workforce, who will soon retire in large numbers?

In a sense, there are no clear-cut answers — different surveys reach different conclusions about what keeps employees engaged and what makes them stay put. But in another sense, most surveys point in similar directions when it comes to factors beyond pay and benefits that keep people satisfied.

The bottom line

The key point to remember is that employee satisfaction is directly linked to a team's or an organization's performance. A 2006 survey, *Working in America: What Employees Want*, conducted by Harris Interactive and sponsored by Kronos Inc., found that 82 percent of workers who are satisfied with their employers feel motivated to perform beyond their daily duties.

On the flip side, more than half of employees who were unhappy

with their employers said their dissatisfaction discouraged them from giving extra effort.

Another study by Deloitte Consulting found that companies on the *Fortune* magazine list of Best Companies to Work For consistently outperformed the S&P 500.

And yet, the *Working in America* survey found only 36 percent of employees said they worked for organizations that invest in key initiatives that create job satisfaction.

A 2006 survey, *Working in America: What Employees Want*, conducted by Harris Interactive and sponsored by Kronos Inc., found that 82 percent of workers who are satisfied with their employers feel motivated to perform beyond their daily duties.

When people in this survey who were satisfied with their jobs were asked why, the top three responses were:

- I like my boss.
- I am treated with respect.
- My employer pays me well.

Other perspectives

Of course, many surveys look at the factors driving job satisfaction. A study published by Human Resource Planning surveyed employees from a wide range of organizations and jobs. To those people, the most important drivers of job satisfaction were, in order:

- Opportunities for promotion

- and advancement
- Trust and respect
- Open and honest communication
- Fair treatment
- Challenging and interesting work
- Competitive salary
- Health care benefits
- Competent management
- Support from management
- Meaningful work

In another study, the *Job Satis-*

faction Survey conducted by the Society for Human Resource Management (SHRM) and CNNfn (the financial network of CNN), employees ranked these attributes as the most important, again, in order:

- Benefits
- Compensation/pay
- Feeling safe at work
- Job security
- Flexibility to balance work and home life
- Communication with upper management
- Relationship with immediate supervisor
- Opportunity to use skills and abilities

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 Ted Rulseh at 800/257-7222, or e-mail editor@mswmag.com.

- The work itself
- The overall corporate culture

And thirdly, in their bestselling book, *Love 'Em or Lose 'Em*, dealing with employee retention, Beverly Kaye and Sharon Jordan-Evans listed the top reasons employees stay where they are:

- Career growth, learning and development
- Exciting work and challenge
- Meaningful work, making a difference and a contribution
- Great people
- Being part of a team
- Good boss
- Recognition for work well done
- Fun on the job
- Autonomy, sense of control over my work
- Flexibility, for example, in work hours and dress code

Pay and benefits ranked eleventh on their list, which also included inspiring leadership, great work environment, job security and family-friendly conditions.

Factors in common

It's easy to see common elements in these lists. It's also interesting to see the range of positions in which pay and benefits fall in the rankings. Be that as it may, municipal agencies have limited ability to use dollars to attract and keep people. The alternative, then, is to create working conditions in which people feel comfortable, enjoy their jobs, and want to give their all.

In an article published in *Fast Company* magazine, Kaye and Jordan-Evans offered tips on overcoming what they called the "satisfaction gap." They find that when asked how thrilled they are with their jobs, people give a wide range of answers, but there's always an "except for" — something wrong or missing.

"One employee wants autonomy, and another craves recognition," the authors write. "Others want a promotion or work-life balance. What thrills us at work is as unique to each of us as our fingerprints. Spend time with your employees to clearly define what rings their chimes. Ask them to list their IJPs (Ideal Job Parameters)."

They suggest asking questions like: What would make you jump out of bed in the morning, eager to go to work? If you were to win the lottery and resign, what would

you miss the most about work? Which of your job tasks would you like to do more of?

The answers can help supervisors determine what matters most to each person, and then match those items to the opportunities in the workplace.

"It sounds so simple, and of course it's not," the authors stress. "Humans are complex, and successful managing is part art and part science. Sometimes your most talented people must move on to be satisfied and successful. Often, though, moving out is not the answer. Talking it out is. Most employees can get exactly what they want, right where they are. You can help them do that."

It's a thought worth noting in a time when talent is a precious commodity, destined to become more so. ♦

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FILLING A GAP

The NASSCO Inspector Training and Certification Program aims to set a standard for the pipe-rehabilitation industry

By Irvin Gemora

I don't need a crystal ball to see the future of NASSCO's new Inspector Training and Certification Program. The ITCP provides comprehensive education and tools for professionals to better understand and inspect trenchless pipeline-renewal technologies.

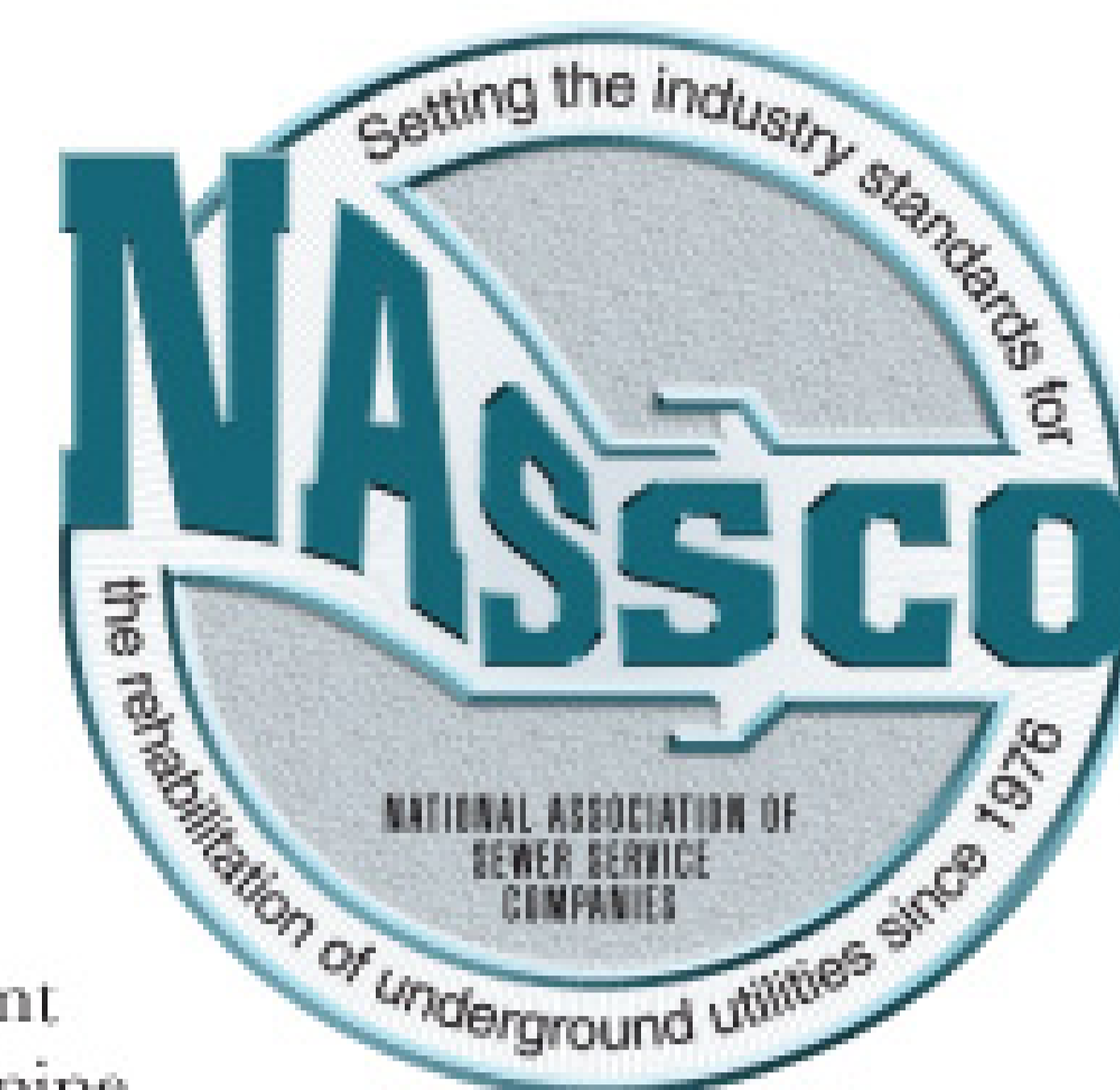
I expect this new program to transform the standard by which sewer rehabilitation projects are inspected. At least that is my hope and vision. I believe we've had a big gap in the industry with regard to inconsistencies in inspection methodologies.

This comprehensive program fills that gap. I believe the industry will quickly adopt it in much the same way professionals embraced the Pipeline Assessment and Certification Program (PACP). When we adhere to standards, our entire industry benefits with greater success stories and more funding to support our growing businesses.

Replicating success

PACP has been NASSCO's greatest success story in setting standards. Recognized as the industry standard in North America since 2001, PACP provides consistency in the way sewer pipes are evaluated, coded and managed.

PACP creates a comprehensive and reliable reservoir of data to describe the sewer pipe that can be used in prioritization, planning and renovation of the wastewater collection system. Today, EPA consent decrees mandate that rehabilitation programs utilize PACP. Most recently, PACP was chosen as the industry standard in Quebec province, setting it on course to become the industry standard for all of North America.



ITCP is now being offered for cured-in-place pipe (CIPP). Future training programs are in development for other technologies, such as pipe bursting and cleaning. The two-day ITCP for CIPP consists of classroom learning in five areas:

- Chapter 1 – Existing Pipe Defects and How They Affect CIPP Installations.
- Chapter 2 – Overview of CIPP Technology.
- Chapter 3 – Field Installation of CIPP.
- Chapter 4 – Specifications: The Inspector's Instructions and Guidelines.
- Chapter 5 – Pipeline Renewal Technologies and Applications.

Course for credit

Attendees who complete the ITCP will receive a comprehensive course manual, CEU or PDH credits and, upon passing the course examination, a certificate of completion. In addition, attendees will receive the NASSCO Trenchless Assessment Guide for Rehabilitation (TAG-R) computer program, an interactive software for evaluating rehabilitation methods.

While other training courses for inspectors exist in the industry, none offers the NASSCO certification, now recognized as the reputable and often required standard for rehabilitation of underground utilities.

ITCP will greatly benefit field construction professionals, including consulting engineers, municipal engineers and contractors. The cost for the two-day program and certification is \$995. Courses can be scheduled

at your convenience in your city with a minimum attendee requirement. For more information, please call Gerry Muenchmeyer at 252/626-9930.

To learn more about NASSCO training and educational events, visit www.nassco.org or call Andrea Carter at 410/486-3500. ♦

Irvin Gemora is executive director of NASSCO. He can be reached at director@nassco.org. The NASSCO headquarters is at 11521 Cronridge Dr., Suite J, Owings Mills, MD 21117.



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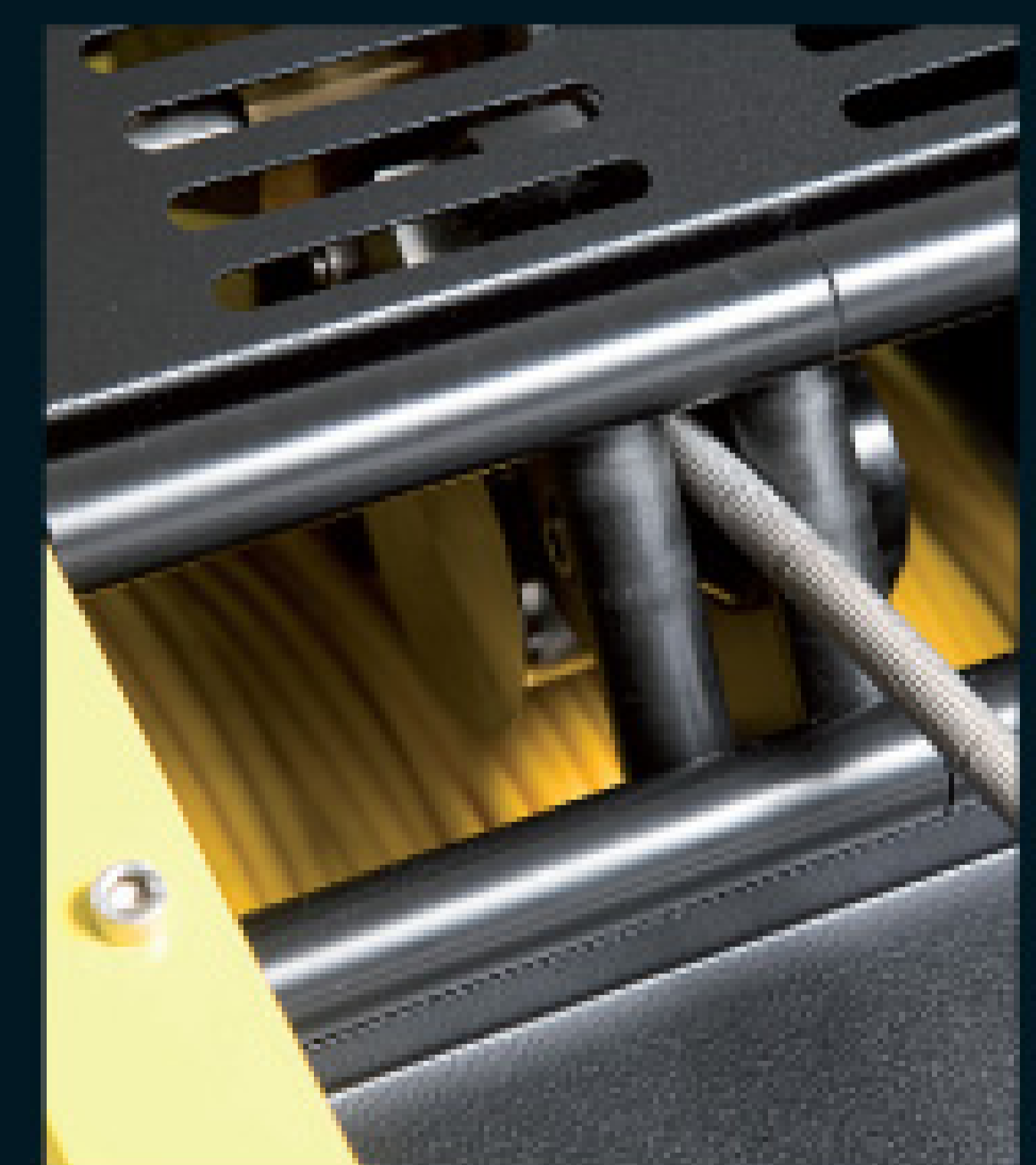
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OH NO! NOT DOWN THE DRAIN!

A children's play about storm drains wins a major public educator award from the New England Water Environment Association

By *Scottie Dayton*

The Needham (Mass.) Department of Public Works was seeking a way to complete the educational requirement of the National Pollutant Discharge Elimination System (NPDES) program.

Kevin Keith, assistant superintendent of the Water and Sewer Department, worked with the Needham Science Center to develop a 30-minute play that taught grades K-5 how stormwater drains function. The play correlated with the youngsters' science unit on condensation and precipitation.

Anne Schloder, then head of the Science Center, was the narrator. She gave a small PowerPoint presentation about how rain happens

and where it goes. Besides pictures of catch basins, she held up a plastic foam replica of a storm grate.

One woman from the Science Center wore a costume with white clouds on one side and gray rain clouds on the other. Another woman, dressed as a frog, explained how trash and pollution dumped down catch basins could harm her home.

Up with the curtain

The curtain then rose on a working drain system built by the Science Center. The prop was an elevated rain barrel that appeared to be connected by PVC pipe to a half-full aquarium. However, a funnel inside the barrel physically

connected to the pipe. The aquarium was labeled "Charles River."

The audience first watched Schloder pour "rain" into the barrel and the water level rise in the aquarium. Next, she dropped sticks, rocks and candy wrappers into the barrel, illustrating how a little trash allowed some water to pass, but lots of it blocked the flow. Water not destined for the aquarium was poured directly into the barrel.

The children were told to call Mr. Keith from Public Works to unclog the drain. "I was dressed in OSHA-compliant equipment, and climbed a small ladder to reach the top of the barrel," says Keith. "Using a long-handled 'poop scoop' to simulate our clam buckets, I started pulling out garbage. The more I removed, the more water flowed to the 'Charles River.'"

To demonstrate pollution, Schloder used red food coloring to simulate vehicles leaking hydraulic fluid, soapy water to simulate washing a car, and water-based children's paints to simulate oil and white paint. The audience watched the water in the aquarium become dirty.

Making deputies

"We closed the play by deputizing the kids as part of our Storm Drain TASK Force, and gave them little magnetic badges," says Keith.

TASK stands for:

- Teach about storm drains
- Alert people about pollution
- Spot storm drains near you
- Keep storm drains clean.

Each class then toured the town's drain-cleaning, camera, clamshell, flushing and rodding trucks in the school parking lot. "We had a video playing in the camera truck that showed the rodder removing tree roots inside a drain," says Keith. "The camera was on, enabling the kids to look at the lens and see themselves on the monitor. Another video showed a raccoon running away from the camera. It reaffirmed how all the culverts and openings lead to brooks, streams and rivers where animals live."

Some 2,000 pupils from the town's five elementary schools took part in the program. The presentation had such a positive effect that kids now wave at Public Works crews. If Keith is walking through town, his TASK deputies greet him by name.

"We've received phone calls and e-mails from parents expressing how much their children enjoyed the day," he says. "The icing on the cake was winning the Public Educator Award." ♦

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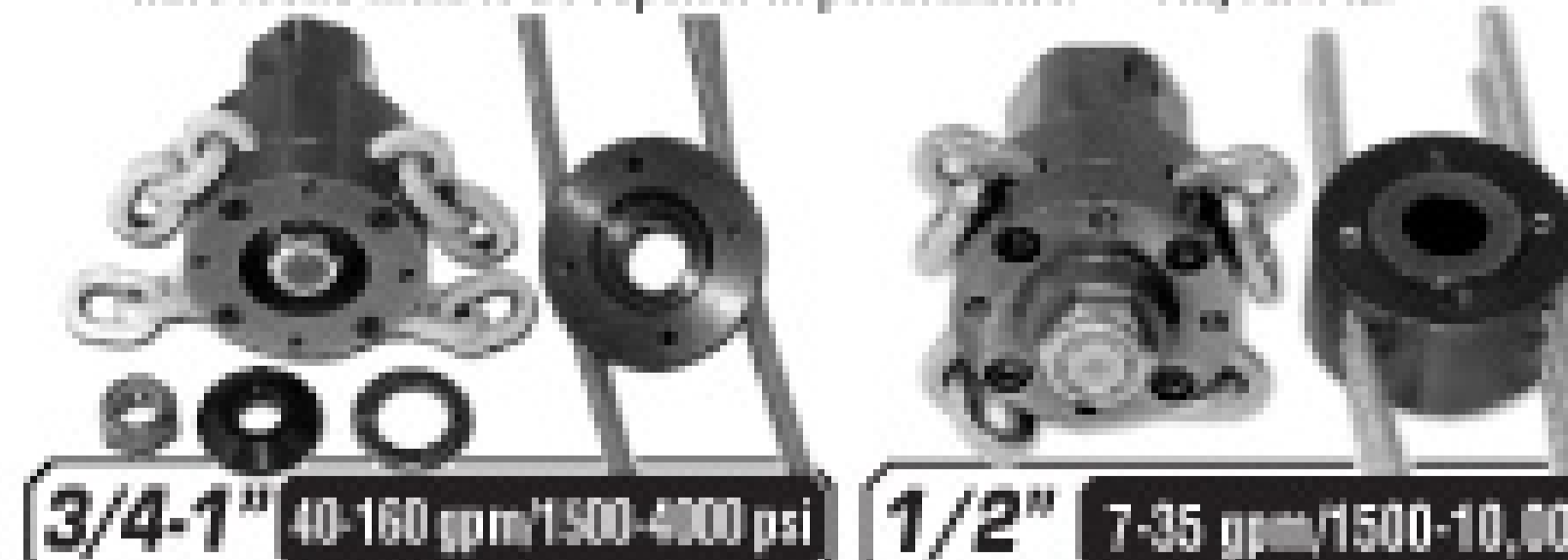
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Product Spotlight

Rotating Nozzle Simplifies Manhole Cleaning

By Ken Wysocky

The Alphajet manhole-cleaning nozzle from USB Sewer Equipment Corp. is designed to simplify cleaning with a combination of oscillating and driving nozzles that cuts through accumulated grease and sludge.

Made of stainless steel, the unit has a pair of oscillating nozzles that clean and a pair of driving nozzles that produce 360-degree rotation. Powered by water pressure supplied by a high-pressure jetter, the nozzle also can be configured to use four driving nozzles, says Patrick Savio, company vice president.

The unit delivers 30 to 80 gpm at 2,000 psi. Threaded, replaceable nozzle inserts are available in stainless steel or more durable ceramic. A primary benefit of the nozzle is less maintenance.

"The nozzle doesn't need lubrication for at least a year," Savio says. "With some nozzles, you need to replace lubricating fluids every 200 hours. But with this unit, you won't have to replace any internal wear parts for at least a year. That saves contractors and municipalities a lot of time and money."

Another advantage is the ability to configure the nozzles to any flow rate. "You can use them at a higher pressure without losing any efficiency," Savio says. "The hydromechanics of the nozzle prevent any water turbulence." By swapping Alphajet nozzles with the USB Primus nozzle, contractors can clean mainline sewers, too.

"By putting on just a few extra parts, you can do the whole job, from cleaning manholes to 6-inch mainline sewers," Savio says. "Or you can get really tricked out and put it on an expandable skid and clean 6- to 12-inch lines or 10- to 20-inch lines." 770/984-8880; www.usbsec.com.



Alphajet nozzle from USB Sewer Equipment Corp.



Water Cannon Introduces Construction-Grade Washers

Rated from 4 gpm to 8 gpm, Water Cannon's new line of industrial, continuous-duty pressure washers offers extended run times, 15-gallon onboard fuel tank and 20- to 27-hp engines. Available in poly-chain or 4-V belt-drive models, the washers also feature up to 7,000 psi, powder-coated steel frame, removable complete roll cage with hose reel platform, adjustable pressure unloader and thermal pump protection. Options include pneumatic wheel kit, EZ-start unloader, high-capacity 350-foot hose reel rated up to 5,000 psi, industrial wet blast attachment or pulse valve for commercial jetter applications. 800/454-9274; www.watercannon.com.



Raven Offers Wastewater Centrifuge

The bench-top Wastewater Centrifuge from Raven Environmental Products Inc. features a horizontal swing-out rotor that holds six centrifuge tubes. Made of heavy stainless steel and aluminum, the centrifuge delivers a digital, 15-minute spin test for mixed liquor suspended solids and return activated sludge suspended

solids. It also is designed to provide a multitude of additional sludge quality parameters, such as aeration tank concentration, returns sludge concentration and clarifier sludge concentration. 800/545-6953; www.ravenep.com.

Elastec/American Marine Develops Versatile Vacuum System

Elastec/American Marine has developed a versatile vacuum system that can be towed by an all-terrain vehicle. The system can reach sites inaccessible to vacuum trucks. A three-cylinder diesel engine powers the pump that can generate more than 300 cfm of airflow and 15 inches of vacuum, enabling it to suck up oils, mud sludge and other liquids. It is fitted with a safety relief valve, cyclonic separator and exhaust. Both the tank and vacuum pump are mounted on all-terrain tires with walking beam suspension. The components are within the towing limits of most ATV or utility vehicles. Optional tracks can be added for soft ground, snow or sand. The vacuum tank also can be removed from the chassis, enabling it to be used as a trailer for other equipment. 618/382-2525; www.elastec.com.





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Vacall Introduces AllTrench Hydroexcavator

The AllTrench vacuum hydroexcavator from Vacall is designed to remove spoil for holes and ditches,

as well as excavating around sensitive underground utilities. The unit features a 35 gpm at 2,000 psi water pump with variable flow output controlled by the operator; 12-cubic-yard debris tank; 1,500-gallon aluminum water tank; and 5,000-cfm/16-Hg blower. It has a 26-foot boom reach with extension and infinitely adjustable boom speed. A front-mounted boom is standard with an optional rear-mount. Standard equipment includes a rear decant and cyclone separator designed to remove particles from 10 to 100 microns. **800/382-8302; www.vacallindustries.com.**

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Logiball Celebrates 25th Anniversary

Logiball, which manufactures trenchless rehabilitation and collection system maintenance equipment, celebrates its 25th anniversary this year. Roger Bissonnette, P.E., founded Logiball in 1983 to provide equipment for his trenchless rehabilitation company, Renovation Aqua. Since then, Logiball has been providing test and seal packers, reinforced multisized plugs, carrier packers for sectional liners, lateral cleaning equipment and specialized tools for the rehabilitation and maintenance of collection systems.

Federal Signal Expands Dealership

Federal Signal's Environmental Solutions Group, Elgin, Ill., has added Trans Iowa Equipment Inc. of Ankeny, Iowa, and Nebraska Environmental Products of Lincoln, Neb., to its group of authorized sales and service dealers for Elgin Sweeper and Vactor Manufacturing. The dealers also offer full parts inventory, service, road service and rentals.

WJTA Offers Vacuum Safety Seminar

The WaterJet Technology Association will present "Safe Operation of Industrial Vacuum Equipment" on Oct. 16 at the Clarion Hotel in Atlantic City, N.J. The seminar will teach contractors how to get the most out of their industrial vacuum equipment by maximizing safety and

enhancing production. The seminar combines classroom training, a step-by-step overview of vacuum trucks and components using wet, dry and combo machines onsite, and "ask the experts" roundtable sessions. The seminar is designed for vacuum equipment owners, operators, contractors and in-plant managers who contract for industrial vacuum services.

Vactor/Guzzler's Phil Stein will review industrial vacuum loaders. Topics range from operation to potential problems and safety issues. Gary Toothe, training manager for Thompson Industrial Services LLC, will cover job setup, maximizing production on the jobsite, problems with mixing materials, and case studies. Ravel Ammerman, a lecturer at the Colorado School of Mines, will discuss electrical hazards, including high-voltage hazards, overhead power lines, trailing cables and proper grounding and bonding. For more information, call 314/241-1445, e-mail wjta@wjta.org, or visit www.wjta.org.

Simple Solutions Adds Distributors

Simple Solutions LLC, makers of the Wolverine brand of activated carbon filters, has added new distributors: Carleton Environmental Services, Richmond, Ontario; Missouri Water and Wastewater Products, Camdenton, Mo.; and YTG, Yemen Technical Group, Sana'a, Haddah, Yemen.

Pump Systems and Hydraulic Institute Offer Guidebook

Optimizing Pumping Systems: A Guide to Improved Efficiency, Reliability, and Profitability from Pump Systems Matter and the Hydraulic Institute is a 250-page reference based on the collaborative efforts of 22 industry experts. The book includes graphics, illustrations and reference tables covering a range of topics, including pump fundamentals, pump and system interaction, calculating cost of ownership, improving the performance of existing pump systems, optimizing new designs and pumping system economics. For more information, call 973/267-9700, or visit www.pumps.org.

CRC Press Releases Book on Wetland Treatment System

Written by Scott Wallace and Robert Kadlec, the 1,016-page *Treatment Wetlands: Second Edition*, available through CRC Press, features advances in the planning, design and performance of wetland treatment systems for water pollution control and wastewater treatment. The volume includes detailed information on wetland ecology, performance data, wastewater characterization, procedures for analyzing hydraulics, and more. For more information, call 651/255-5050, or visit www.nawe-pa.com. ♦

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DEWATERING

1989 BDP model E 1 meter belt press with rotary drum thickener, 2 - 500 gallon polymer mixing tanks, infrared heaters, fluorescent lighting, stainless steel flooring with fold out walkways, variable speed controls for sludge pump, rotary drum, polymer pump, and press section. All self contained in a 50' curtain side trailer with air ride, \$140,000 OBO. **Flottweg model 2-73 36" horizontal decanter centrifuge** with 8' gravity belt table, 2 - 500 gallon polymer tanks, infrared heaters, fluorescent lighting, stainless steel flooring with fold out walkways, variable speed controls for sludge pump, gravity table, polymer pump, and centrifuge. All self contained in a 50' curtain side trailer with air ride, \$395,000 OBO. **2005 BDP model 3DP 1 meter belt press** with 8' gravity belt table, 2 - 500 gallon polymer mixing tanks, infrared heaters, fluorescent lighting, stainless steel flooring with foldout walkways, variable speed controls for sludge pump, gravity table, polymer pump, and press section. All self contained in a 48' curtain side trailer with air ride, \$285,000 OBO. Contact Parker Ag Services at 719-775-9870 Ext 223 for Kipp or Ext 233 for Bob. (PM10)

DREDGES

1984 Mudcat Dredge Model SP810. Completely reconditioned and new hull in 2005. All pipe, hardware, and semi trailer also available. \$52,500 OBO. Contact Parker Ag Services at 719-775-9870 Ext. 223 for Kipp or Ext. 233 for Bob. (PM10)

JET VACS

2006 Vac-Con, only 22,000 miles, 12-yard debris, 3-stage fan, 1300 gallons, spec sheet is available. 801-301-3017. (MPT110C11)

JETTERS-TRAILER

New O'Brien Model 3518-SC jetting unit, trailer mounted unit, w/350 poly water tank, 4000 psi @ 18 gpm, 400' hose and attachments. In stock!!! (Stock #3024V) **www.VacuumSalesInc.com, (888) VAC-UNIT (822-8648).** (M10)

1998 SECA 700 gallon trailer jet, 40 gpm @ 2000 psi, Cummins diesel, 600' of 3/4" hose, 1,500 total hours on unit. Excellent condition. Call 1-800-381-9134 and ask for Dave. (CM10)

Pre-owned PipeHunter model 38T44 jetting unit, trailer mounted unit w/335 poly water tank, 4000 psi @ 25 gpm, 600' hose and attachments. In stock!!! (Stock #4313V) **www.VacuumSalesInc.com, (888) VAC-UNIT (822-8648).** (M10)

New PipeHunter Model 38T44 jetting unit, trailer mounted, w/335 Poly water tank, 4,000 psi @ 25 gpm, 600' of hose and attachments. **In stock!!!** (Stock #13317) **www.VacuumSalesInc.com, (888) VAC-UNIT (822-8648).** (M10)

JETTERS-TRUCK

2006 GMC TC6500 cab & chassis truck mounted jetting unit w/Jet Eye camera system, 3000 psi @ 50 gpm, 1000 gallons water, 600' hose, 500 cfm blower, debris tank and attachments. In stock!!! RENT ME!! (Stock #13234) **www.VacuumSalesInc.com, (888) VAC-UNIT (822-8648).** (M10)

LOCATORS

ST-20 Ridgid Locator with case, and ST-510 Ridgid SeekTech transmitter device. Like new. Call 1-800-381-9134 and ask for Dave. (CM10)

MISCELLANEOUS

1985 Brown Bear Model 1 compost turner, hydrostatic drive, 4 position steering, Cummins motor, good teeth, 1385 hours, excellent condition. \$49,900 OBO. Contact Parker Ag Services at 719-775-9870 Ext. 223 for Kipp or Ext. 233 for Bob. (PM10)

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PADLOCKS: Your lock number, your key number, your quantity. Low prices. Quick shipments. Fast quotes. Master American. Wilson Bohannon. Catalog with prices. 800-461-0620. Lock-Masters USA Inc. (MBM)

PIPE REHABILITATION

Cues TV/Cutter Trailer: 2007 Evolution package, with or without camera, cutter or compressor. Call for specs. Financing available. Kelly 608-279-2299. (MBM)

POSITIONS AVAILABLE

OUTSIDE SALES: So. California. Cable/pipe locators, pipe inspection cameras and leak detection equipment. \$50-\$75K+ **potential!** Must have working knowledge of above equipment, together with outside sales experience. jjones@wctproducts.com. (CM10)

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SLUDGE APPLICATORS

1979 Terra Gator 2505, 3000 gallon liquid vacuum tank with injectors. 903 Cummins motor, 10-speed transmission, incorporation bar. \$25,000 OBO. Contact Parker Ag Services at 719-775-9870 Ext. 223 for Kipp or Ext. 233 for Bob. (PM10)

(2) 8150 Knight slingers, 2005 and 2006 models, one owner, excellent condition. \$45,000 each OBO. Contact Parker Ag Services at 719-775-9870 Ext. 223 for Kipp or Ext. 233 for Bob. (PM10)

SWEEPERS

2008 American La France Condor with a Vac/All Model VS10DC 3-in-1 machine (sweeper, catch basin, leaf collector), 350 water comp, 10-yr. debris body; vacuum system: 16,500 cfm belt drive with silencer, driven by Cummins turbo charged 6 cyl. diesel. In stock RENT ME!!! (Stock #1791) **www.VacuumSalesInc.com, (888) VAC-UNIT (822-8648).** (M10)

TANKS

Used Ag-Chem 3500 carbon steel Presvac, top load hatch, complete pump system included. \$3,500 OBO. Fremont, NE 402-690-8058. (P9M10)

TRAILERS: VACUUM/TANKER

Absolute Public Auction surplus from Metropolitan Sewer of St. Louis on November 20th including vac-trucks, jetters, compost turner and other heavy equipment. www.jjkane.com. (CMPT111)

TV INSPECTION

UEMSI PREDATOR color mini-camera system. 200 ft. of push cable. Built-in VCR for recording. Great shape. \$2,500 OBO. 715-623-2212. (CM10)

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1999 Vector 2110J: 10-yd. debris body, 600' 1" rodder hose, 1500 gal. water tank, 8" vac hose, 8' hyd. telescoping boom, 80 gpm @ 2500 psi hydro-excavating package, 2-stage fan. More pics available at www.metroquip.com.

208-344-3318

M10



2000 Sterling, Vac-Con V311: 3126 Cat, Cummins 3.9 turbo upper, Allison auto., 20 front, 40 rears, 23,470 miles, 3,309 hours vac unit, 611 hours on jetter.

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OMP10



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2001 Mack RD: E-Tech EM7-300 w/Jacobs engine brake, 7-spd. trans., 5:55 rears w/camelback susp., front lift axle w/duals, 227" WB, 4,000 gal. steel tank w/rebuilt Masport pump, 154,726 miles, 5400 hrs.\$68,000

Dave @ 610-285-2563

or dhummel@christmanseptic.com

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1990 Ford L-8000 Aquatech Jet Truck: 65 gpm @ 2000 psi, 2000 gal. water tank, Gaso pump, 450' of 1" hose, arrow board, 19,100 miles, 3,610 hours, very clean, excellent running condition.\$29,500

John or Bob 732-469-6224

C10



2002 International 2554 w/Vector 2110 Combo Sewer Cleaner: 275 hp, Allison AT, 80 gpm, 2500 psi pump, 10-yd. debris, hyd. rotating reel, deep tires & brakes, extremely clean, fully serviced & inspected, 33,803 miles, 5,573 hrs.\$102,500

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• **ONLINE** ad form at: www.pumper.com, www.pumpertrader.com,
www.mswmag.com, www.cleaner.com

• **FAX** this completed form to: 715.546.3786 and **E-MAIL** photo to:
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Liquid Assets

Penn State Public Broadcasting (WPSU-TV) this month premiered a documentary, "Liquid Assets: The Story of Our Water Infrastructure," examining America's distressed drinking water, wastewater and stormwater systems.

The 90-minute documentary will be available nationwide on public broadcasting stations. The goal is to stimulate community discussion and bring this issue into the public consciousness. The documentary explores major water, sewage and stormwater infrastructure issues facing communities across the country.

An online companion toolkit will help facilitate discussions that extend beyond the broadcast. It includes an outreach guide and other resources. "Liquid Assets" will also be available on DVD through Penn State Media Sales for \$24.95 plus shipping and handling. It can be ordered by calling 800/770-2111 or at <http://mediasales.psu.edu>.

Major funding for "Liquid Assets" was provided by the Colcom Foundation, along with the Associated General Contractors of America, the American Society of Civil Engineers and its Environmental & Water Resources Institute, Insituform Technologies and the National Association of Clean Water Agencies.

Support for community outreach efforts was provided by the National Association of Water Companies, Water Environment Federation, Uni-Bell PVC Pipe Association, 3 Rivers Wet Weather, American Public Works Association, American Water Works Association, CH2M HILL, Ductile Iron Pipe Research Association, Gannett Fleming, National Association of Sewer Service Companies, National Utility Contractors Association, Northwest Pipe Company and Plastics Pipe Institute.

You can view a four-minute trailer of the program and get a copy of the supporting toolkit at <http://liquidassets.psu.edu>. For more information on "Liquid Assets," contact Jill Filby at jillfilby@psu.edu or 814/863-9912.

Educating Local Officials

The Missouri Rural Water Association (MRWA) is preparing a management circuit rider program to help elected officials on water district boards and city councils. The program will educate decision makers about the regulations affecting water and wastewater systems and the state's Sunshine (open meeting) law.

Many certified operators in the far southeast portion of the state aren't authorized to attend training events in central Missouri, and fuel prices place a burden on those who can travel. In response, the association sponsored its first annual Boot Heel Expo, a conference and training event in Sikeston. Call Tom Hyatt at 573/783-1745 or e-mail thyatt@moruralwater.org.

Book Authored About Arkansas Lake

Researchers with the Arkansas Water Resources Center and Beaver Water District staff in Lowell co-authored *Beaver Lake and Its Watershed*, a 42-page book focusing on facts about the lake and watershed, and answering common questions asked by the public. "This is the first time we assembled such a document," says Alan Fortenberry, district CEO. "Our goal is to achieve public awareness and education, getting everybody to understand that they're players in this situation." Beaver Lake is the source of drinking water for one in eight Arkansans. The book is available from the Beaver Water District, PO Box 400, Lowell, AR 72745. Or call 479/756-3651.

Stormwater Permits Struck Down

In a landmark decision, the Washington Pollution Control Hearings Board struck down two regional stormwater permits issued by the Department of Ecology. The board said they were inadequate to protect Puget Sound and meet the law's requirements.

The permits focused on traditional engineered stormwater management facilities like detention ponds. The ruling requires cities and counties around Puget Sound to reduce stormwater runoff by using low-impact development techniques. The board also modified the permit's adaptive management process for water-quality violations, making it more rigorous and accountable.

Puget Soundkeeper Alliance and People for Puget Sound appealed the permits last year. Also appealing the permits were the City of Tacoma, the Port of Seattle, the Pierce County Public Works and Utilities Department, Snohomish County, Clark County, Pacificorp and Puget Sound Energy.

EPA Releases Wastewater Report

The U.S. Environmental Protection Agency (EPA) released *Yesterday, Today & Tomorrow: 20 Years of Progress*, the 2007 report on Clean Water State Revolving Fund (CWSRF) programs. Since 1987, CWSRF has funded \$63 billion in projects. In 2007, the programs reached a new high, providing nearly \$5.3 billion in assistance to large and small communities, farmers, small businesses, non-profits and individuals. That includes \$240 million for nonpoint source projects. Besides information about new initiatives, the report also recognizes the recipients of the 2007 Performance and Innovation in the SRF Creating Environmental Success (PISCES) Awards. The report is at www.epa.gov/owmitnet/cwfinance/cwsrf/.

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LEARNING OPPORTUNITIES

Free Water Seminars

ESRI is presenting the following free water seminars on geographic information system (GIS) technology:

- Oct. 7 – Dayton, Ohio
- Oct. 7 – Minneapolis, Minn.
- Oct. 9 – Detroit, Mich.
- Oct. 14 – Allentown, Pa.
- Oct. 14 – Brookfield, Wis.
- Oct. 14 – Seattle, Wash.
- Oct. 16 – Naperville, Ill.
- Oct. 16 – Newark, N.J.
- Oct. 16 – Portland, Ore.

Call 888/377-4575 or visit www.esri.com.

UW-Madison Engineering Courses

The University of Wisconsin-Madison Department of Engineering Professional Development is offering the following CEU, LU, PDH classes. They are at the Madison campus unless indicated otherwise:

- Oct. 6-7 – Designing Bio/Infiltration Best Management Practices for Storm Water Quality Improvement (K214)
- Oct. 14-15 – Storm Sewer System Design (J977), Las Vegas, Nev.
- Oct. 16-17 – Stormwater Detention Basin Design (J976), Las Vegas, Nev.
- Oct. 27-31 – Cross-Connection Control and Backflow Prevention (J829)
- Nov. 5-6 – Preparing an Effective Municipal Capital Improvements Plan (J974), Las Vegas, Nev.
- Nov. 17-18 – Pumping Equipment and Systems: Selecting, Operating, Maintaining and Troubleshooting (K272), Las Vegas, Nev.
- Nov. 17-18 – Storm Sewer System Design (J892)
- Nov. 19-20 – Stormwater Detention Basin Design (J891)
- Dec. 8-9 – Improving Public Works Construction Inspection Skills Course (K118), Las Vegas, Nev.

Call 608/262-2061 or visit <http://epdweb.engr.wisc.edu>.

American Public Works Association

APWA has these courses as Web-based broadcasts:

- Nov. 13 – ETHICS ... or Doing the Right Thing
- Dec. 18 – NPDES Good Housekeeping

Call Carrie Merker at 816/472-6100, ext. 5213, or visit www.apwa.net.

American Water Works Association

The organization is offering the following CEU/PDH seminars or Web casts:

- Oct. 15 – Total Coliform Rule: Final, Web
- Nov. 5 – Environmental Values in the Water Industry, Web
- Nov. 13-14 – Mapping Your Course to a Successful Workforce Plan, Ft. Worth, Texas
- Dec. 3-5 – CEO and GM Forum, Fort Lauderdale, Fla.
- Dec. 10 – Alamosa: Lessons Learned, Web

Call 800/926-7337 or visit www.awwa.org.

Georgia

The Georgia F.O.G. Alliance is presenting Fats, Oils and Grease Inspector Training on Oct. 8-10 at the Marriott Hotel in Atlanta, Ga. The course includes one 30-minute presentation by a vendor of class-related material each day. Call Xavier Davis at 770/487-7993 or visit www.georgiafog.com.

North Carolina

North Carolina State University is offering these courses at its Raleigh campus unless stated otherwise:

- Oct. 14-16 – Designing Wastewater Irrigation Systems
- Nov. 5-7 – Subsurface Wastewater Operator Training, Plymouth
- Nov. 18-19 – Onsite Wastewater System Inspector Training, Plymouth

Call Joni Tanner at 919/513-1678 or visit www.soil.ncsu.edu/training, then click on "Training, Shortcourses and Workshops."

CALENDAR

Oct. 1-2

3 Rivers Wet Weather Sewer Conference, Four Points by Sheraton, Pittsburgh, Pa. Call 412/578-8375 or visit www.3riverswetweather.org.

Oct. 5-8

National Rural Water Association Leadership Forum & Technology Exhibit, Grand Sierra Resort and Casino, Reno, Nev. Call 580/252-0629 or visit www.nrwa.org/ev.htm.

Oct. 8-10

Georgia F.O.G. Alliance Grease Inspection Course, Marriott Hotel, Atlanta, Ga. Call Xavier Davis at 770/487-7993 or visit www.georgiafog.com.

Oct. 18-22

WEFTEC.08, McCormick Place, Chicago, Ill. Call 800/666-0206 or visit www.weftec.org.

Oct. 26-30

International Water Conference, Crowne Plaza, San Antonio, Texas. Call 412/261-0710 or visit www.eswp.com/water.

Oct. 27-28

Minnesota Water Resources Conference, RiverCentre, St. Paul, Minn. Call Sara Van Essendelft at 612/624-3708 or visit <http://wrc.umn.edu/waterconf/index.html>.

Nov. 11-12

Trenchless Road Show, Baltimore, Md. Call Michelle Magyar at 330/467-7588 or visit www.trenchlessroadshow.com.

Nov. 16-19

International Low Impact Development Conference, Westin Seattle, Seattle, Wash. Call 800/548-2723 or visit <http://content.asce.org/conferences/lid08/index.html>.

Nov. 16-20

American Water Works Association Water Quality Technology Conference and Exposition, Duke Energy Center, Cincinnati, Ohio. Call 800/926-7337 or visit www.awwa.org.

Nov. 17-20

American Water Resources Association Water Resources Conference, Sheraton Hotel, New Orleans, La. Call 540/687-8390 or visit www.awra.org.

Dec. 2-3

Water Environment Research Foundation Research Forum, Marriott Suites on Sand Key, Clearwater Beach, Fla. Call 703/684-2470 or visit www.werf.org.

Feb. 25-28

Pumper & Cleaner Environmental Expo International, Kentucky Exposition Center, Louisville. Education Day Feb. 25; exhibits open Feb. 26-28. Call 800/257-7222 or visit www.pumpershow.com.

Maine

The Maine WasteWater Control Association and York County Community College in Wells have developed a Certificate of Business Management for Wastewater program. Sessions are Thursdays from 8 a.m. to noon at the college.

- Oct. 30-Dec. 18 – Problem Solving
 - Jan. 8-Feb. 26, 2009 – Technical Skills/Regulatory Compliance
- Call 800/452-8786 or visit www.mwwca.org.

Pennsylvania

The Pennsylvania Water Environment Association is offering Nutrient Removal Technology Workshops at these locations:

- Oct. 9 – New Cumberland
 - Oct. 17 – Kulpville
 - Oct. 24 – Indiana
 - Oct. 31 – Williamsport
 - Nov. 7 – Wyomissing
 - Nov. 14 – Cranberry Township
- Contact Cindy Rock at 570/549-2204 or visit www.pwea.org. ♦

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- Cleanest way to smoke test.
- With the patented SuperJet™ smoke generator, produces more smoke for less dollars than any competitive model.



Solution #2 - Valve Exercising

Spin Doctor® G2



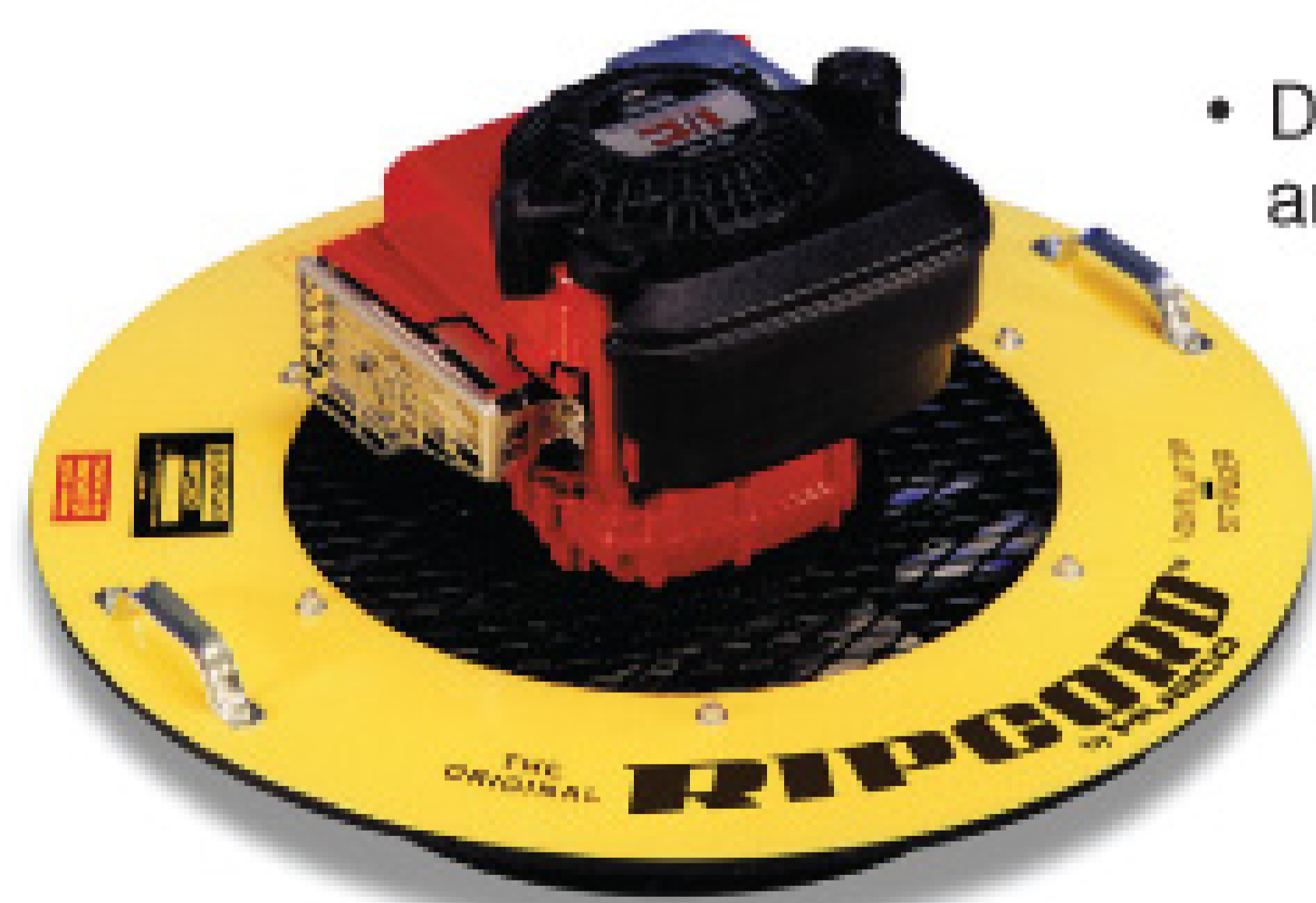
The SpinDoctor® - The next generation of valve exercising, maintenance and management systems.

- Industry's fastest - exercise more valves per day.
- Self leveling and finger tip light.
- Widest range-of-motion, 270 degrees side-to-side and 0' to 13' in and out.
- Complete valve data management system.



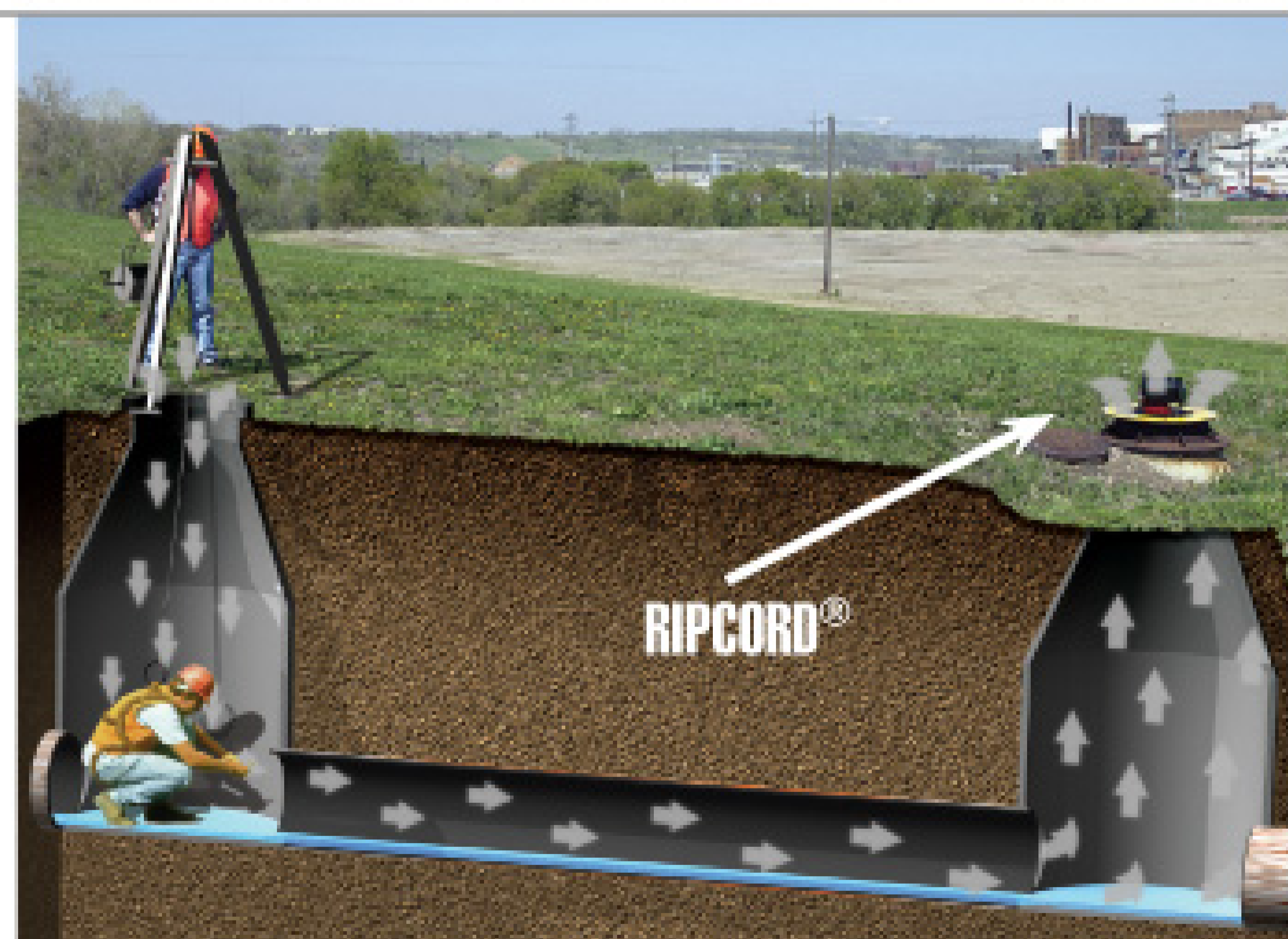
Solution #3 - Manhole Ventilation

RIPCORD® Super-RIPCORD® Ventilator/Stringer



The RIPCORD® - Engineered to quickly create a safe working environment, maximizing the available work space for sewer manhole maintenance.

- Doesn't just dilute dangerous gases and dust, it ELIMINATES them.
- Allows workers to safely enter work space sooner.
- No ventilation hose - provides an unobstructed work area.



For more on these products go to:
Get HURCO.com
or call
1-800-888-1436





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VAC-CON MACHINES SET PERFORMANCE STANDARDS AT THE HIGHEST LEVEL.

No matter the job, you can count on a Vac-Con to make top performance and safety features standard. No up charges for options that aren't really optional. And our complete line covers every application with a machine designed to get the job done faster and safer, increase up time, and last longer:

- Combination Sewer Cleaners
- Industrial Vacuum Machines
- Hydro-Excavating Machines

At Vac-Con, top performance isn't an option.



VAC-CON
MORE POWER TO YOU

The **WaMax** milling system is used for the removal of roots, mineral deposits, concrete, protruding taps, and for the preparation of relining work. These different applications are possible by the use of various guiding-cages and milling heads. The WaMax System works in pipe diameters of 3" to 40".



WaMax

The **Mega 6** Floor Cleaning Nozzle uses weight and jet angle to create a "water shovel". The jet pattern provides maximum removal of debris in lines up to 100".



Mega 6

The **Smart Cutter** clears problems your nozzle can not, gives you a lifetime warranty against rust, and a kit that covers pipes from 4" to 15".



Smart Cutter

The **RotoJet** large diameter pipe rotation nozzle is independently driven, delivers a rotation rate between 50 & 300rpm, and cleans pipe walls 12" to 120".

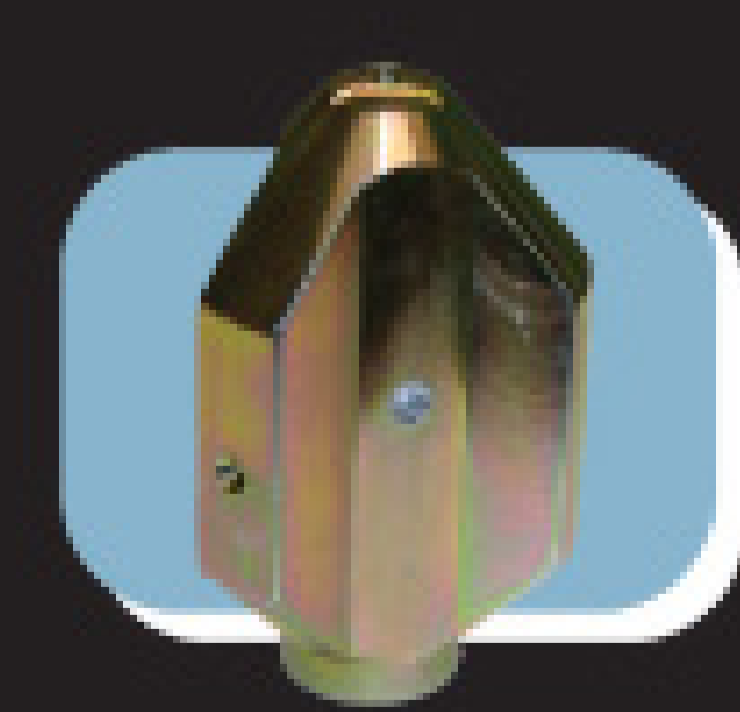


Roto Jet

The **K114** large pipe chain cutter is designed to handle your biggest root cutting problems. The K114 covers pipe diameters from 18" to 40".



K114



For Sales and Rental information contact your local Smart Nozzle Distributor or Call Sewer Equipment Company of America at 800.323.1604.