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April 2017

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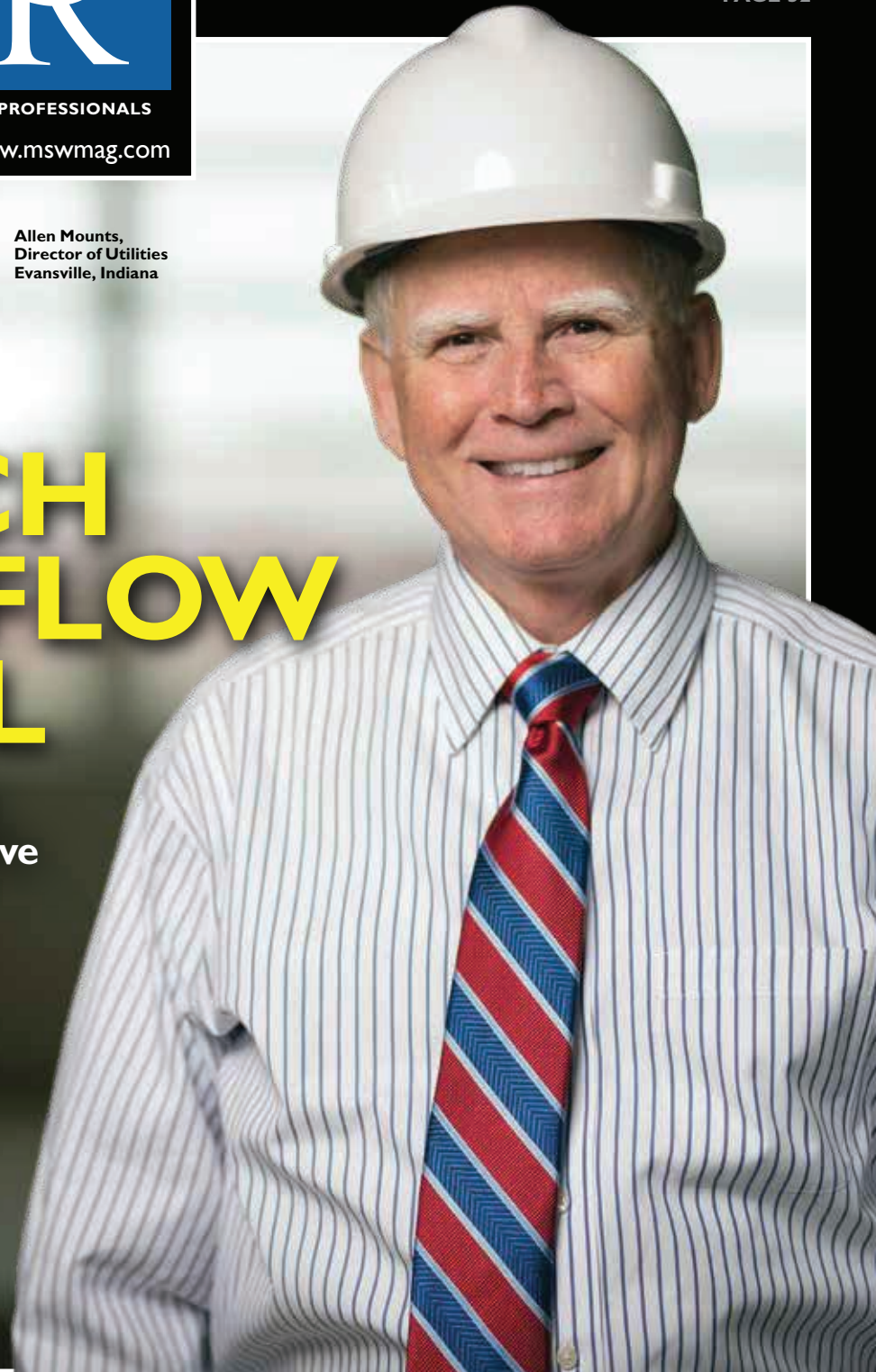
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Allen Mounts,
Director of Utilities
Evansville, Indiana

A NEW APPROACH TO OVERFLOW CONTROL

Renew Evansville will incorporate green infrastructure and alternative projects to manage combined sewer overflows.

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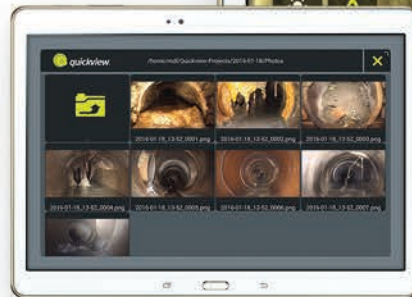
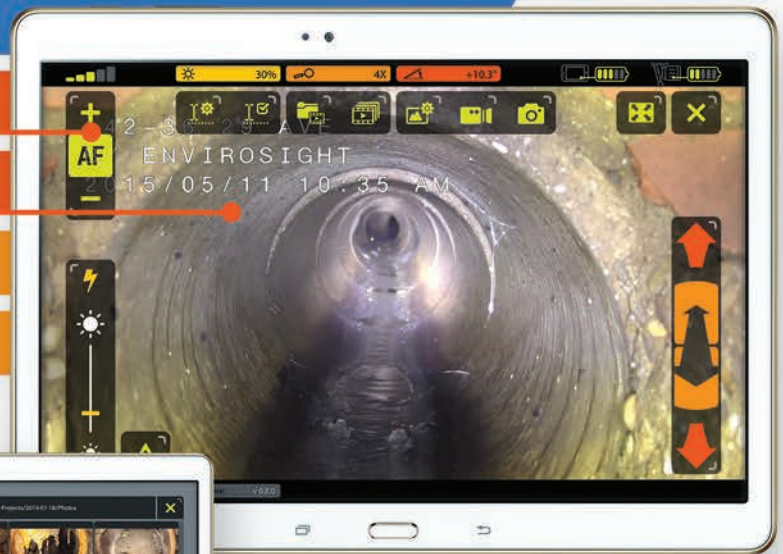
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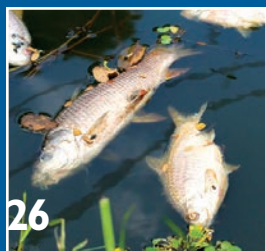
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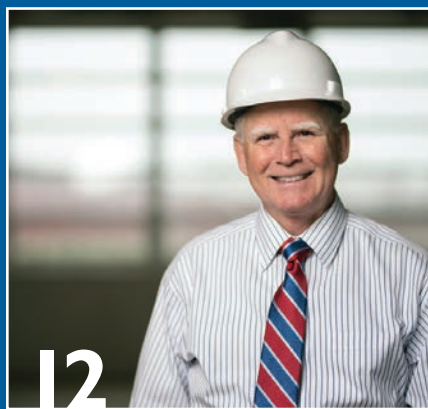
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INSIDE:

NO-DIG SHOW ISSUE,
MANHOLE EQUIPMENT AND REHABILITATION



ON THE COVER: Evansville Director of Utilities Allen Mounts in the utility's centrifuge building. The utility recently began a \$729 million effort to control combined sewer overflows. (Photography by Marc Lebryk)



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ACE Pre-Show Issue,

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- ◆ TECH CLOSE-UP: Web App supports system management
- ◆ HUMAN SIDE: Eliminate the yes-men at your utility
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FROM THE EDITOR

Luke Laggis

Regardless of the size of your collections system, you have many more manholes than miles of pipe in the ground. That holds true for all utilities.

In a given system, depending on pipe and manhole size, you could have as many as a dozen or more manholes per mile of pipe. That adds up to a whole lot of potential problems per mile.

Regardless of the condition of your system, no utility is immune from manhole problems. From I&I and elevation to reconstruction and rehabilitation issues, you're all dealing with them.

I was paying special attention to manhole solutions at this year's WWETT Show. It's great to see all the new tools, technology and equip-

ment on the floor every year, and it was no different this time around. From a cool new manhole safety device designed to be highly visible to traffic and protect your workers from falls, to full rehabilitation systems that can eliminate I&I, there's clearly a strong market for manhole improvement. It's obvious that manufacturers are stepping up to advance the technology and fill the void.

Of course, the show covers a lot more than manholes. There are new tools and innovations for every part of your collections system, and enough knowledge and insight on the show floor to help you solve almost any problem.

You can expect to see more on these new products and a lot of other things manhole-related moving forward.

One of the things I really enjoy over the course of the year is seeing everything from the show come to life in the pages of this magazine, from new insights to tools and equipment and, of course, the people. Regardless of whether you were able to attend the show, you'll be able to get the flavor of the show in future issues.

From the classrooms to the show floor, the whole show is an education. No matter how much technology advances and no matter how many years of experience you have under your belt, there are still new things to learn about some of the most basic services you provide. And don't for a second question whether the technology is advancing in meaningful ways.

The future of this industry and your utilities was on display — jet/vac trucks with water recycling systems, tracks on a hydroexcavator, modular inspection crawlers, mapping and locating systems, and every pipe rehab option under the sun. If you're looking for a better way to tackle just about any problem you have, there's a solution for you.

The technology aimed at helping you do your job more effectively and efficiently is truly impressive, but it's the people you meet, and the knowledge and advice you glean from conversations with them that can transform your utility.

I speak with many of you from my desk in Northern Wisconsin, but the opportunity to meet face to face, to speak with you directly and hear your stories in person really brings everything together. It's great to hear how MSW is informing your work. That's the goal, and it's also the reward.

Enjoy this month's issue. ♦

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

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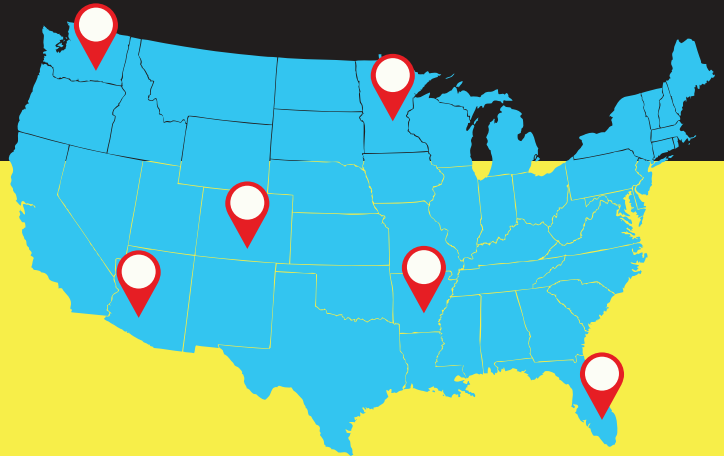
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OVERHEARD ONLINE

“This isn't something that has happened frequently in Massachusetts, but it's a growing tool that DAs are recognizing is available when there are employers that recklessly put their employees in harm's way. This was so egregious.”

— Contractor Indicted for Fatal Trench Collapse
mswmag.com/featured



LEAK DETECTION

Acoustic Methods Pinpoint Leaks Other Techniques Cannot

A large slate of educational sessions at the Water & Wastewater Equipment, Treatment & Transport Show in February provided opportunities to learn about a variety of facets of the industry. One of the speakers, Mark Beatty of Utility Technologies in Ohio, gave a tutorial on selecting acoustic leak detectors. It's a good starting point if you're unfamiliar with the technology — or just new to it. mswmag.com/featured



WET WINTER

Storms Bring Drought Relief to California

California started coming out of its years-long drought in January as a series of storms inundated the state with precipitation. A significant amount came in the form of snow that dumped in the Sierra Nevadas, key for releasing to reservoirs and ecosystems more gradually and efficiently over the summer months. But officials are still emphasizing water conservation, unsure whether this will be a single wet year preceding another lengthy drought. mswmag.com/featured

FOND FAREWELL

Texas Community Gets Nostalgic Over Water Tower Demolition

Typically, removing a piece of damaged water infrastructure wouldn't be met with any pushback, but back in February, some residents of Rowlett, Texas, were a little sad to see one of the city's water towers demolished. The tower was one of the few remaining signs of what existed before a tornado outbreak ripped through the community and surrounding areas on Dec. 26, 2015. mswmag.com/featured



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Evansville's \$13.3 million Bee Slough Relief Sewer Project involves building a 3,000-foot relief sewer that will be used to drain the slough and prevent overflows. (Photography by Marc Lebryk)



A NEW APPROACH TO OVERFLOW CONTROL

Renew Evansville will incorporate green infrastructure and alternative projects to manage combined sewer overflows

By *Jim Force*

Twenty-five years from now, rain events in Evansville, Indiana, will result in much less environmental damage than they cause today.

Instead of running off into an open sewer called Bee Slough, overwhelming the city's wastewater treatment plants, and pouring millions of gallons of untreated water into Pigeon Creek and the Ohio River, rain events will be managed through a comprehensive overflow control program called Renew Evansville.

The plan — agreed upon by the Evansville Water and Sewer Utility, EPA, and the state of Indiana in February 2016 — calls for the investment of \$729 million over the next 24 1/2 years to control combined sewer overflows. While overflow points will remain close to the 22 that exist now, the number of combined sewer overflows will be reduced from 50 to four per year. Based on typical rainfall data, overflows will total just 40 million gallons, down from 2 billion gallons

now, and CSO overflow capture rates will be increased to 98 percent from the current 35 percent. Bee Slough will be smaller and much cleaner, the city's two treatment plants will be upgraded

“After years of negotiation, (we) reached an agreement that’s great for our environment and less financially burdensome to the residents of Evansville than what the federal government proposed.”

— Lloyd Winnecke

and expanded, and green infrastructure — including what might be the nation's largest constructed combined sewer wetland — will reduce runoff from the urban area.

Director of Utilities Allen Mounts and Deputy Director Mike Labitzke report the project is already in its first phase, with contracts awarded for inlet openings to be cut into the Bee Slough channel so it can be drained periodically to reduce stagnation and the associated odors.

“It’s smelly and unsightly,” Labitzke says of the slough that serves as a receptacle for more than 40 percent of the utility's sewer overflows, as well as the effluent from its East Side treatment plant.

“Plus, it runs right alongside the Veterans Memorial Parkway — a major roadway leading into the city from the southeast — and it’s close to a number of residences.”

Compromise

Renew Evansville represents a compromise between the utility and environmental regulators hammered out over several years. Originally, the EPA wanted EWSU to reach a zero-discharge solu-


(continued)



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“The whole idea is to keep stormwater out of the sewer system in the first place.”

— Allen Mounts

tion (0 overflows), which would have required the utility to spend over a billion dollars to design and install a deep tunnel to capture and store the water. Evansville countered with a plan to spend around \$540 million to reduce overflow occurrences to 11 per year, with a stormwater capture of 92 percent.

Finally, after an analysis of the city’s ability to afford the remediation projects, the current plan was agreed upon.

Mounts says Evansville Mayor Lloyd Winnecke and state Department of Environmental Management officials were helpful in arriving at the compromise. “We had a difficult time convincing the authorities that the constructed wetlands would be effective and were a much less expensive way of meeting the requirements than the deep tunnel. Our mayor was actively involved in the discussions. Finally, we reached the point where we said, ‘this is it, and this is all we can do.’”

EWSU’s 24 1/2-year time frame differs from most U.S. cities’ 20-year plans, the mayor also noted. The extended time limit was negotiated to allow the city more time to fund the planned projects and reduce the rate increases that would have been greater throughout a 20-year period.

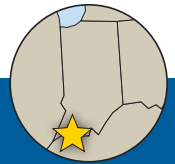
“Some cities are struggling to honor the terms of their federally mandated Consent Decrees, and we’re thankful that EPA worked with us to develop a mutually beneficial plan,” Mayor Winnecke said in a press release at the time. “After years of negotiation, (we) reached an agreement that’s great for our environment and less financially burdensome to the residents of Evansville than what the federal government proposed.”

Plan elements

While the overflow control plan contains a number of elements the utility will be taking to reach discharge goals, the remediation of Bee Slough is the signature piece. That’s not only because of its visibility, but a citizen advisory council working with EWSU identified it as the top priority.

For years, the slough has served as a 1.1-mile-long channel for the collection of stormwater and combination sewer overflows, as well as treated effluent from the city’s East wastewater treatment plant. The slough is emptied into the Ohio River only when certain levels are reached and the local Levee Authority either opens its gates or pumps the water out. The water stagnates, and solids and sediment collect on the bottom, which must be removed by front-end loaders after the channel is emptied. Labitzke says the slough fills about 50 times a year, collecting nearly a billion gallons of combined sewer overflow annually — about half of the city’s total — which is discharged into the river.

(continued)



PROFILE:

Evansville, Indiana,
Water and Sewer Utility

FOUNDED:

Water utility in late 1800s

AREA AND POPULATION SERVED:

55 square miles, 180,000 people

INFRASTRUCTURE:

830 miles of sewers,
two wastewater treatment plants

PROJECT:

Renew Evansville —
integrated overflow control plan

OBJECTIVE:

Reduce overflows to no more than
four occurrences per year

COST AND TIMELINE:

\$729 million over 24 1/2 years.

STAFF:

216 (Consolidated workforce for both
water and sewer utilities, with many
shared services)

ANNUAL OPERATING BUDGET:

\$63 million

WEBSITE:

www.ewsu.com



Evansville Director of Utilities Allen Mounts (left) and Deputy Director of Engineering Mike Labitzke check work progress against the plans for the Bee Slough Relief Sewer Project. The 1-mile slough is an open concrete channel that carries wastewater overflow during wet weather events.

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Allen Mounts (center) discusses the expansion of a pump station with Mike Labitzke (right) and IOCP Construction Manager Steve Capin.

“Public outreach is very important. I think our team has been really creative, using You Tube videos; our Leadership Evansville program, which develops community leaders; Twitter; and the mayor’s Facebook page.”

– Allen Mounts

Evansville is embarking on a project to construct its own effluent pumping station to transport treated effluent directly to the Ohio River instead of Bee Slough.

CLEAR PATH TO SUCCESS

As the Evansville Water and Sewer Utility launches its huge stormwater control program, another project to improve the sewer infrastructure has been going on for the last six-plus years.

It’s called Clear Path, and it involves inspecting and cleaning all 630 miles of smaller sewer pipes (15 to 18 inches in diameter) as part of the utility’s CMOM (Capacity, Management, Operations and Maintenance) program. Deputy utilities director Mike Labitzke says the Clear Path project will wrap up this coming November, having examined and cleaned lines beneath backyards, alleys and easements that are often forgotten or overlooked.

To do the work, the EWSU deploys CCTV trucks equipped with two CUES cameras and three Sewer Line Rapid Assessment Tools from InfoSense. Cleaning is handled with four Vactor jet/vac trucks and two remotely operated easement machines that can extend hoses into private easements.

In some cases, old pipes are lined using CIPP. The annual competitive bid project has involved several contractors including Insituform, Miller Pipeline and Layne Inliner.

As with the larger overflow control program, public outreach has been important. The utility’s Clear Path website (www.ewsu.com/clearpath) enables residents to see sewer lines on and around their property. Labitzke says it’s an educational tool to help people understand what might be in their backyard. “It helps people understand what’s around them.”



The situation will change soon. Currently, EWSU is constructing an interceptor sewer running parallel to the slough from Cass Avenue to Shawnee Drive. The 60-inch fiberglass pipe runs southeasterly for 3,000 feet. The new line is situated between homes and the slough, and will consolidate two CSOs and in the future will direct them to a satellite treatment location. For now, flow can be directed to a lift station and then the East treatment plant for treatment and disinfection. The current project — estimated at \$13.3 million — also includes the inlets that can be opened to drain the contents of the slough into the new sewer when necessary.

And while the interceptor is a key to eliminating the Bee Slough problem, it’s a double-edged sword, in Mounts’ words. “It backs up against neighborhoods and is highly visible,” he explains. “Neighbors are having to put up with the removal of many trees and 20 months of heavy construction in their backyards.”

New pumping station

Next, the utility is embarking on a project to construct its own effluent pumping station to transport treated effluent directly to the Ohio River instead of the slough. The pump station is due for completion by 2019, and will be located near the East treatment plant. It will have a maximum capac-

ity of 68 mgd, including 40 mgd in reserve for treated effluent from the East treatment plant expansion and 28 mgd for pumping water from the satellite treatment facilities of Bee Slough.

“Construction of our own effluent pump station means we will be able to elevate and discharge treated water to the river without having to depend on the Levee Authority,” Mounts says.

The new pumping station will be just one of the improvements at the East treatment plant. “The plant is bottlenecked at the secondary stage,” says Labitzke. “The primaries can treat up to 40 mgd, and the agreement calls for expansion of the secondary train by 14 mgd (which would take it to 40 mgd capacity as well).”

He says the utility will hire a design firm to look at different technologies, including vertically configured aerated biofilters, which are in operation at the West plant. “They might be the solution,” he says, noting that the East plant is landlocked and a vertical treatment process would be best suited for that site. “We’re looking at a two- to three-story building, rather than additional aeration basins.”

The expansion will give the plant the ability to treat and then disinfect the first flush from the sewer system at the start of a rain event and before a CSO is activated. “When that project is finished,” says Mounts, “we’ll start seeing a real impact.”

Wetlands

The wetlands, to be completed sometime in 2023, will be constructed next. At about 24 acres in size, they will be among the largest constructed combination sewer wetlands in the U.S., if not the world, Labitzke and Mounts believe. The wetlands will have the capacity to treat up to 42 mgd of overflow that will be settled, then “polished” with plants like bulrushes, sedges and prairie grass that take up pollutants and filter out metals, and finally disinfected. Water leaving the wetlands will return to Bee Slough and ultimately to the Ohio River.

Mounts says the wetlands solution followed extensive discussions with the EPA, convincing the agency wetlands would work, and cost far less than brick-and-mortar solutions. “Wetlands were not among their set of solutions,” Mounts says.

Two associated projects include a 200 mgd pumping station to transport water to the wetlands, and a new 108-inch conveyance pipe to carry the CSO discharge under Bee Slough to the wetland pumping station. A new satellite vertical treatment and storage unit will also be installed to provide primary treatment and disinfection of up to 226 mgd of CSO discharge from the 60-inch consolidation sewer built previously. (The lift station directing water to the plant would be abandoned at this time.)

Green solutions

In addition to the wetlands, the EWSU is looking to other green solutions to help reach their ambitious overflow control goals. In the downtown area, public as well as private spaces are being modified to include such features as permeable pavement, curb bump-outs to capture and infiltrate runoff, rain gardens, infiltration beds beneath surface parking lots, and more. “The whole idea is to keep stormwater out of the sewer system in the first place,” Mount says.

He says current green infrastructure projects total about \$9 million thus far, with more scheduled in the next few years. “We hope to have an entirely green street downtown.”

A key to implementing these solutions is getting the private sector to buy in. Evansville is using public-private partnerships to accomplish that, through public outreach and incentivizing private sector owners to include green infrastructure in their build-outs.

The program is known as the Green Infrastructure Participation Plan, and the utility has placed a higher priority for green infrastructure projects in the downtown area. For approved projects, the utility will pay a one-time 20-cents-per-gallon incentive for every gallon of stormwater redirected away from the combined sewer system.

Engineering projections and post-construction testing are being used to validate projects by the annual volume of stormwater that will be redirected. Future maintenance costs are often split between the property owner and EWSU, with the EWSU completing the underground maintenance and the property owner completing the surface maintenance.

“Public outreach is very important,” Mounts says. “I think our team has been really creative, using YouTube videos; our Leadership Evansville program, which develops community leaders; Twitter; and the mayor’s Facebook page. As well, the media have done a good job of reporting on the project.”

And while the community of Evansville is the main target of the utility’s message, the whole nation may be watching. The EWSU’s overflow control project could well be a textbook example of how a medium-size city can effectively address CSOs and stormwater runoff by combining green and grey solutions, and engaging the public, at an affordable cost. ♦

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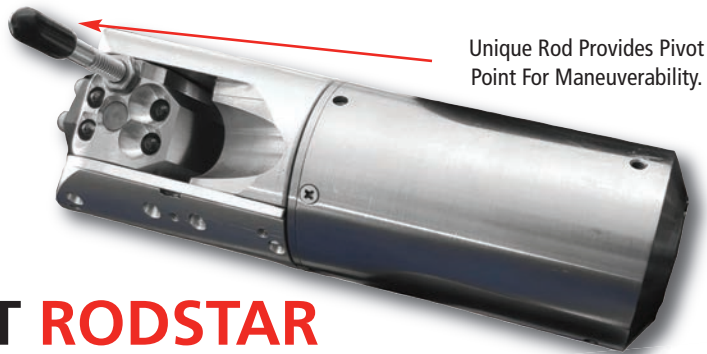
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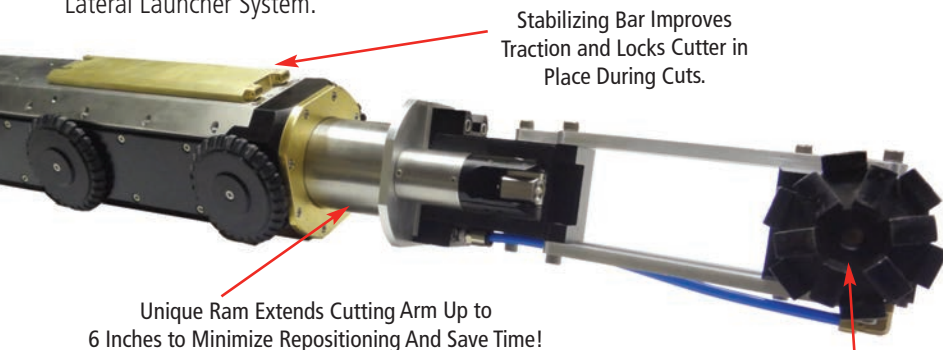
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LESS MAINTENANCE, FEWER CLOGS

Inline pumping system is designed to make wastewater lift stations much less maintenance-intensive while dealing with wipes and other trash

By *Ted J. Rulseh*

Lift stations are a key link in the wastewater collections chain. They can also be maintenance-intensive. That's especially true since the proliferation of consumer wipes products that, when flushed, can collect in lift stations and clog submersible pumps.

Now Kansas-based C&B Equipment offers a different concept in lift station pumping. Called the DIP System (for direct inline pumping), the

technology has been deployed in numerous wastewater systems in Europe, but is new to North America.

In place of submersible pumps installed in a wet well and activated by floats, the DIP System pumps are directly connected to the lift station inlet and outlet. The pumps run continuously when there is flow, ramping their speed up and down according to the incoming flow volume. When there is no flow, the pumps stop.

In the process, the pumps grind up wipes and other trash to pass through without causing clogs. Jon Dunham, key accounts manager for C&B Equipment, described the technology in an interview with *Municipal Sewer & Water*.

MSW: How would you describe the difference between your system and traditional lift station pumping?

Dunham: Traditional lift stations use submersible pumps in a wet well. The pumps are activated by float



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Pumps grind up wipes and other trash to pass through without causing clogs

switches when the water reaches a preset level. The pumps then run at full speed to empty the wet well. In the DIP System, the inflow is piped directly into the pump — a wet well is not necessary. The pumps operate continuously and are controlled by a variable-frequency drive so they run at the speed necessary to handle the flow. It is not batch pumping.

MSW: What sort of maintenance do traditional lift stations require?

Dunham: A primary issue with submersible pumps in wet wells is clogging with wipes and other flushable materials. The float switches are subject to fouling with fats, oils and grease, and may require frequent cleaning to keep them operable. In addition, wet wells occasionally have to be cleaned out, typically with a vacuum truck. Then you have hydrogen sulfide gas that can corrode electrical components, anything made of steel or iron, and even concrete. The cost of maintaining a wet well continues for as long as it is in service.

MSW: Why does the DIP System require less maintenance?

Dunham: The wastewater remains inside the piping and the pump, creating a clean and dry environment. Solid objects such as cans and plastic bottles, and fibrous items such as wipes or bandages, can pass through without clogging the pumps. Whereas wet wells typically use a duplex pumping system, which means two check valves and two plug valves in a valve vault, the DIP System uses only one check valve and one plug valve. There is no valve vault, so the system fits in a smaller footprint. The main system components are stainless steel. With soft starts and stops, there is no water hammer, so you ease the impact on the sewer line and valves downstream.

MSW: How does this system deal with wipes, rags and other trash materials?

Dunham: The pump is self-cleaning and uses a special impeller design. When the torque increases, the pump senses that it is becoming clogged. It then automatically slows down, stops and reverses direction. When it does that, knives on the impeller pop up and slice up any trash. When the pump senses that it is running free again, it slows down, stops and returns to the normal pumping direction. All this happens without operator intervention.

MSW: Can this technology be retrofitted to existing lift station wet wells?

Dunham: It is easy to retrofit. There have been cases where retrofits have been completed in one day. You can take an existing wet well, pull out the

old submersible pumps, put this system in, and pipe the inlet and outlet directly into the pumping system.

MSW: How is the rate of pumping controlled?

Dunham: The pumps are controlled by the volume of influent, through the electronic system that is provided. The flow rate is measured by a transducer installed in the lower part of the inlet. The transducer measures the depth of the flow over it, and the output from the transducer determines

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the speed of the pumps. The system has two pumps and two motors, and is sized so that one pump and motor will handle 100 percent of the expected capacity. In the case of higher inflow, both pumps will kick on, so in effect you have 200 percent of capacity.

MSW: How is the system monitored?

Dunham: The control scheme is fully customer programmable. Users can check on or adjust the pump operation remotely using a smartphone, tablet or desktop computer. They can dial up the pump, see how it's running. They don't have to send a crew to the site.

MSW: Where has this technology been deployed successfully?

Dunham: The first system went into use in Europe in 2003, and since then thousands of them have been installed. In Europe, wastewater is typically handled by the private sector under contract with municipalities. These contractors often remove the submersible pumps from lift stations and install the DIP System to eliminate maintenance. From that point they can largely manage the system remotely.

MSW: What return on investment can a utility expect from a retrofit of this system?

Dunham: That depends on the size of the system and the initial cost, but a typical installation will pay for itself in two to three years from the savings on maintenance.

MSW: How does this technology fit the needs of today's wastewater systems?

Dunham: Every government agency and utility I talk to is looking for innovation and sustainability. This system answers those needs. Furthermore, the wastewater industry is facing a personnel issue with a coming wave of retirements. Our system lends itself to younger people because it's technologically astute and frees them from dirty work, which no one wants to do anymore. ♦

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MAINE STREAM CLEANUP



Community volunteers and staff from Hydro International collect trash along Long Creek in South Portland, Maine. The project was part of a study aimed at evaluating trash composition and improving stormwater treatment systems.



Project pulls trash from stormwater systems and collects helpful data for protecting waterways

By Irwin Rapoport

The buildup of trash in stormwater systems is a major problem for many utilities. Last May, the city of South Portland, Maine, and some of its residents got together, along with help from Portland-based Hydro International, to tackle the problem with a cleanup project that removed 1,890 gallons of trash in the Long Creek Watershed.

The action, coordinated by the Cumberland County Soil and Water Conservation District, as a contractor of the Long Creek Watershed Management District and aided by Fairchild Semiconductor, was similar to beach cleanups held in many parts of the country where trash, particularly plastic, is removed on a regular basis. Development in the LCW over several decades has converted the landscape from mostly forests and fields to commercial, light industrial, retail and transportation uses. The LCW is identified as an urban impaired watershed that requires action.

As a water-focused engineering and manufacturing firm, Hydro International staff volunteered

to help with the cleanup. The trash was taken to the company's facility to evaluate the types of trash that most often make it into the water, and best practices to help minimize this ongoing problem.

"The Long Creek is in our backyard and we were happy to help in a cleanup effort," says Jeremy Fink, a principle development engineer with Hydro International. "Despite the cleanup, the area continues to amass significant volumes of

trash in spite of stormwater remediation efforts. The community embraced the initiative and is more aware of its impacts on the environment. The trash was used as part of a study to advance the development of stormwater treatment systems, such as trash screens, which will be used across the globe. In understanding trash composition, including

the material type and size ratios, it will influence development of future trash screening systems."

The research was translated into a study entitled *New England Trash Study: Long Creek Watershed* (written by Fink and Bridget Domareki).

"No amount of trash can safely be assimilated into a natural ecosystem. Until legislation catches up to this important issue, engineers and contractors have an important opportunity to protect area wildlife from centuries of harm."

— Jeremy Fink





Trash accumulations caused fish kills and other problems in Long Creek. The cleanup efforts removed 1,890 gallons of trash from the watershed.



“Despite the cleanup efforts, the area surrounding Long Creek where the cleanup took place still amasses a significant amount of trash,” Fink says. “When storms occur, that debris makes its way into drainage lines and from there into the watershed unless it’s appropriately screened out.

“Much of the nonbiodegradable trash that you see on land will end up in the water — lakes, rivers or oceans — where it will do the most damage to the environment, particularly to aquatic life,” he adds. “Birds, fish and other wildlife too often consume these floating pollutants and all too often die of poisoning from that. The ripple effect is that after animals die, the plastic bottle caps, food wrappers and beverage straws re-enter the ecosystem by way of a rain and threaten the life of other animals. It’s a vicious cycle.”

Fink’s message is clear: “No amount of trash can safely be assimilated into a natural ecosystem. Until legislation catches up to this important issue, engineers and contractors have an important opportunity to protect area wildlife from centuries of harm.”



“The volunteers put in a high level of effort. They enjoyed the ability to make a highly visible, material difference in the quality of their local environment. Many of the volunteers also enjoyed learning about watershed management and strategies for improving water quality.”

– Damon Yakovleff

Opportunity to protect

In 2009, the U.S. Environmental Protection Agency determined that certain stormwater discharges were contributing to degraded water quality in Long Creek. As the result of a community-based watershed management plan implemented by the Long Creek Watershed Management District, the district has become a leader in implementing stormwater treatment technologies.

Long Creek was identified as an urban impaired watershed, and with funding from the EPA and guidance from the Maine Department of Environmental Protection, along with input from various stakeholders, a variety of stormwater treatment solutions were implemented. These measures included tree box filters, media filters, storage chambers, pervious pavement, bioretention cells, detention basins and gravel wetlands.

Implications

The Hydro International study analyzed all 54 bags (1,890 gallons/583 pounds) of trash that was collected and the breakdown was thus: food/beverage packaging — 39 percent; plastic — 31 percent; paper — 17 percent; polystyrene — 4 percent; metal — 2 percent; clothes — 1 percent; cigarette butts — .5 percent.

“The breakdown may be similar to other northeastern sites, but this can only be confirmed with future studies,” Fink says. “Knowing what is backing stormwater systems and the time it takes for these materials to break down will help us produce smarter designs for new stormwater treatment systems such as screens, separators and filters.”

The study stresses that 80 percent of trash that ends up in water is generated on land, pointing out that a recent city of Los Angeles study of trash found on land compared to trash in the water demonstrated that plastics “make up a significantly higher percentage of trash found in water” and that “the avenue by which most of waterborne trash is able to reach bodies of water is via stormwater drainage systems. While some

“If it’s not specifically required of them to take action, and there is an additional cost to their clients, many engineers are unlikely to recommend a screening option, especially if they know that another screen may already exist further down the drainage line.”

– Jeremy Fink

states (California) and cities (Baltimore) have a zero tolerance for trash discharging from their runoff, most areas of the country leave it to the discretion of the civil engineers overseeing development and redevelopment projects to decide if trash screening is necessary.”

The implications of inaction and neglect are clear.

“If it’s not specifically required of them to take action, and there is an additional cost to their clients, many engineers are unlikely to recommend a screening option, especially if they know that another screen may already exist further down the drainage line,” Fink says.

Community involvement

Damon Yakovleff from the Cumberland County Soil & Water Conservation District was pleased with the turnout of more than two-dozen volunteers who helped with the cleanup.

“The volunteers put in a high level of effort,” Yakovleff says. “They enjoyed the ability to make a highly visible, material difference in the quality of their local environment. Many of the volunteers also enjoyed learning about watershed management and strategies for improving water quality. I am certain that many would be willing to help out again.”

Yakovleff believes that the greater community is more aware of the problem of litter entering waterways. “But a lot more still needs to be done as far as actions to add more receptacles,” he says. “This should include a larger effort to collect cigarette butts as well, especially as smokers are driven further afield due to smoking bans. This event was facilitated by the United Way Day of Caring event, which is a nationwide program. If other cities want to emulate this event they could likely leverage the efforts of United Way and other organizations promoting public service.”

There are also additional devices that can be placed directly in stormwater collections systems to prevent trash from entering local waterways, but since these devices typically require more frequent and regular maintenance that add to municipal costs, they are not widely used.

As for the Long Creek Watershed, one cleanup project, however successful, won’t prevent trash from building up again. Some has already returned.

“It is difficult to measure how much debris has accumulated since the cleanup event,” Yakovleff says. “Overall, I would say the area is still cleaner than before the event. Based on what I

have seen, a fair amount of lighter debris has accumulated, but there are fewer heavier items. The district is working to provide education and outreach about the need for proper waste management, such as keeping dumpster lids closed and monitoring for illegal dumping. It is possi-

ble additional stream cleanups with media outreach will take place as well.”

Annual cleanups provide an opportunity to highlight the importance, and necessity, of partnerships between various interest groups such as nonprofits, businesses and municipalities.

“These cleanups are a helpful tool for providing outreach, not just about waste management but about the need for better stormwater management generally,” Yakovleff says. “Before the event, many participants only had an abstract awareness of the stream.” ♦

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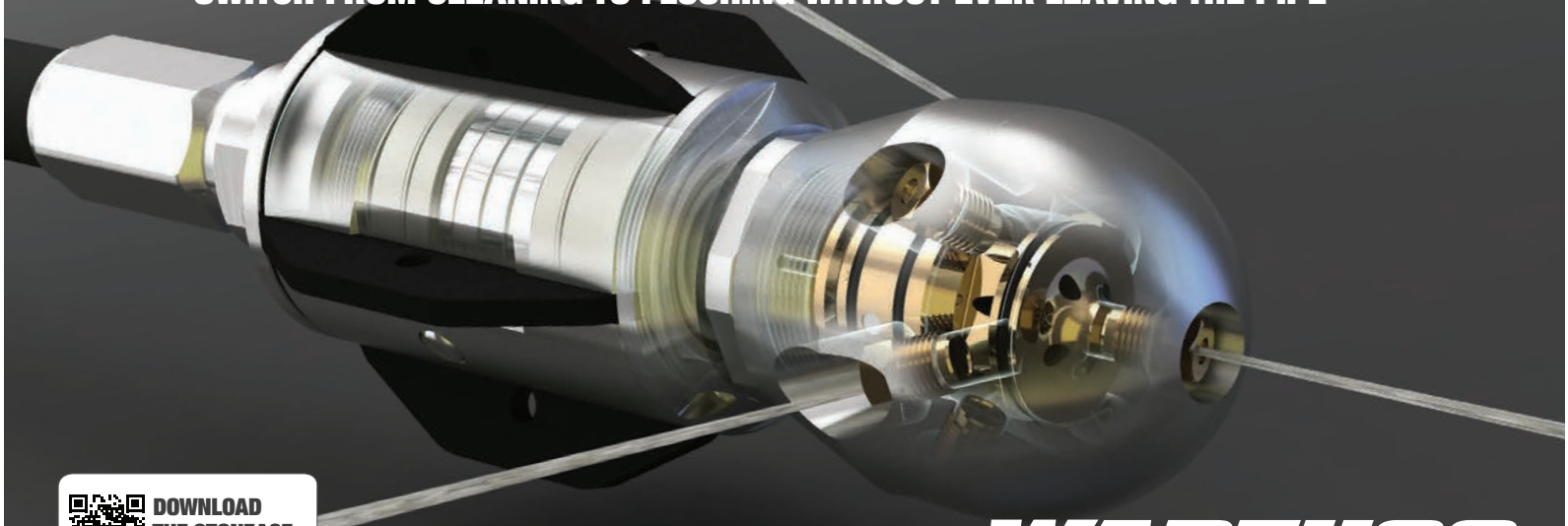
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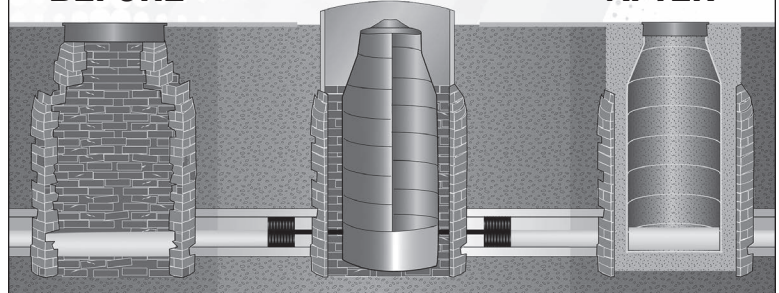
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COLLABORATION BY DESIGN

To create happier, more productive employees, take a closer look at your work environment

By Ken Wysocky

As managers and executives sit in their offices and ponder ways to increase employee engagement, innovation and productivity, one answer literally lies beneath their feet: the design of their organization's workspaces.

"Workplace design does matter in terms of creativity and innovation," says Holly Christian, a design director and workplace expert at Gensler, a global architecture, design and planning firm. "Workers need different types of spaces to be able to work effectively — they need variety and choice. One size doesn't fit all and one environment doesn't fit all."

Optimally, workplaces should be designed to accommodate four different employee work modes, according to Gensler studies: stations where they can focus and get work done, open spaces where they can socialize and share knowledge, areas designed for collaboration, and places for training and learning, Christian says.

"It's fair to say that workplace design is overlooked as a driver of innovation and productivity," she notes. "Maybe it's just that companies focus more on having the right people doing the right task, and not on the synergy a well-designed workplace can create. But more and more companies are becoming much more aware."



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

“Leadership has to walk the walk. Many times we’ve designed very cool collaborative hubs that no one uses because the ‘big guy’ isn’t using them. Management needs to endorse it and show it’s OK to use it.”

— Holly Christian

A national workplace survey that Gensler performs every few years backs up this assertion. In the latest survey — completed in 2016 and representing the views of 4,000 employees across a wide variety of job roles, ages, industries and geographic locations — 1 in 3 workers say they enjoy an optimal workplace experience. That's up from 1 in 4 workers in a 2013 survey. But that also means

that the remaining two-thirds of respondents — mostly professional, technical and administrative workers — continue to struggle with problems caused by poorly designed workspaces.

In addition, workplaces that prioritize a healthy balance of both individual and group work report higher levels of job satisfaction and managerial relationships, plus employees find more meaning in their work. As the study notes, collaboration and connections do not occur in a vacuum, but in well-designed workplaces that encourage employee interaction.

Moreover, the survey revealed that innovators spend more time working away from their desks, not at them. In fact, employees that spend 80 percent or more of their time in an office report significantly lower levels of job satisfaction and find their work less meaningful. Furthermore, innovators typically have better-designed workspaces as well as more choices about where to work — and the freedom to choose what environment they prefer for the task at hand.

So what does all this mean for organizations with conventional workplace designs? After all, in an era of tight budgets, few companies have the financial resources to completely rework their floor plans/workspaces. In addition, most organizations aren't likely to go all Silicon Valley on their workplaces and offer amenities such as pingpong and foosball tables, Legos in conference rooms (to inspire creativity) and “floating” chairs suspended from ceilings by chains.

“I think it's fair to say a foosball table isn't right for a lot of cultures. ... We should dispel the myth of that as a gold standard,” Christian notes. “You have to design a physical space that pairs well with your culture — or the culture you're trying to change.”



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Some changes don't require much investment, such as focusing on ergonomic workstations. This includes height-adjustable work surfaces, adjustable arms on monitors, phone headsets, and ergonomic chairs with many different adjustment options, she says.

As for larger changes, the proverbial how-do-you-eat-an-elephant approach — one bite at a time — applies here. “You can attack small areas,” Christian suggests. One example: Retrofit a traditional conference room with a stand-up table and more informal, lounge-style seating, or use a smaller room for meetings and turn the larger room into a more public area.

“Folks interact differently when stand-up tables are available. The dynamics are much different than sitting in big chairs,” she explains. “Meetings might be shorter or a little more impromptu. And while most older companies have bigger conference rooms, smaller rooms are more intimate and might be more effective.”

The ultimate goal is what Christian calls “a palette of places:” small team rooms as well as scattered stand-up tables and other “meet-up” areas where employees can informally brainstorm. This kind of cross-pollination of ideas yields richer solutions, she points out.

Some of these spaces can actually do double and triple duty. “We call them scrum tables — one counter where you can eat lunch or work solitarily or hold small meetings,” she says. These kinds of spaces encourage and allow employees to come together quickly, share ideas and then get back to work.

Of course, noise management is a big consideration in public areas. In some organizations, a healthy buzz is welcome, while others may put a premium on silence. “What's good for one may not be good for the other,” Christian notes. Some companies issue headphones for employees to block

out noise, while others opt for phone-booth-like cocoons for more intense, focused work in open areas.

As for organizations with multi-generational workforces, Christian says there's typically no need to worry about contending with factions of employees that hold opposite views on workspace amenities and design. The most recent Gensler workplace survey showed that millennials and baby boomers generally all want the same thing: meaningful work and a healthy, well-designed space in which to do it — and one that reflects their organization's culture.

But no matter what changes are made, management buy-in is critical. It serves no purpose to invest in creating small collaboration spaces if management still think the most productive employee is an employee sitting at a desk, or that small, impromptu gatherings are just an excuse for employees to goof off and avoid work.

“Leadership has to walk the walk,” Christian says. “Many times we've designed very cool collaborative hubs that no one uses because the ‘big guy’ isn't using them. Management needs to endorse it and show it's OK to use it.”

Christian says she even knows of law firms that are creating spaces known as “collaborative cafes” and turning coveted corner areas formerly reserved for senior-leadership offices into shared-use spaces — a welcome trend. As she puts it, “Organizations need more ‘we’ space and less ‘me’ space.” Call it innovation and collaboration by design. ♦

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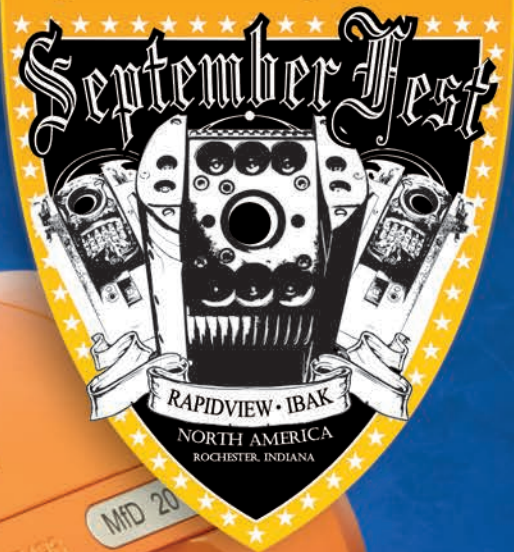
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WORKING AS ONE

Urban-rural partnership uses innovative approach to reduce phosphorus loading to lakes and streams

By Doug Day

A catch basin along Mooreland Road in the Madison Metro Sewerage District, Madison is playing a leading role in the Yahara WINS collective aimed at reducing phosphorus runoff in the Yahara River watershed. (Photography by Lauren Justice)

The lakes and rivers around Wisconsin's capital city are severely impaired by nutrient pollution and subject to severe summer algae blooms. Rather than addressing the problem individually, the Madison Metropolitan Sewerage District (MMSD) and neighboring communities are using an alternate, less costly and more effective approach to remove phosphorus and other excessive nutrients from the Yahara River watershed.

Six cities, eight villages and five towns have joined the Yahara



PROFILE: Yahara WINS

ESTABLISHED:
April 2016
(after four-year pilot program)

PARTICIPANTS:
Cities of Madison, Fitchburg, Middleton, Monona, Stoughton, Sun Prairie and 13 additional towns and villages

MISSION:
Reducing total phosphorus contributions to the Yahara River watershed

WINS (Watershed Improvement Network), a 20-year program aimed at reducing total phosphorus contributions from wastewater treatment plants, industries, urban stormwater and agriculture across the 540-square-mile watershed. Many other groups are actively involved in the partnership.

At a total cost of \$104 million, the plan carries estimated savings of \$13.5 million per year versus traditional point-source-centered approaches to phosphorus reduction, which would bring limited water quality benefits in the watershed. Yahara WINS addresses point and nonpoint sources with a goal of reducing total phosphorus releases by 106,000 pounds a year. That would cut phosphorus contributions from 263,000 pounds per year to 157,000 pounds, a level the state Department of Natural Resources (DNR) has deemed sustainable.

The Yahara WINS initiative is enabled by state law that allows clean-water agencies to meet phosphorus reduction goals through adaptive management — working with landowners upstream to reduce their contributions instead of or in addition to improving local efforts. Some 10 other states have versions of adaptive management programs.

The approach extends across the watershed to reduce the total phosphorus loading from all sources, instead of focusing on small and increas-

“If we looked at a brick-and-mortar addition to reduce just our phosphorus, it would cost more than \$100 million. The adaptive management approach costs about \$12 million for us. But we’re going after the sum total of phosphorus reductions required from all sources in the watershed, which is about 10 times what we are responsible for.”

– Dave Taylor

ingly expensive reductions from regulated entities such as wastewater treatment plants.

Stormwater

Greg Fries, principal engineer for Madison's Storm & Sanitary Sewer Section says just like wastewater treatment plants, stormwater's contribution to the problem is guided by a watershed total maximum daily load approved by the Environmental Protection Agency that is stricter than the regulatory level set by the Wisconsin Department of Natural Resources. “For the city of Madison, the TMDL almost doubled our mandatory reduction,” Fries says. While the regulation required the city to remove 40 percent of the total sus-

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“That’s part of what the pilot project was all about, reaching out to those municipal entities and the agricultural community. We’ve gone beyond the finger-pointing to a mentality that says we’re all in this together — let’s roll up our sleeves and get it done.”

– Dave Taylor

pendent solids, the TMDL requires approximately 80 percent removal.

That’s a difficult task to accomplish for a municipality, especially with so many areas of a city already developed and there being little or no room for stormwater mitigation strategies such as retention ponds. “When you start looking at the cost per pound of phosphorus or total suspended solids reduction, you’re at least an order of magnitude cheaper to work with others than you would be trying to do this within your municipal boundaries, even if you could do so without condemning land and tearing down existing development to make space for ponds, which frankly you couldn’t and wouldn’t,” Fries says.

Treatment plants

The watershed’s wastewater treatment plants in Madison, Stoughton and Oregon have a series of four five-year discharge permits that include language relating to adaptive management along with specific phosphorus targets.

“The first set of limits we have to meet are the interim effluent phosphorus concentrations,” says Dave Taylor, MMSD director of ecosystem services. “That says we have to be down to 0.6 mg/L by the end of the first permit term, and then 0.5 mg/L by the end of the next permit term. Our Madison plant is already below those limits. Stoughton and Oregon are close to 0.6 and should be able to meet the 0.5 limit in the next 10 years.”

Taylor compared the \$104 million Yahara WINS cost to the price of phosphorus reduction at his district’s 42 mgd Nine Springs Wastewater Treatment Plant: “If we looked at a brick-and-mortar addition to reduce just our phosphorus, it would cost more than \$100 million. The adaptive management approach costs about \$12 million for us. But we’re going after the sum total of phosphorus reductions required from all sources in the watershed, which is about 10 times what we are responsible for.”

Proving the concept

Yahara WINS officially began in April 2016, after a four-year pilot program that proved the concept was workable by reducing phosphorus loads by more than 20,000 pounds. It began by gaining the participation of every city, village and town identified as having a discharge to the watershed (see table).

Yahara WINS participants

Cities	Villages	Towns
Madison	Cottage Grove	Blooming Grove
Fitchburg	DeForest	Cottage Grove
Middleton	Maple Bluff	Dunn
Monona	McFarland	Westport
Stoughton	Oregon	Middleton
Sun Prairie	Shorewood Hills	
	Waunakee	
	Windsor	

In addition to those communities and their clean-water utilities, the Yahara WINS participants include the Clean Lakes Alliance, Dane County, Madison Gas and Electric, the U.S. Geological Survey, Yahara Pride Farms, the Wisconsin DNR Nevin Fish Hatchery, the U.S. Department of Agriculture, and the Natural Resource Conservation Service.

Other entities cooperating in the initiative include the Capital Area Regional Planning Commission; Friends of Badfish Creek; River Alliance of Wisconsin; Rock River Coalition; the U.S. EPA; the Wisconsin Department of Agriculture, Trade and Consumer Protection; the Yahara Lakes Association; and Friends of Pheasant Branch.

Taylor says the key to putting together such a large group was building trusting relationships. “That’s part of what the pilot project was all about, reaching out to those municipal entities and the agricultural community,” he says. “We’ve gone beyond the finger-pointing to a mentality that says we’re all in this together — let’s roll up our sleeves and get it done. From the municipal side, it was important to make the business case for adaptive management and to demonstrate that it’s less expensive than the traditional alternatives.”

He adds that adaptive management isn’t for everyone. “It starts by looking at the watershed. Can you easily identify the players? And how likely is it that they’d be willing to work together? It’s one tool. There are certainly places where water quality trading or plant additions make more sense.”

Trees a major culprit

In Madison, however, it made sense. In one project, the city partnered with the Wisconsin Department of Natural Resources, the U.S. Geological Survey, the Fund for Lake Michigan, and Yahara WINS to study leaves, their impact on phosphorus levels, and leaf collection methods. While still ongoing, an interim report shows leaves are “a significant source of phosphorus to urban stormwater” and that removing them is one of the few options available.

“Approximately 60 percent of the total phosphorus discharge from the city of Madison to the surrounding waters comes from leaf fall,” says Fries of the study’s findings. “So of the whole year’s worth of phosphorus, you get 60 percent in a little more than a month. Of the remaining roughly 40 percent of phosphorus, about 25 percent comes during bud drops (from trees) in the spring.”

(continued)



Mike Northouse collects a soil sample in a farm field in the Madison Metro Sewerage District. Right: Northouse demonstrates how a sample is taken.



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The Madison Metro Sewerage District team includes (from left) Metrogro manager Mike Northhouse, laboratory manager Rhonda Riedner, environmental specialist Kathy Lake and Director of Ecosystem Services David Taylor.

“Yahara WINS approached farmers in a very positive way and want to support agriculture. They wouldn’t be where they are today without Yahara Pride Farms, and we wouldn’t be where we are without Yahara WINS.”

– Jeff Endres

The rest of the year is basically a phosphorus desert. If you take actions to control those, for a relatively short amount of time, you can have a significant impact. If you do incredibly aggressive methods to try to keep that out of the streets where it gets washed into the storm sewer, you can impact about 80 percent of that load. As part

of the study, we actually used leaf blowers to blow leaves out of the streets and onto the grass.”

Along with leaf blowers, the city also used leaf collection and street cleaning about every seven days from late September through mid-November in one residential location and asked residents to pile their leaves adjacent to the street. They then compared pollution levels to another location where such actions weren’t taken. The research showed significantly lower levels of phosphorus and nitrogen at the site where the leaves were removed.

Obviously, adds Fries, a Public Works Department is not going to go to the extreme of using leaf blowers, but the example shows that other things can be done to achieve the same outcome. “I don’t think this is going to be a problem solved only with Public Works crews,” he says. “It’s going

to be solved by the populace. If you roll back the clock 25 years, recycling programs were just beginning. At least in Madison, some people now have bigger recycling bins than garbage bins because they are so diligent about recycling. Would you have predicted that 25 years ago? I think the answer is no, but the culture has completely shifted. Could you get people, over the course of the next generation, to think differently about their leaves? I think that possibility exists.”

One successful tool has been a grant program that focuses primarily on urban reductions. In the first half of 2015 alone, five mini-grants reduced phosphorus loading by 483 pounds per year. Dane County, home to the city of Madison, established plans that reduce loading by more than 3,500 pounds per year. Madison also used some grant money to hire a full-time person for

PAYING THE BILLS

Nearly half of the Yahara WINS budget is covered by municipalities and government entities based on the amount of phosphorus reduction they are required to make to achieve their total maximum daily load.

“About 45 percent of the phosphorus load comes from those entities, so they’re covering about 45 percent of the cost,” says Dave Taylor, director of ecosystem services for the Madison Metropolitan Sewerage District. The rest comes from a combination of cost sharing by agriculture producers and the U.S. Geological Survey, contributions from Dane

County, state and federal programs, and funding from groups such as the Clean Lakes Alliance. An executive committee decides how to disburse the funds contributed by municipal entities.

“We’re moving toward the ‘one water’ concept, rather than just focusing on wastewater treatment plant effluent,” says Taylor. “If we’re really going to make meaningful improvements to water quality, we have to think of this more broadly.”

Cover crops, as shown in this field demonstration trial, are an emerging farming practice in the Yahara Watershed that can improve water quality by reducing runoff from farmland.



a summer to look at erosion control at construction sites and to check for compliance. While valuable, says Fries, it's much more difficult to document true phosphorus reductions from such actions because a certain amount of erosion is always going to take place.

Beyond borders

Agriculture is a leading source of phosphorus and is generally regulated less strictly than urban sources. A 2011 study of the Yahara watershed showed that 90 percent of the sediment and 84 percent of the phosphorus entering the areas lakes came from agricultural sources, according to Yahara Pride Farms, one of the participants in the WINS group. "WINS provided funding for Yahara Pride, which worked with participating farmers to use strip tillage, cover crops, low-disturbance manure injection, and other practices that agricultural producers can use to reduce phosphorus loads," Taylor says.

The experience showed that farmers were willing to do projects on their own. "Yahara Pride quantified how many practices the farmers put on their land in the absence of any cost-sharing, and the number was really high," Taylor says.

In 2014, for instance, an \$80,000 grant to Yahara Pride Farms resulted in:

- Strip tillage of 52.5 acres, reducing phosphorus by 47 pounds

- Vertical manure injection on 273 acres, reducing 164 pounds

- Cover crops on 1,329 acres, reducing 3,786 pounds

In 2015, farmers reduced phosphorus loading by another 2,159 pounds through cost-share programs funded by Yahara WINS, but another 6,483 pounds was removed from the environment through individual projects not covered by cost sharing.

"Agriculture is in a position that we have to be proactive versus reactive, and we're promoting things that actually work and make a difference," says Yahara Pride Farms board president Jeff Endres. His group provided cost sharing for 2,500 acres of cover crop, but farmers planted close to 6,000 acres. "That tells me the farmers are very in tune to it and want to make a difference. That says a lot about agriculture. Yahara WINS approached farmers in a very positive way

and want to support agriculture. They wouldn't be where they are today without Yahara Pride Farms, and we wouldn't be where we are without Yahara WINS."

In May 2016, the group was honored with the Outstanding Achievement in Resource Stewardship award from the Innovation Center for U.S. Dairy for its cost-sharing program. Since 2012, more than 45 farmers have used the program to reduce phosphorus by 15,872 pounds.

Endres says it shows farmers that it's OK to get out and provide leadership on environmental issues. "The practices we're using today were invented and perfected by farmers themselves, nobody else did that for them. So if we turn our

attention to this and work together, we can probably make more positive impact faster than if we were to step back."

Doing so also helps identify the financial impacts of different practices. "There are conservation practices that are good to a farmer's bottom line," says Endres. He cites reduced tillage as an example. "We've proven that there are a number of ways to reduce tillage that protects water quality with less erosion that maintains crop yield. There are other effective conservation practices that may never support the bottom line. It's important to differentiate those to understand where to target our funds." ♦

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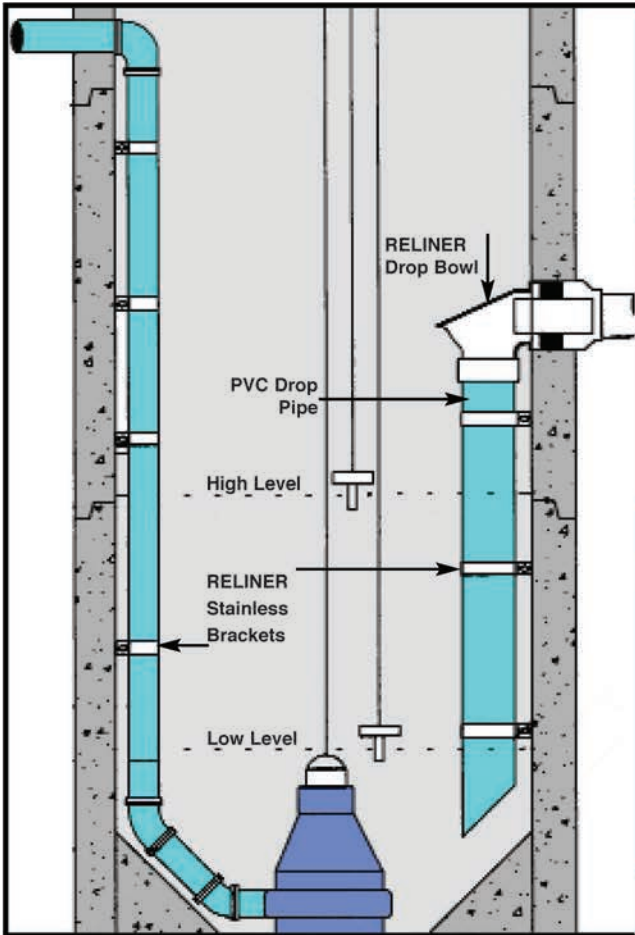
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Work group will address growing concern and ensure standards are met in the identification of existing problems

By *Ted DeBoda*

Our mission is to set standards for the assessment, maintenance and rehabilitation of underground infrastructure. In short, to ensure work is done right. In addition to controlling costs and maximizing efficiencies, however, standards are specifically developed to protect our communities from disaster, including those that occur as a result of cross bore.

Cross bore is a term used to describe an instance where an underground utility is installed directly through an existing utility. This is usually a result of horizontal boring or directional drilling techniques in the installation of a new utility conduit, with the install drilled directly through an existing, crossing utility. Natural gas providers commonly use directional drilling as an economical method to install gas distribution piping for mains and service lines.

Gas line cross bores into sewer laterals — which, since they are gravity drainlines, serve as a direct conduit to the home — damage the pipe and block flow, eventually leading to sewer backups. When the homeowner calls for a plumber to clear the line, a diligent plumber will generally try to clear the line with a root cutter, which could cut the gas line, resulting in a catastrophic explosion with significant property damage and, occasionally, loss of life. Often, roots will also camouflage cross bores, therefore the plumber has to be absolutely diligent when using CCTV to verify.

Best practices to identify these potentially dangerous cross bores are continually evolving based on lessons learned. The principle activity behind a good program involves deploying a CCTV camera with a locating transmitter inside the sewer lateral. The most effective and thorough way requires a lateral launch from the mainline, ensuring that 100 percent of all connecting branch lines are located and inspected.

Most states have regulatory statutes and fines that relate to pipeline damage prevention, but such actions typically only apply when the damage is reported. Cross bores in gravity drain systems, such as storm drain and sewer systems, remain unde-

tected until the crossing utility owner conducts maintenance, or the cross bore itself clogs the line. Typically, most cross bores will remain undetected for years.

Gas distribution providers are launching aggressive sewer investigation programs to ensure that all cross bores from past drilling efforts have been corrected. Referred to as legacy programs, time is of the essence to prioritize the areas most likely to have cross bores. Legacy programs are currently viewed as a maintenance operation, with many NASSCO contractor members involved in identifying and reporting these potential disasters. Unless gas companies can implement a fool-proof procedure for preventing cross bores on future installs, the legacy programs will most likely never end, and the responsibilities of contractors to properly inspect these lines will continue to be a critical step in keeping our communities safe.

Many municipalities are deploying the Pipeline Assessment and Certification Program and Lateral Assessment and Certification Program in the inspection of their sewer mains and laterals. In PACP, the OBI code, or “object intruding through a pipe wall,” is used to identify cross bores. Anytime this code is used, it alerts the system owner of the existence of a cross bore, and should be investigated immediately to determine if it is potentially a gas main. Many times the line can be “cleared” if there is no gas service in the vicinity, but it is imperative that this be done quickly and corrective action taken as soon as possible. Such swift and effective action for all segments in which the OBI code is used can prevent significant loss of property, and even save lives.

Understanding the importance of cross-bore assessment, NASSCO has recently formed a work group to address the growing cross-bore concern, and unite NASSCO members and others within our industry to ensure standards are met for identifying existing cross-bore activity and identifying ways to prevent them in the future. If you would like to know more, email info@nassco.org or call 410/442-PIPE (7473). ♦

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OTHER CLASSES FORMING

Contact one of the trainers listed above if you are interested in having a class at your facility or in your area.

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MANHOLE EQUIPMENT AND REHABILITATION

By Craig Mandli

APPLICATORS

1. Perma-Liner Industries Perma-Main Top Gun

The **Perma-Main Top Gun** from **Perma-Liner Industries** is a manhole-to-manhole, continuous inversion lining system. It is specifically designed to rehabilitate 8- to 24-inch-diameter pipelines in only a few hours with no excavation or disruption in substrate. The liner is air inverted through existing manholes and steam cured in as little as 90 minutes using compact 750,000 Btu dry steam generators. This minimizes repair time, road closures and reconstruction, and allows for safe reactivation of the repaired pipeline in just hours. Because the system can be continuously fed, there is no limit to the length of material it can invert. Depending on the infrastructure, the installation lengths for liners typically average 300 to more than 600 feet. Prep time is minimal because all liner materials are premeasured and delivered to the repair location pre-saturated. **866/336-2568; www.perma-liner.com.**

CHEMICAL GROUTS

2. Avanti International AV-254 Gelseal

AV-254 Gelseal injection grout from **Avanti International** is a hydrophilic urethane gel with permeation properties when injected in water. It quickly permeates various soils and cures to create an effective, long-lasting water barrier while providing soil stabilization. It is designed to stop water infiltration in manholes, sanitary and storm sewer mainlines, pipe joints, service laterals and other underground structures by providing support and strengthening surrounding

soils. Typical injection techniques are probe or curtain grouting and by remote packer. It is easy to handle, nontoxic, nonflammable, and is typically pumped at an 8-1 water-to-resin ratio, but in injection areas with high water flow it can be pumped without water. **800/877-2570; www.avantigrout.com.**

COATINGS

3. Raven Lining Systems AquataFlex 505 and 506

AquataFlex 505 and **506** high-performance protective coatings from **Raven Lining Systems** are designed to provide maximum versatility for performance and application. They are versatile novolac epoxy polyurethane hybrids, 100 percent solids, with zero VOCs. They are also NSF/ANSI 61 certified for potable water. They deliver strong adhesion properties to properly prepared concrete, steel, aluminum, wood, composites and many other substrates, and recently earned the USDA Certified Biobased Product Label verifying that the product or product family's amount of renewable biobased ingredients meets or exceeds levels set by USDA. **800/324-2810; www.ravenlining.com.**

EPOXIES

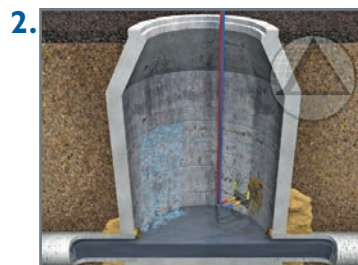
4. Sauereisen SewerGard No. 210X

Sauereisen SewerGard No. 210X is a protective lining that provides a chemical-resistant barrier for concrete, masonry, brick and steel substrates. It can be built up to 125 mils and offers strengths in excess of 15,000 psi, with the ability to maintain an elongation of more than 12 percent. As a 100 percent solids epoxy polymer, it is specified to protect infrastructure throughout the wastewater industry, including manholes and lift stations within collections systems to tankage, structural steel and secondary containment at treatment plants. Installation is easily completed using airless spray equipment, plural component spray equipment or roller. It is resistant to hydrogen sulfide and sulfuric acid, and moisture tolerant. **412/963-0303; www.sauereisen.com.**

5. Source One Environmental GreyCoat Epoxy

GreyCoat Epoxy from **Source One Environmental** is a 100 percent solid monolithic epoxy that offers chemical resistance and lasting durability with adhesion to concrete substrates and metal surfaces. The epoxy can build up to 1/4 inch without sag or shrinkage, and has a quick cure time depending

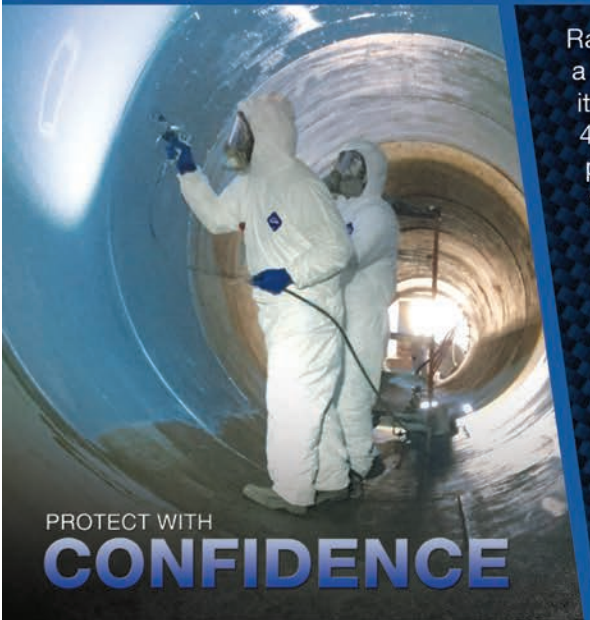
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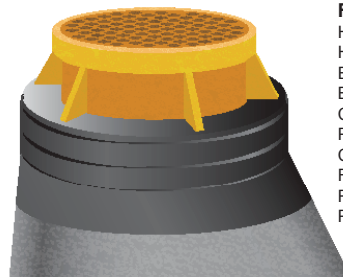
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on the temperature. It is designed to structurally repair a variety of substrates such as manholes, wet wells and vaults, and provides adhesion in damp humid surfaces. The material's viscosity also allows installation on vertical and overhead areas. As an environmentally friendly product, it contains no VOCs, CFCs or HFCs, and protects against hydrogen sulfide and other chemicals typically found in a sewer system. It is packaged in a two-part bagging system that eliminates guesswork and product waste. **877/450-3701; www.s1eonline.com.**

6. Standard Cement Materials 4553 Epoxy Coating Repair Kit

The **4553 Epoxy Coating Repair Kit** from **Standard Cement Materials** can be used to protect concrete in fiberglass manhole bottoms. The acid resistant, U.S. EPA Environmental Technology Program verified that it increases bond strength and reduces permeability to control concrete and brick deterioration in existing sewer manholes, damp lift stations, RCP and corrugated CMP, steel pipe inverts and WTP facilities. It can be applied by hand or sprayed from 65 to 250 mils, and is stocked in 15-gallon kits for easy field mixing. **888/278-1337 www.standardcement.com.**

INSERTS

7. Sealing Systems SSI Manhole Insert

The strong, durable **SSI Manhole Insert** from **Sealing Systems** can help stop unwanted inflow of rainwater through the manhole cover. The manhole cover inserts are custom sized to provide an enhanced fit and seal, and are manufactured from ultra-high-density polyethylene. They are simple to install with in-house personnel. **800/478-2054; www.ssisealingsystems.com.**

8. The Man Pan Classic

The **Man Pan Classic** manhole insert is strong and easy for field staff to handle. Its reverse-arch bottom provides strength and holds less water, which puts less stress on the insert. Lifting lugs make it easy for field staff to install and remove the unit with a pick or a J-hook. Its standard gasket provides an extra barrier to inflow and helps control odor. The unit is made from high-density polyethylene for forgiveness and corrosion resistance, and comes trimmed to order after a review of the user's needs. **724/942-9500; www.themanpan.com.**

LIDS

9. Trumbull Industries COMPOSITE Manhole Cover and Frame Assembly

The 24-inch **COMPOSITE Manhole Cover and Frame Assembly** from **Trumbull Industries** can pass a 50,000-pound proof load test per AASHTO M-306, H-25, yet weighs only one-third of a comparable cast iron frame and lid. Four stainless bolts compress the lid to the O-ring seal to prevent infiltration. Its O-ring seal design eliminates infiltration through the bolt holes. The underside of the lid allows the attachment of flow monitoring/leak detection devices. It is an ideal solution for manholes where hydrogen sulfide gas has caused deterioration to standard cast iron manholes. **800/677-1799; www.trumbull-mfg.com.**

MANHOLE LINERS

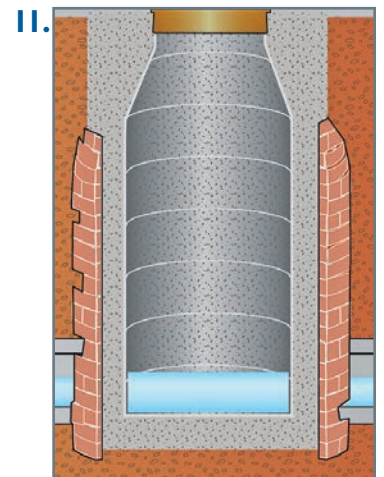
10. LMK Technologies CIPMH

The **CIPMH** manhole system from **LMK Technologies** is engineered to produce a cured-in-place seal that resists freeze/thaw conditions. Since it uses a stretchable liner, site preparation and installation can occur in the same day, eliminating the lead time for ordering. It can be installed as a chimney seal or as a full-depth manhole lining. Once the liner has been vacuum impregnated and manually inverted into the manhole, the liner will cure ambiently under pressure in one to two hours depending on depth. The end result structurally renews the repaired area while simultaneously reducing I&I. **815/433-1275; www.lmktechnologies.com.**

11. MONOFORM by Hydro-Klean

MONOFORM by Hydro-Klean is a no-dig or trenchless rehabilitation process of restoring manholes via installation of a monolithic concrete liner. Restoration is accomplished by installing a custom-forming system within the existing manhole, leaving an annular space to be filled with a high-strength ready-mix concrete. The system includes various diameters to fit most structures, including concentric and eccentric cone configurations. It can be used on older brick or block manholes in need of repair, and eliminates the troubles associated with open-cut replacement. The finished product withstands water traffic loads and has a design similar to that of installing

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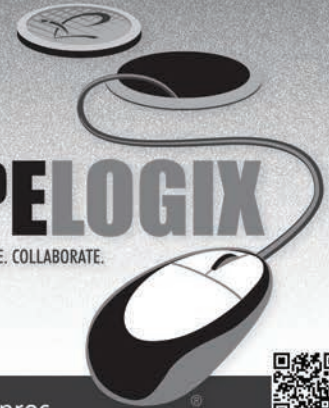
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12. SpectraShield Liner Systems

SpectraShield Liner Systems are a systematic layering of polymer resins designed to rehabilitate and protect wastewater structures such as manholes, wet wells or wastewater treatment plant facilities. A typical 7-foot-deep manhole can be completed in approximately one hour. **800/284-2030; www.spectrashield.com.**

MANHOLE PARTS AND COMPONENTS

13. RELINER Manhole Invert Channel System

The **RELINER Manhole Invert Channel System** is a molded fiberglass flume with a smooth sewer pipe interface used to rehabilitate inverts without flow interruption. The system provides a solution to insufficient manhole hydraulics, reducing the occurrence of backups due to wipes, paper and solids. The field-installed modular components bolt together, are adaptable to a wide range of field conditions and manhole sizes, and are compatible with all manhole-lining systems. Once installed, the fiberglass channels act as a form for the placement of a new concrete bench. The full-depth lined channels are high flow and easy to clean and maintain. Standard 8- and 12-inch-depth channel sections fit through a 24-inch manhole frame and will accommodate 6- through 12-inch pipes. Larger sizes are available. **800/508-6001; www.reliner.com.**

14. Simple Solutions Distributing Breakthrough Indicator Sticker

Breakthrough Indicator Stickers for Wolverine Brand odor filters from **Simple Solutions Distributing** indicate when the carbon is saturated and will require replacement, keeping the technician ahead of odor complaints. They change from green to brown to black. The change to brown occurs when 1 ppm of hydrogen sulfide is detected at the outlet of the filter. The 148SS model is specifically made for manhole filters, while the 153WP can be applied to any Wolverine Brand odor filter, with the exception of the WVI inline filter and MNHL manhole filter. **866/667-8465; www.industrialodorcontrol.com.**

15. USB - Sewer Equipment Corporation Alphajet

The **Alphajet** cleaning nozzle from **USB - Sewer Equipment Corporation** is designed to clean grease, sludge and crusts from lift stations and manholes prior to rehabilitation. It is actuated by water coming from the pressurized hose of the jetter truck. Four driving nozzles cause 360-degree controlled rotation in a horizontal plane, eliminating the need to cover the manhole. The horizontal rotation only allows for observation of the cleaning progress. The body requires no lubrication or replacement of internal mechanical parts within the first 12 months of operation, making it user friendly. Driving nozzles can be extended to accommodate various sizes of manholes/lift stations. **866/408-2814; www.usbsec.com.**

RISERS

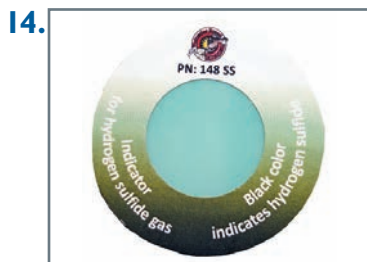
16. Abart Industries Top Hat

Top Hat recycled rubber manhole risers from **Abart Industries** are a cost-effective, reusable product that offers a cure for castings. They are custom fit to apply to any manhole design, absorbing impact from traffic and protecting the manhole structure. They help reduce water infiltration and wear and tear on vehicles while exceeding the life of the pavement. They are UV resistant, and heavy equipment is not needed to install them. Bolt packages are included, and they can be installed within 30 minutes, reducing lane closure times. They can be applied before or after blacktop application, making them a solution for after-thought adjustments. **315/730-2588; www.tophatrisers.com.**

17. LADTECH manhole riser ring

Manhole riser rings from **LADTECH** can be installed in minutes. The rings nest together, and include a 2 percent slope ring and a 1/4-inch spacer ring for a precision fit. They're made of high-density, lightweight recycled polyethylene, meet AASHTO's HS-25 axle-loading spec, and are impervious to H₂S corrosion that destroys concrete. **877/415-1252; www.ladtech.com.**

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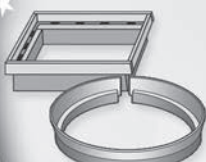
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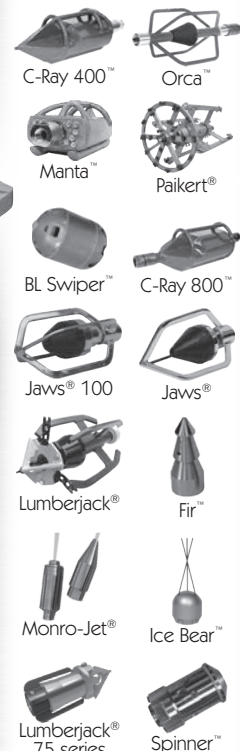
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SAFETY EQUIPMENT/TOOLS

18. Coneqtec-Universal HS-57 Series II

The **Coneqtec-Universal HS-57 Series II** is a heavy-duty hole saw skid-steer attachment that removes the collar and surrounding concrete and asphalt encasing manholes. It offers a 14 1/2-inch-deep cut, optional drum widths and optional centering arms for overlay projects. It has a heavy-duty hydraulic motor, and a breakout feature, meaning the loader arms stay positioned with a low center of gravity during operation and breakout. Its 45 carbide-tipped pics cut through concrete, asphalt and brick. A self-aligning hydraulic clamp attaches to the collar and pulls the drum into the cut. A 57-inch-diameter hole cut is standard, with optional sizes available. The unit lifts the collar and surrounding layers of concrete/asphalt when the cut is finished, and it can be set/released onto a truck bed for disposal or broken free to reuse the collar. It requires a skid-steer with 25 gpm or higher hydraulics. **888/832-3462; www.coneqtec.com.**

19. CUES SPIDER

The **SPIDER** wireless, color manhole scanner from **CUES** can calculate its position in the manhole shaft by using sensor data to measure its incremental motion. It weighs less than 30 pounds and can be hand-carried to easements or other difficult-to-access sites. The processing computer and battery supply are integrated into the scanner, which allows portability. It collects millions of 3-D measurements during each manhole inspection. The raw data is post processed to a 3-D point cloud that provides engineering and survey quality information on manhole geometry and condition that can be used for structural assessment, pre- and post-rehabilitation analysis, hydrological surveys, as well as general condition assessment. It provides live-video stream and recorded video that can be used for I&I studies. **800/327-7791; www.cuesinc.com.**

20. Duke's Root Control Razorooter II

Diquat-based **Razorooter II** root-control herbicide from **Duke's Root Control** is registered by the U.S. Environmental Protection Agency for controlling nuisance tree roots in sanitary sewer line collections systems, and received a classification of "evidence of noncarcinogenicity for humans." In 2014, the EPA further approved an amendment of labels to lower the signal word from "warning" to "caution." Crews insert a hose from manhole to manhole, preparing to fill the affected sewer pipe with herbicide. The

foam is released, compressing against pipe surfaces and penetrating cracks, joints and connecting sewers. Roots are killed on contact, decay naturally and slough away. Application is designed to prevent root-related stoppages for two to three years. **800/447-6687; www.dukes.com.**

21. H2TR MPR100

The **MPR100** manhole protection ring from **H2TR** protects lines from the rough edges of manholes by simply dropping it into the manhole prior to any equipment. It is produced in a highly visible safety orange to help identify the site and the open manhole, reducing potential hazards. It provides a full 360-degree area of edge protection. **517/204-2121; www.h2tr.com.**

22. LIFTPLAQ

The **LIFTPLAQ** tool allows manhole covers and road stoppers to be removed in a safe manner. The mechanical assembly is fitted with a powerful magnet, connecting firmly to covers and road plates. It is ideal for personnel working on dry and wet networks and can be fitted with extensions to suit large manhole covers. The ergonomic design allows workers to lift covers with their backs straight and knees bent. There is no contact between the operator's hands and the cover. The unit is easy to move and requires minimal storage space. **786/486-3197; www.liftplaq.us.**

23. RootX

Chemical root control from **RootX** is a long-term solution to pipeline root intrusion that will stunt and discourage new root growth without damaging the pipe. It poses no harmful effects to the water treatment system, and can be used to effectively reduce SSOs caused by root blockages. **800/844-4974; www.rootx.com.**

24. Southland Tool Saf-T-Guide Roller

The **Saf-T-Guide Roller** from **Southland Tool** keeps contaminated sewer water from splashing up from the manhole. It is made of aluminum and incorporates clear, removable Lexan side plates that protect the operator from spray and mist. The plates are 3/8-inch thick with rubber trim around the edge that won't come off. The center roller is made of durable nylon. The end lift plate allows the operator to insert hose with any size nozzle. Units are available for 24- or 36-inch manholes. **714/632-8198; www.southlandtool.com.**



25. Whirlygig

The **Whirlygig** system is a time-tested method of manhole riser/collar installation. It is size accurate, installs in minutes and leaves no doubt about quality control. Simply place a form on the manhole cone, trim the form to grade with the Radial Arm Trimmer, place the manhole ring, check accuracy and pour redi-mix. The system streamlines installation into a process that increases safety and ease of install, and works every time to produce a sturdy installation, even on slopes of steeper roads. 800/307-4263; www.wgig.us.

SEALANTS

26. The Strong Company Storm Seal

Storm Seal from **The Strong Company** is a specially formulated, fiber-reinforced, cementitious mixture designed for lining the interior of corrugated metal pipes, culverts, concrete pipes, catch basins and other stormwater structures. It is centrifugally cast using the Strong-Seal System mixer, pump and spinner, which are electronically controlled for consistent product and thickness of application. It may also be sprayed manually. 800/982-8009; www.strongseal.com.

27. Trelleborg Pipe Seals BIDCO C-56

BIDCO C-56 joint sealant and external joint wrap from **Trelleborg Pipe Seals** forms a bond with a wide variety of substrates including concrete, metals and plastics. Adhesion and cohesion during installation are excellent, and improve after the joint has been formed and placed in service. The sealant is designed not to shrink, oxidize or harden and has excellent resistance to extreme temperatures, acid and alkaline environments. The material complies with ASTM standard and specification as required by federal, state and local agencies. Applications include sanitary and stormwater manholes, pipes, septic tanks, box culverts, wet wells, utility and burial vaults. 800/626-2180; www.trelleborg.com. ♦



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FEATURED CASE STUDY

CCTV INSPECTIONS

Town takes control of storm water inspections



The Town of Renfrew, Ontario, maintains a storm and sanitary system including 55 miles of pipe. This system requires CCTV camera inspections to ensure the integrity of the infrastructure and to minimize the risk of contamination or flooding. Being a small municipality, the high cost of inspections limited their abilities to complete these inspections on a regular basis.

To overcome this, Renfrew acquired a **Deep Trekker DT340** pipe crawler. Deep Trekker CCTV crawler vehicles are entirely battery operated and do not require a dedicated truck to operate. This two carry-case system reduced the barrier to purchase a robust and capable system, with a lower up-front and ongoing cost in comparison to a typical CCTV inspection van.

Read the full story at www.deeptrekker.com/storm-water-cctv-inspection or call 519/342-3177.

Adjustable risers streamline paving operations



Problem:

Superintendent David Ramsey of Lower Allen Township Authority, Pennsylvania, needed an adjustable riser to accommodate the various manhole dimensions in the sewer system on short notice. The manhole raising solution needed to be quick to install, sturdy and reliable, and of course cost-effective. "The single-piece risers were just a solid ring

that couldn't be adjusted, so all that held them in place was the new paving," Ramsey says. "Often that wasn't enough, so they'd rattle or get loose after a few months. We also had to keep an eye on them as the paver passed over, which was tedious."

Solution:

We were actually introduced to the **American Highway Products** risers in 1997," Ramsey explains. "And based on the way our risers at the time were performing, they seemed like a good option to explore." The pivoted turn-buckle risers can be ordered in very fine size increments, they expand and lock into place, and they're custom made for each order, so diameter and thickness are always suited to particular utility frames and paving thickness.

RESULT:

"Just recently, we had a 60-day window turn into a seven-day window," says Ramsey. "So we put a rush order in on a Tuesday, and had our risers by Friday afternoon. That was very helpful." 888/272-2397; www.ahpl.com.

CCCP used to rehab large culverts under high-traffic roadway



Problem:

Aware of aging and deteriorating infrastructure, the city of Aurora, Colorado, contracted with Wilson & Company Inc. Engineers & Architects to conduct a comprehensive condition assessment of their corrugated metal pipe (CMP) stormwater infrastructure and assess various rehabilitation methods based on a set of specific criteria with regard to hydraulic capacity, load capacity and impact on the environment and traveling public. Two 96-inch CMP culverts under a major arterial roadway at the intersection of Louisiana Avenue and Biscay Street were found to be severely deteriorated and deemed to be in imminent danger of failure.

hydraulic capacity, load capacity and impact on the environment and traveling public. Two 96-inch CMP culverts under a major arterial roadway at the intersection of Louisiana Avenue and Biscay Street were found to be severely deteriorated and deemed to be in imminent danger of failure.

Solution:

ACE Pipe Cleaning, a certified applicator of **CentriPipe** from **AP/M Permaform**, began the rehabilitation process with cleaning, invert repair, void grouting, storm flow diversion and sandbagging to ensure any large storm runoff wouldn't flood the nearby neighborhood. They then applied the fine-aggregate cementitious CentriPipe liner in 1/2-inch passes to attain the engineered design thickness.

RESULT:

CCCP proved to be a viable and cost-effective rehabilitation method for the large-diameter CMP. The minimal footprint enabled it to be installed without disrupting traffic. 800/662-6465; www.centripipe.com.

Lightweight grade rings a fit for off-road manholes



Problem:

The District of North Vancouver, British Columbia, faced a problem in spring 2015 when they were tasked with the rehabilitation of existing manhole grade rings that were located off-road, in remote easements. They had a list of approximately 50 manholes that required attention and using a traditional concrete grade ring system made this project look daunting.

concrete grade ring system made this project look daunting.

Solution:

The district had heard about the expanded polypropylene **PRO-RING** system from **Cretex Specialty Products**. It meets AASHTO M306 for HS-20 and HS-25 traffic loading to withstand repeated impacts without damage, and is resistant to many chemicals. A traditional concrete grade ring would require several men or equipment to lift, while a 6-inch-thick PRO-RING weighs just 14 pounds. The entire ring system is assembled and bonded together in minutes using a construction adhesive/sealant to create a watertight, testable system. It is available in round, square and rectangular shapes.

RESULT:

The PRO-RING proved to be effective in this application, allowing crew members to easily handle and install the rings without risk of injury. It enabled the district to spend less time on the job site, use less material, and use a smaller crew. **800/345-3764; www.cretexseals.com.**

PVC liner used to rehab multiple manholes damaged by sinkholes



Problem:

Municipal Utility Districts around the Houston, Texas, area were discovering sinkholes in the ground surrounding manholes. Hydrogen sulfide gas from force main discharges was causing the problems. Inspections determined that the integrity of the manholes was compromised and was quickly

deteriorating, causing dirt and ground water infiltration that in turn caused excess debris to enter into the wastewater treatment plant.

Solution:

A corrosion-resistant **Danby PVC Liner** was used to rehab the manholes by excavating out any remains of the manhole below the base while installing a liner plate for trench safety. The manholes were designed with 1-foot thick walls that had double mat No. 5 rebar installed, a minimum 5,000 psi concrete and lined with Danby PVC corrosion-resistant modular panels. An HDPE force main drop was also designed and installed. The manhole lids are designed for HS20 load and were also constructed and lined using the Danby PVC liner to provide the corrosion-resistant protection necessary for a manhole with a force main. The liner easily accommodated the depth, shape and even the lateral connections found in these manholes.

RESULT:

The liner and panels help produce structurally sound, corrosion-resistant reconstructed manholes and manhole lids. **281/598-1126; www.danbyrehab.com.**

Access assemblies enable smooth pavement



Problem:

In the city of Elmira, New York, the dips, raises and cracking in the streets, especially in the areas surrounding manholes, were garnering some bad press. Craig Southard, senior engineer for the city of Elmira, hoped to find a solution that would also increase the life span of the pavement and make maintenance of city streets less

labor-intensive.

Solution:

He learned about **SELFLEVEL** access assemblies from **EJ** and ordered seven units. Judson Street, a street that would receive heavy traffic as the detour route for a major city thoroughfare, was selected as the test site. The **SELFLEVEL** eliminates steps that are par for the course with a typical one-
(continued)

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frame assembly, such as measuring to ensure the frame lines up with the existing curb line, and shimming the frame to match the pitch of the road. The immediate result after installation is a smooth street. Even after a winter of continual freeze-thaw cycles, the street will remain smooth as the covers move with frost heaves to match the pitch in the road. The unit can be used for either new installations or retrofits.

RESULT:

“It will save us money long-term, and will save us on maintenance, too,” Southard says. “It’s definitely a labor reduction internally of at least 50 percent. There’s also no need for extension rings.” **800/626-4653; www.ejco.com.**

Plugs allow company to divert flow in order to rehabilitate manhole bench and channel



Problem:

While performing the rehabilitation of sewer manholes in Baltimore County, Maryland, MIDAS Companies had difficulty controlling the flow while trying to rehabilitate the manhole bench and channel.

Solution:

MIDAS brought this issue to **Logiball** to see if they had a large flow-through plug that could provide an easier way to control the existing flow in order to allow a more efficient rehabilitation of the manhole bench and channels. Logiball proposed its **Type “D” Flow-Thru Plugs**. The double-action bladder allows for the inward bladder to seal against the pump suction hose or bypass pipe while the outer bladder seals against the host pipe wall.

RESULT:

Use of the plugs allowed for a quicker and safer diversion of flow while performing the rehabilitation of the manhole bench and channel. **800/246-5988; www.logiball.com.**

Tool saves city time and money on water services repair



Problem:

The city of Van Wert, Ohio, needed to replace the water services at a busy intersection, which included drilling 28-inch-diameter holes through 12 inches of blacktop. The project needed to be completed at the same time as another road closure, which put pressure on the city to complete the project as quickly as possible without having to rent or buy new equipment.

Solution:

Through the street department, the city had access to a **Mr. Manhole Six Shooter Gold Series** tool that could cut the 12 inches of blacktop in just eight to 10 minutes. After the initial cut, it took just under two hours to excavate the

holes so the city could perform the work on the water services. As an added bonus, the circle cut meant that the road is much less likely to split or crack, potentially saving the city thousands of dollars in damage.

RESULT:

Incorporating the tool ensured that the project was successfully completed on time and within budget. The workers and the water superintendent of Van Wert have said the Mr. Manhole tool made the whole project easier, and they were very pleased with the results. **419/741-9075; www.mrmanhole.com.**

Epoxy and adhesive provide transition between T-Lock and concrete manhole



Problem:

Two manholes at the Los Angeles County Sanitation District’s Joint Outfall “G”, Unit 9 Trunk Sewer Rehab Phase 4 Project required epoxy coating of the base/bench with reliable connection to the previously installed T-Lock PVC liner. Standard epoxy resins couldn’t be used, as they don’t adhere to PVC materials.

Solution:

Neopoxy International recommended using a combination of solvent-free **PVC adhesive/primer** and hand-applied epoxy resin **NPR-5305**. Sancon Engineering applied a 1-inch-wide strip of PVC adhesive on the low edge of the T-Lock sheet. The next day, benches were coated with high-strength, corrosion-resistant epoxy **NPR-5305**, overlapping the PVC adhesive strip. That epoxy coating bridged the PVC material with the concrete manhole floor.

RESULT:

The combination of PVC adhesive and **NPR-5305** epoxy resin created a reliable transition between PVC material and concrete structure. **510/782-1290; www.neopoxy.us.**

Resin used to repair storm drain manholes



Problem:

Sinkholes had developed around storm drainage manholes in grassy areas of a military housing subdivision in Richmond, Virginia. Besides being unsightly, this posed a danger to neighborhood children. Flooding the sinkholes identified infiltration points further up the structure. The connection of the inlet pipe from the surface catch basin and the connection of the storm main near the bench were the source of most leaks. These connections have brick aprons that have been surface sealed. There were no rubber boots present. Water leaked between the bricks through cracks in the surface seal.

Solution:

The crew injected **Prime Resins Prime Flex 920** through the manhole wall to fill voids and create a watertight curtain. Prime Flex 920 is an expan-

sive hydrophobic polyurethane resin that forms a watertight mass. The grouting was done from inside the manhole because the repair locations were so deep — as much as 20 feet from the surface. Technicians repaired wide gaps around the main connection by soaking oil-free oakum with hydrophilic Prime Flex 900 XLV and pushing it into the gaps to seal the openings with a bond to the wet concrete.

RESULT:

The crew tested their repair by flooding the sinkhole again and saw no infiltration. The contractor completed the repairs with 8 gallons of material. 800/321-7212; www.primeresins.com.

Structural polyurethane liner proves itself in demonstration



Problem:

Mishawaka, Indiana, was removing and replacing existing pipelines and manholes in a densely populated area of the city. Conco Spray Solutions was subcontracted to rehabilitate the manholes. Jennifer Hoop, Conco president, believed Sprayroq could be of great benefit, and wanted to prove it though a demonstration. Hoop proposed that

the city allow Conco to apply polyurethane lining material to one manhole scheduled for demolition, to demonstrate its strength and structural rehabilitation properties.

Solution:

Conco was allotted a manhole with severe structural issues, inflow and infiltration. Following two hours of light pre-lining prep work, the old brick manhole received a 250-mil lining of **Sprayroq SprayWall** structural polyurethane, completed in a single pass in one hour. The manhole was returned to service immediately after the invert was sprayed.

RESULT:

The city was impressed with the speed and application of the product, and its ability to provide savings in the quick return to service and true structural properties. Mishawaka recognized its viability for future rehabilitation and protection projects. During the manhole demolition, an excavator with an operating weight of approximately 65,000 pounds, ground pressure around 8.82 psi and bucket breakout pressure of 39,000 psi was used to subject the manhole to multiple hits. Even after this — with its brick structure crumbling — the lining material inside stood strong. 205/957-0020; www.sprayroq.com. ♦



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Product Spotlight

Detailed manhole inspection and 3-D scan in under a minute with RST Helix

By Jared Raney

Imagine your typical manhole inspection. You're probably picturing the use of a pole cam or other manual camera system, unwieldy and difficult to use, with substandard results. Or even worse, you're picturing physical entry into the manhole, with the inherent dangers and hassles of confined-space entry.

Now imagine getting a detailed scan of a manhole — both comprehensive imaging and 3-D mapping — all at the push of a button, literally.

"The RST Helix is a manhole inspection system capable of producing an incredibly detailed manhole inspection in under 60 seconds," says Andrew Clinkingbeard, product specialist for the Helix system with R.S. Technical Services. "Operators simply position the system over a manhole and press a button to start the scan process.

"From there the unit automatically travels down the manhole, capturing every surface with high-resolution 2-D images, as well as hundreds of thousands of 3-D data points," Clinkingbeard says. "The entire scan process can be monitored wirelessly via tablet or laptop."

Helix is fully automated and can be deployed from a CCTV vehicle, pickup truck or ATV by a lone operator. R.S. Technical says the system will scan a typical 10-foot manhole in less than one minute.

It uses six high-resolution cameras to capture panoramic imagery of every surface within the manhole, six 3-D sensors recording hundreds of thousands of spatial data points, and a sonar system to assist in scanning.

The automatic system includes probe, cable reel, launching boom



and wireless control unit, and the data is compatible with NASSCO's MACP standards.

"The heart of this product is its imaging system," Clinkingbeard says. "Viewing the inspection in software becomes a completely immersive experience, allowing the user to pan, tilt, zoom, and even take measurements of every surface. It's as if he was actually in the manhole, but can take place in the safety of the office."

Developed to lower manpower costs and improve system performance in I&I analysis and structural evaluation, the Helix system is meant to bring users accuracy and simplicity.

"Our top priority when designing this system was data quality," Clinkingbeard says. "We made the unit as compact as possible without sacrificing imaging and functionality. ... It can also be used to inspect wet wells, chambers, and pretty much any other type of vertical shaft."

The system comes with a tablet, but can also connect to laptops, personal tablets or even cellphones. Helix Dashboard automatically receives the scan data, which can be reviewed in the office or field. It also shows past inspection data and usage statistics.

"This scanner is a general-purpose manhole inspection system," Clinkingbeard says. "Inspections can be viewed later in the office, where software allows the user to look around virtually, take precise measurements and generate reports." **800/767-1974; www.rstechserv.com/helix**.

Sioux's Low-Pressure Steam Solution for Trenchless Pipeline Rehabilitation



Sioux's line of Steam-Flo steam generators is quickly becoming the selected choice for curing pipe liners. The Steam-Flo increases production by transferring heat faster than hot water or ambient curing. The steam-cure system increases efficiency with faster set up and reduces water usage and sewer system pollution. Steam curing reduces the risk of liner failure due to heating the liner too quickly or slowly. Sioux's LowNox Steam-Flo also meets

California's South Coast Air Quality standards. Sioux has been designing and building low-pressure steam generators since 1939. These units are rug-

ged, compact, and easy to operate. There are many different mounting options available, including completely self-contained trailer-mounted systems for remote applications. Sioux specializes in application specific designs and has the capabilities to design the exact piece of equipment you need. **877/763-4039; www.sioux.com/trenchless-pipeliner-rehabilitation.html**.

Envirosight CleverScan



CleverScan performs a comprehensive, fully automated assessment of manhole condition in just two to three minutes. It captures visual and dimensional data, and presents the user with three powerful deliverables: a flat scan with detailed image data covering every inch of the manhole wall; a dense point cloud

for 3-D visualization of the manhole structure and easy CAD integration; and a virtual view inside the manhole, where an operator can pan, tilt and zoom to areas of interest. With the press of a button, the system's probe descends into the manhole, capturing image data using five HD cameras and building a dimensional profile using an array of four lasers. An onboard rangefinder controls descent and determines when the scan is complete. Scan data is immediately transferred to a laptop running CleverScan software, where it can be viewed, annotated and shared. **866/936-8476; www.envirosight.com/cleverscan.php.**

Vactor RamJet 850 Series truck jetter



Vactor Manufacturing has updated the RamJet 850 Series truck jetter, offering an optional aluminum rear shroud with heavy-duty, see-through Lexan windows that keep the hose and components warm while working in extremely cold conditions. The RamJet 850 comes standard with a certified water pump flow of 0 to 80 gpm at a variable pressure up to 2,500 psi at the hose reel and features a choice of front or rear hose reel locations. **800/627-3171; www.vactor.com.**

TRIC hydraulic pump



TRIC Tools' 14 hp, 6,000 psi hydraulic power pack is designed to accompany the TRIC lateral pipe bursting system. The pump delivers 2 to 8 gpm to the pulling unit, and the Kohler engine couples directly to the oil gear pump, eliminating the need for a lovejoy connector between the pump and the engine. It also has a muffler heat shield and an all-welded steel frame for strength and durability. The wheels have been upgraded to withstand rigorous field use. **888/883-8742; www.trictools.com.**

Valley Industries HardCore hose reels



HardCore fluid-handling hose reels from Valley Industries are made with Schedule 40 316 stainless steel, making them corrosion resistant. Available in manual and electric drive units, each frame is made of lightweight aircraft-grade aluminum. The electric drive units use a heavy-duty gearbox system and can be disengaged

for easy unspooling. **800/86401649; www.valleyind.com.**

CUES Easy Grout system



The computerized grout control system from CUES is designed to consolidate the valves, electrical controls and more into an instrumentation cabinet that can be mounted in any location. Easy Grout's graphic user interface leads you through the grouting process and includes help files and tool tip descriptions to assist new users. An automated entry logic provides recommended settings

for the grouting process based on the basic inputs of pipe size and depth. **800/327-7791; www.cuesinc.com.**

Oxford Plastics composite modular road plates



Composite modular road plates from Oxford Plastics have a highly visible yellow color, integrated antiskid surface, chamfered edge, interlocking sections, and can be installed by only two people. The plates are HS20-certified and DOT approved. **800/567-9182;**

www.oxfordplasticsusa.com.

Aries Sentinel portable inspection system



The Sentinel inspection system from Aries is an integrated system with components operated by an all-in-one controller. The compact, portable unit combines a tractor, camera and lightweight reel. The control unit has an 8.4-inch LCD screen and internal DVR and can be hand-held or mounted on a desktop. The tractor has various wheel sizes and can be set up for standard operation in 6- to 15-inch pipe. A large line kit facilitates navigation in pipes up to 36 inches. The pan-and-tilt camera has auto focus, white balance and a 40:1 optical zoom. **800/234-7205; www.ariesindustries.com.** ♦

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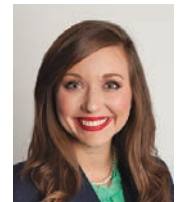
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The Strong Co. announces new appointments

Mike Kappler was named national sales manager for the Strong-Seal System for infrastructure rehabilitation. Emily Lanier was named marketing coordinator and sales representative. She will coordinate all company marketing efforts and serve as a sales representative for infrastructure rehabilitation products. Laurel Maranto was named national sales representative and will have sales and product management responsibilities for Strong-Seal's family of products. Jenny Beck was named national sales representative and her primary responsibility will be for the company's lightweight concrete products, in addition to the Strong-Seal product line.



Emily Lanier



Laurel Maranto



Jenny Beck

Rausch announces new distributor

Rausch Electronics announced Peirce-Eagle Equipment of Branchburg, New Jersey, is the newest addition to their list of authorized distributors. Peirce-Eagle will provide Rausch Electronics equipment, service and parts to the municipal sales market.

Itron recognized as a leader for Meter Data Management products

Itron has been named to the leaders quadrant in Gartner Inc.'s Magic Quadrant for Meter Data Management for the fourth consecutive year. Itron's Enterprise Edition MDM is in production at 76 utility companies with more than 38 million cumulative meters.

AWWA Board of Directors selects David Rager of Cincinnati as next president-elect

The American Water Works Association selected David Rager as the association's next president-elect during its annual winter meeting. An AWWA member for almost 15 years, Rager is the principal of Rager Management Consulting. He will serve his one-year presidential term beginning in June 2018.

Aclara acquires Smart Grid Solutions division

Aclara Technologies acquired the Smart Grid Solutions division of Apex CoVantage. The transaction includes the ProField mobile workforce management technology used for smart grid demographics and the Smart Grid Professional Services business comprising utility field services and consulting. ♦



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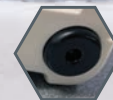
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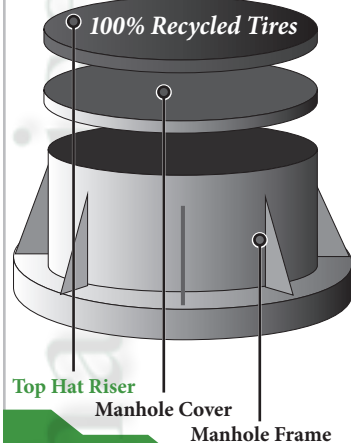


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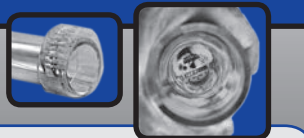
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PEOPLE/AWARDS

The city of **Centralia** received a \$25,000 grant for stormwater capacity from the Washington Department of Ecology.

The city of Muskogee (Oklahoma) Public Works Department announced the retirement of **Francie Martin**, who began working for the city in 2005. Martin was responsible for assisting the environmental technician in the operation of stormwater quality management and the stormwater management system.

The U.S. Environmental Protection Agency, the New Mexico Environment Department and the city of **Santa Fe** announced that the city will receive \$150,000 in services through an EPA “toolkit” for managing stormwater pollution. Specifically, the package will include a step-by-step guide to help the community develop long-term stormwater plans, a web-based toolkit for planning and technical assistance for the city to develop a model for other neighboring communities.

Kevin Krulik was named city engineer for the city of Lebanon (Indiana). Krulik will oversee the planning, street and stormwater departments.

The city of Deerwood and **Summer Place Association** were presented the 2016 Minnesota Pollution Control Agency Community Partnership Award. The award was presented as part of the Minnesota Association of Soil and Water Conservation District Convention. In 2015-'16, the city of Deerwood, Serpent Lake Association and Summer Place Association partnered to complete a major stormwater retrofit project. This project now filters polluted runoff and helps control the flooding problem that Summer Place residents faced in 2012. The city also worked with Crow Wing County to donate two parcels of tax-forfeited land for this project. The city donated an additional 16,000 square feet of land for this project, and Summer Place Association donated 6,500 square feet.

Geauga Soil and Water Conservation District was recognized for its “Outstanding Project” by the Ohio EPA’s Ohio Environmental Education Fund. The project was a collaborative effort with the Northeast Ohio Public Involvement and Public Education work group. Titled “From the Upper Reaches to Lake Erie’s Beaches: A Banner Year for Nonpoint Source Pollution Solutions,” the regional stormwater initiative promotes watershed awareness and household habits to improve water quality for residents and homeowners in the Lake Erie Basin. Sets of collapsible banners were created with five unique themes, along with an accompanying brochure with stormwater pollution solutions.

The city of **Fort Wayne** (Indiana) honored employees for milestones in their years of service. The following individuals were honored:

- Thomas Pallone Jr., city utilities, 45 years
- Jay Hursh, stormwater maintenance, 30 years
- Rick Seals, city utilities, 30 years
- Patrick Drudge, stormwater maintenance, 25 years
- Robert Heredia, stormwater maintenance, 25 years

LEARNING OPPORTUNITIES

Wisconsin

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

CALENDAR

April 23-26

American Public Works Association 2017 North American Snow Conference, Iowa Events Center, Des Moines, Iowa. Visit www.apwa.net.

April 30-May 3

American Water Resources Association 2017 Spring Specialty Conference, Snowbird Ski and Summer Resort, Snowbird, Utah. Visit www.awra.org.

May 21-25

American Society of Civil Engineers' World Environmental & Water Resources Congress, Sacramento Convention Center, Sacramento, California. Visit www.ewricongress.org.

June 11-14

American Water Works Association Annual Conference & Exposition, Pennsylvania Convention Center, Philadelphia. Visit www.awwa.org.

June 14-16

Florida Stormwater Association Annual Conference, Sanibel Harbour Marriott Resort and Spa, Ft. Myers, Florida. Call 888/221-3124 or visit www.florida-stormwater.org.

June 25-28

American Water Resources Association 2017 Summer Conference: Climate Change Solutions, Sheraton Tysons Hotel, Tysons, Virginia. Visit www.awra.org.

June 26-29

National Association of Flood and Stormwater Agencies Annual Meeting, Belmond Charleston Place, Charleston, South Carolina. Visit www.nafsa.org.

July 16-19

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

Aug. 27-30

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

Aug. 27-31

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

Sept. 18-20

National Rural Water Association WaterPro Conference, Reno, Nevada. Visit www.nrwa.org.

Oct. 8-11

American Society of Civil Engineers 2017 Convention, New Orleans Marriott, New Orleans, Louisiana. Call 800/548-2723 or visit www.asce.org.

Nov. 5-9

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

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