

# I&I

INFLOW & INFILTRATION SOLUTIONS AND EQUIPMENT

Supplement to:  
MUNICIPAL  
SEWER  
&  
WATER



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to diagnose  
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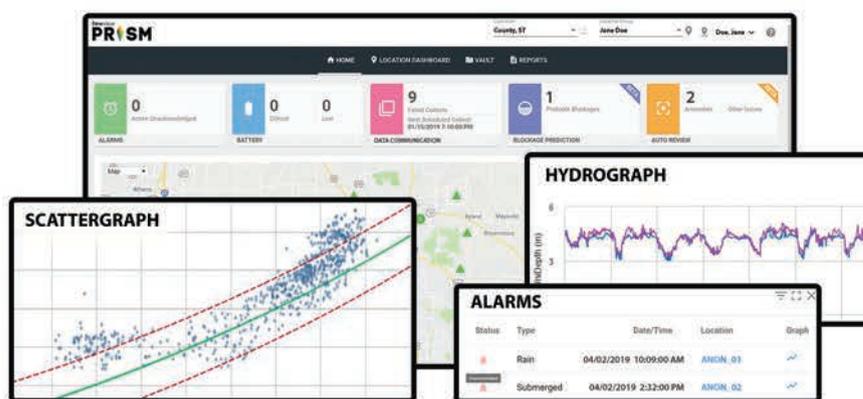
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Summer 2019

# I&I

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COVER PHOTO: Kenny Andrews, smoke-testing crew leader at Compliance EnviroSystems, smoke tests a sewer line in Baton Rouge, Louisiana. The company uses smoke testing and an advanced data center to evaluate sanitary sewers and storm drains. (Photography by Meggan and Jeff Haller)



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# Depth of Analysis

## Specialty contractor focuses on data collection and delivers accurate diagnoses

STORY Ken Wysocky | PHOTOS Meggan and Jeff Haller

**W**ith its large fleet of camera trucks, combination sewer trucks and other equipment, Compliance EnviroSystems would appear to be a large, well-equipped sewer cleaning contractor. But its highly visible public face belies its true mission, which plays out more behind the scenes: helping municipalities find the troublesome sources of inflow and infiltration.

“All that equipment is there just to provide our clients with data,” says David Guillory, vice president of business development for CES, headquartered in Baton Rouge, Louisiana. “All of the evaluation work we do — things like sewer cleaning, smoke testing and televising pipelines — is related to I&I detection. We consider ourselves an I&I detection company that happens to do a lot of sewer cleaning, too.”

“The data is where the rubber really meets the road,” he continues. “That’s the key deliverable for our clients in I&I situations. We spend a lot of time analyzing data and developing GIS maps for clients, which is what usually differentiates us from our competitors.”

A staff of about 20 experts does the analysis work in a data-management center in Baton Rouge. “All they do is compile and analyze data,” Guillory explains. “They’re doing reports all day long.”

It’s not unusual for companies like CES to provide data for clients. But two things separate the company from most of its competitors: the depth of the analysis and the collective experience of its staff.

Moreover, the company — established in 1995 by Ken Dutruch — has developed a solid reputation by staying in its lane. Some I&I detection companies diversify into trenchless rehabilitation services such as pipe lining, grouting and pipe bursting to fix I&I problems.

CES, on the other hand, specializes in just collecting, analyzing and disseminating data to clients. And along the way, the company has laid down some impressive numbers: an estimated 90 million feet — or a little more than 17,000 miles — of pipelines evaluated.

Every so often, the company will tackle a pipe cleaning project, usually a large-diameter pipeline. But the vast majority of the time, the company’s focus is on data, Guillory says.



Smoke-testing crew leader Kenny Andrews (right) and assistant smoke tester Danny Gonsaulin use a Hurco Technologies smoke machine to test sewer lines in Baton Rouge.

The management team at Compliance EnviroSystems includes, from left, David Guillory, vice president of business development; Brad Dutruch, president; and Joshua Hardy, vice president of engineering.





## COMPLIANCE ENVIROSYSTEMS

### Baton Rouge, Louisiana

**FOUNDED:**  
1995

**OWNER:**  
Brad Dutruch

**EMPLOYEES:**  
160

**SPECIALTIES:**  
Evaluating sewer lines to detect inflow and infiltration sources; collecting and analyzing data; large-diameter pipe cleaning

**SERVICE AREA:**  
Southeastern U.S.

**WEBSITE:**  
[www.ces-sses.com](http://www.ces-sses.com)



Compliance EnviroSystems data center employees include, from left, Matthew Baccari, Dimitry Morvant, Kevin Daigle, Franklin Mejia, Jason Carrell, John Middleton, Joshua Hardy, Hermanus Martin, Prabin Panta, Julian Carrell, Marchandrea Seals, Felix Cunningham and Chris Bizzell.

**“Every situation is different — we’ve probably seen it all. The only good thing is that when something becomes the norm, you just get used to working with it.”**

David Guillory

### QUALITY DATA

Guillory says CES provides quality assurance and quality-controlled data, which ensures customers are getting a comprehensive, in-depth and accurate analysis of what’s going on inside their infrastructure. This leads to better solutions for I&I problems.

“Some companies just give clients raw data right off the (camera) truck without it being quality-assured and quality-controlled,” he explains. “But with our process, clients get a higher-quality deliverable. Some of our clients end up coming to us because they get tired of receiving bad data. That’s the whole point of why they hire us. Developing a good, quality product helps set us apart.

“Sure, it costs more for us to evaluate a foot of pipe than our competitors, but we feel our clients get a better deliverable for that money,” he adds. “We’re not the cheapest contractor among all of our peers, but I know we provide the best product.”

It typically can take anywhere from a week to more than a month to get the data to clients, depending on their needs. Sometimes clients would rather get everything at one time, while others want it in chunks as it becomes available. But either way, Guillory says the data CES supplies is better than feeding clients raw data without any accompanying analysis.

### EXPERIENCE MATTERS

The company’s expertise stems from its senior management, which has compiled decades of pipeline-evaluation experience. For example, owner Brad Dutruch, the son of Ken Dutruch, has 25 years’ experience in the industry, dating back to his days in high school.

Furthermore, Dutruch is a former one-term president of NASSCO and is a certified trainer for pipeline assessment. As if that’s not impressive enough, he also has evaluated more than 40 million linear feet of pipe since 1995.

The firm’s vice president, Joshua Hardy, has been with CES for more than 20 years and has managed the evaluation of more than 10 million feet of inspections and overseen 100 flow studies. He is also a professional engineer.

So is Guillory, who also used to be the director of the Baton Rouge Department of Public Works where he managed 800 employees and negotiated and oversaw a \$1.4 billion consent-decree project to rehabilitate and enlarge the city’s system.

The company’s roughly 160 employees also include veterans of the industry like Tim Jacobs, a project manager with 32 years’ industry experience. Jacobs has supervised challenging underwater jobs and river-basin cleaning projects, handled floating rigs and countless other pieces of equipment, and managed numerous routine cleaning projects.

In fact, Jacobs currently is managing a sewer assessment and rehabilitation program in Memphis, Tennessee. CES technicians there are in the sev-

enth year of an 8- to 10-year project that includes evaluating nearly 3 million feet of pipe, 18 inches in diameter or smaller, and another 385,000 feet of interceptor pipe, ranging from 2 to 8 feet in diameter.

## BLOWING SMOKE

Smoke testing has always been one of the company's primary tools for finding sources of I&I. The company owns approximately eight smoke-testing machines made by Hurco Technologies.

"We do a lot of smoke-testing work," Guillory explains. "Smoke testing is one of the better I&I detection processes because smoke is very good at finding leaks — places where it can escape. It's more effective than televising a line because an inspection camera can't always see defects in pipelines.

"With a camera, you can see a crack in a pipeline, but you don't know how much that crack is contributing to I&I unless you use smoke testing," he adds. "Smoke testing just catches things that cameras can miss. They're very different tools, but they're both useful in their own way."

Smoke testing also is a very cost-effective way to track down I&I problems, which makes it an attractive option for customers. Sections of sewer lines undergoing testing (typically from manhole to manhole) are isolated with pipe plugs or sandbags, which also increases the air pressure inside pipes and helps force smoke through defects.

"The longer the pipe you're trying to smoke, or the bigger the diameter, the longer it takes to build up enough pressure to make smoke-detection work," Guillory points out. "So depending on those specifications, it may help to isolate as small a segment of the pipe as possible."

## WHERE THERE'S SMOKE

Typically within minutes, technicians will see smoke emerging from the ground wherever there's a leak. "You'll see it come out of the ground in people's yards (from leaks in lateral lines) or from under sidewalks — just about anywhere," Guillory says. Furthermore, sometimes smoke testing will also reveal pipeline connections that municipal officials weren't even aware of before.

Crew members mark leak locations with flags and also snap a photo for a visual reference point. Nowadays, CES crews also use GPS units made by Trimble to document the location of smoke leaks. If there aren't any leaks, technicians will typically see smoke emerging only from the next manhole downstream or from stack-pipe vents on the roofs of homes.

Because it's hard for smoke to travel through wet ground, soil conditions must be dry for testing to be successful. "Down here in Louisiana, the water table is high and it rains a lot, so it's hard to find those conditions all the time," Guillory explains. "It doesn't necessarily limit our use of smoke testing — you just need to wait for the right conditions to do it."

Under ideal conditions, it takes roughly 15 minutes to smoke-test one manhole-to-manhole section of sewer pipe. An experienced and capable crew working in ideal conditions can test 8,000 to 10,000 feet of sewer line a day, Guillory says. *(continued)*



The crew uses Trimble GPS units to document the location of leaks.

## RELYING ON EXPERTISE AND EQUIPMENT

When municipalities hire Compliance EnviroSystems to help them find the sources of inflow and infiltration, David Guillory compares the investigatory process to finding the proverbial needle in a haystack.

"And sometimes the smaller I&I jobs are the more challenging ones because you're really trying to pinpoint and home in on the sewer leaks causing a particular problem, perhaps at a pumping station or a treatment facility," says Guillory, vice president of business development for the business, based in Baton Rouge, Louisiana.

"But we hold clients' hands through to the end. And more often than not, there's not just one problem. We may well determine that we think there are 10 to 20 problems a client may need to fix in order to stop I&I.

"Sometimes we're looking for needles in a haystack, but if you're doing this right, you stick with the client until you find the problem," he

adds. "When you sign that contract for a job, you're really on the hook to find a solution."

That's where the company's depth of employee experience, both in upper management and out in the field, plus investments in technologically advanced equipment, all come into play. As an example, Guillory cites a recent project the company performed in Houston, where the city is broken down into hundreds of municipal utility districts (or MUDs) that control their own water and sewer services.

"Each MUD has a particular set of problems, and one of them called us to find the problems," Guillory says. "A lot of times it's one big problem they're looking at — maybe a treatment plant that gets overloaded when it rains, for instance," he says. "But that usually isn't caused by one or two problems: There might be 35 or 50 little problems.

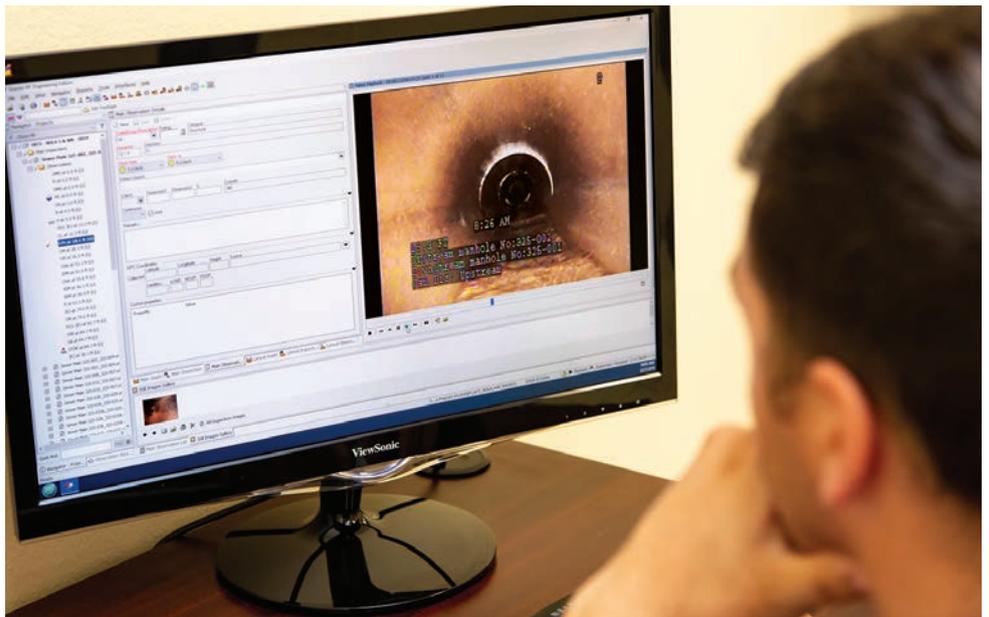
"Sure, sometimes you find one smoking gun, but usually it's a lot of small things creating a big

problem, such as defects in the pipe, missing clean-out cap or cross connections."

To get started, CES typically does flow monitoring in a larger area, which can indicate the source of the problem. "Flow monitoring can narrow down the search and save clients money," he explains. "Say a flowmeter in a particular sewer line shows 1,000 gallons of water passing through on a dry day, but then shows 50,000 gallons passing through a day later, after it rains. That tells us that something is leaking badly upstream because technically, rain shouldn't be getting into the sanitary sewer lines."

From there, Guillory says CES technicians can isolate small sections of pipe and use tools such as smoke or dye testing and/or camera inspection systems to pinpoint the problems. "We have a big group of folks who put their heads together to solve these kinds of problems for clients."

Data technician Chris Bizzell analyzes incoming data at the CES data center (Granite XP software by CUES).



To detect pipeline leaks, CES also uses dye-testing tablets made by BRIGHT DYES - Division of Kingscote Chemicals; a sonar-testing unit manufactured by Cobra Technologies coupled with a Trio-Vision camera and robotic crawler; CCTV trucks outfitted with inspection camera systems made by CUES, RapidView IBAK North America and EnviroSight; and flowmeters from Teledyne ISCO, ADS Environmental Services, Hach and FlowWav.

The company relies on 32 Vac-Con and Vacall combination trucks for cleaning sewer lines. Waterjetting hoses are transported to inaccessible locations with easement machines built by Vactor, PipeHunter, Sewer Equipment and Stanley Infrastructure. CES also owns three Marsh Master amphibious vehicles, manufactured by Coast Machinery.

### HIGH-WATER CHALLENGES

One of the biggest hurdles faced by CES crews is the unusually high water tables in Louisiana, not to mention the fact that cities like New Orleans actually sit about 15 feet below sea level. "On the West Coast, where it's very dry, they're trying to keep water inside pipes," Guillory notes. "Here in the South, especially along the coast in Louisiana, the water table is very high, so we're trying to keep water out of the pipes. You dig down 5 feet in New Orleans and it's just mush."

As such, CES crews typically are evaluating sewer lines that almost always are fully surcharged. To contend with this, crews often use bypass pumps and isolate line segments by plugging them at both ends, then pump out the water in order to work.

"Even then, sometimes the sewer lines start to leak right away," Guillory explains. "Every situation is different — we've probably seen it all. The only good thing is that when something becomes the norm, you just get used to working with it."

For example, sometimes a crew might isolate and pump out a segment of a sewer line, only to have it fill up with water right away, making camera inspections difficult. In those cases, the crew might be forced to wait until the water table drops enough to allow televising operations.

"A lot of it just depends on rainfall and how high the river is, because both those things affect the water table," he says. "If you're standing downtown in the French Quarter and you're close to the river when a big barge comes by, you'll be looking up at the barge because you're actually below where the river is flowing."

"We're always working under wet conditions, which means there's a little more setup and breakdown time on the front and back ends," he continues. "In New Orleans, it can even depend on what part of town you're working in. It's an entirely different process to get a line televised in the French Quarter, for example, than in another part of town."

### LOOKING AHEAD

Guillory sees continued growth for CES, but he emphasizes it will not come through service diversification. "We could line or fix pipes, but we don't veer into that lane," he notes. "We stay in our own sandbox, which is detecting I&I through cleaning and evaluation. It's what CES is built on, and it's what we want to keep doing."

"Plus, it takes different people with different skill sets, as well as other kinds of equipment, to provide other services," he adds. "Furthermore, we're not in danger of running out of work anytime soon. In the areas where we provide service, there's plenty of work to keep both us and our competitors busy for quite a while." **I&I**

**"We could line or fix pipes, but we don't veer into that lane. We stay in our own sandbox, which is detecting I&I through cleaning and evaluation."**

David Guillory

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# MILWAUKEE METRO SEWERAGE DISTRICT

## Pilot program starts with just eight communities and has now expanded to all 28 in southeastern Wisconsin

By Cory Dellenbach

**W**hen the Milwaukee Metropolitan Sewerage District selected eight communities in 1999 to be part of a pilot program for reducing inflow and infiltration, there was no telling where the program would be 20 years later.

“I think the program fits into our philosophy in general with where we’re going, which is proactive,” says Jerome Fogel, a senior project manager for the district. “I think it’s important to note we don’t have a consent decree; we’re not being forced to do this. We’re looking at our performance ourselves and it’s something we always like to improve.”

### THE DISTRICT

The Milwaukee Metropolitan Sewerage District is a regional wastewater utility serving a 420-square-mile area around Milwaukee. The district serves

28 communities and about 1.1 million people, providing water reclamation and flood management services. There are two water reclamation facilities for the region — the Jones Island plant in Milwaukee and another in Oak Creek.

The district has about 300 miles of regional sewer interceptors while the 28 communities it serves include about 3,000 miles of sewer mains, plus

**“I think it’s important to note we don’t have a consent decree; we’re not being forced to do this.”**

Jerome Fogel

another 3,000 miles of laterals from homes and businesses. “Those hook up to the city and village sewers, and then the city and village sewers hook up to our regional sewers deeper in the ground,” Fogel says.

The effluent from the treatment plants discharges into Lake Michigan, which is also the drinking water supply for the 28 communities.

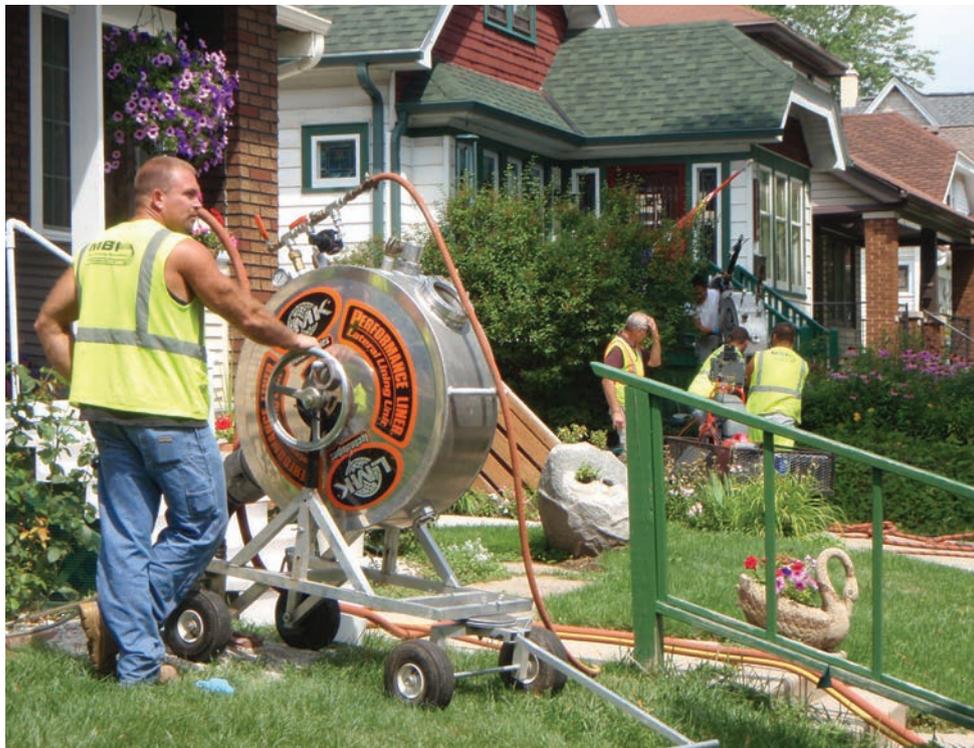
Each of the municipalities has standard structured departments of public works and utilities, so they manage their own collections systems, but all of the wastewater comes to the district for treatment.

### THEN: PILOT PROJECTS

In 1999, the Milwaukee Metropolitan Sewerage District decided to conduct a demonstration project to investigate the cost-effectiveness of different methods for reducing I&I so they could obtain local effectiveness measures, local costs and information on cost-effectiveness of I&I reduction needed for a 2020 facilities plan that the district was completing.

“We set about \$1 million a year for a period of time for some pilot projects on private property work,” Fogel says. “We put that out through a request for proposal to all the municipalities we serve and they could submit their ideas or proposals for participating in that program and kind of compete for that funding.”

Eight project sites were selected for I&I reduction efforts and were chosen to reflect a variety of rehabilitation techniques in different basins throughout the service area. All of the project basins consisted of primarily single-family residential land uses.



In 1999, the Milwaukee Metropolitan Sewerage District began investigating the cost-effectiveness of different methods of reducing I&I, focusing mainly on lateral and manhole rehabilitation.

“A lot of that work done back then was lateral rehab — cured in place. There was some manhole rehabilitation in there too,” Fogel says. “We did some flood grouting and a few foundation drain disconnects, but a lot of it was lateral rehab.”

Work taking place during this pilot program included lining 25 laterals in Bayside using a Perma-Liner Industries system. Green Bay Pipe & TV did the work, installing liners through new clean-outs that were installed along lot lines.

In Brown Deer, the main focus was on lateral rehabilitation. Field tests were performed to determine whether the laterals leaked near the house foundations, the roadside ditch or both, and to what extent. Rehab consisted of lining 50 laterals. Of those 50, 37 were lined from the sewer main to the property line and 13 were lined from the main to the house foundation.

In Elm Grove, work on public property included rehabilitation of the sanitary sewer and manholes. Sanitary sewer rehabilitation consisted of relaying or lining over 1,500 linear feet of 8- and 12-inch sewer mains, testing and sealing nearly 1,300 joints, and sealing lateral connections. Manhole rehabilitation occurred on 81% of the manholes in the project area.

## NOW: COMBATting I&I

Since that original project in 1999, there have been several follow-up studies and more funding put out for pilot work, but things really took off for the district’s I&I reduction efforts in 2011 when it started a regionwide private-property program providing funding for all 28 municipalities.

That funding is for I&I reduction work on the private property side. The dollar amount provided to each community is based on equalized value.

“It’s the same way we set up our capital budget,” Fogel says. “We set aside about \$5 million each year for this program and then it gets distributed using the equalized value formula based on property value in each municipality. So they all get a percentage.”

Work taking place in these municipalities mimics what was done in 1999 with the pilot program: lateral relining or relaying, and manhole rehabilitation. Municipalities have to submit a work plan that follows some guidelines from the district, but from there they have flexibility to prioritize where the work gets done and what they choose to be the most effective work.

“We don’t require cost share, either from the municipality or the homeowner,” Fogel says. “We’ll fund that project 100%, but some municipalities do have some variation of cost share to stretch their money out a little bit.”

Nine years into the program, Fogel believes they’ve gotten to the point where municipalities that have been pretty heavily engaged in the program are seeing the value in coordinating this private property work with the street reconstruction work.

“Municipalities know where the problems are, whether they have constant backups or they have to do bypass pumping when they have wet weather,” Fogel says. “Municipalities are realizing it’s a big benefit to communicate with the homeowners when they’re out there doing the street work, but then there are also benefits to them doing as much work in the public right-of-way while they are out there.”

While it’s hard to see the impact at the treatment plants with wastewater flowing in through 96-inch pipes, Fogel believes that through meter testing and other strategies, they are reaffirming many studies showing that a majority of I&I is coming from private property.

“If you really want to reduce those flows down to a manageable level, you have to tackle the private property side,” he says. “It’s a big education push trying to get out in front of the actual construction work to make the property owners understand this is a neighborhood problem, it’s a regional problem. All these little leaks on their property add up to a big problem if it starts stacking up in the public pipe.”

## FUTURE PLANS

While all 28 are receiving funding, only 26 of the 28 municipalities are participating.

“Some of these municipalities with a few hundred or few thousand people are working on accumulating their funds, so in the span of nine to 10 years, they might have enough for one project because they might only be getting a few thousand each year,” Fogel says.

In 2011, MMSD started a regionwide private-property program providing funding for all 28-member municipalities to pursue I&I reduction work on private property.



**“We set aside about \$5 million each year for this program and then it gets distributed using the equalized value formula based on property value in each municipality.”**

Jerome Fogel

With the initial 10-year plan nearing its completion, district officials are now looking at what revisions are needed for the policy based on what they’ve learned.

“One of those is funding structure: Do we continue with the same funding that is available for everybody, or do we prioritize that work a little bit?” Fogel says. “We’re working on figuring out those details now that the 10-year plan is coming up.”

Fogel hopes to have the new plan up for approval by the end of the year to allow municipalities to plan ahead after 2020.

“We definitely intend to continue the program.” **I&I**



# Digging in With Trenchless

Sanitary district tackles 20-year project to cut unwanted flow

STORY Giles Lambertson  
PHOTOS Kevin Blackburn

OPPOSITE PAGE: Cody Barb (right) and Ronald Miller of the Stoney Creek Sanitary District feed a Reline America pipe liner into a manhole where Mike Barick guides it into an 8-inch sewer line. RIGHT: Manholes are power-washed to create a clean and safe work environment before technicians enter.



**T**en years ago, Stoney Creek Sanitary District embarked on a course to sharply reduce the inflow and infiltration of groundwater into its sewer collections system. Everyone believed it wouldn't be a quick fix. Everyone was right.

"When we bought the equipment and started relining our sewer system, we knew this would probably be a 15- to 20-year project," says Stad Hirsh, the district's maintenance and construction supervisor. A decade later, the I&I problem has been reduced by half. However, because the numbers involved are large, the remaining half represents a lot of water — 1.5 mgd. In March, a relatively benign month for invasive water, 0.67 mgd was recorded.

The district's I&I problem dates from the original infrastructure put in place in the 1960s. The district is located near the northern end of the Shenandoah Valley in northwestern Virginia, about two hours from Washington, D.C. The area's relative proximity to the D.C. metropolitan area led to the opening in 1965 of an outdoor attraction — Bryce Resort. The recreation property attracts tourists year-round. In warmer months, they walk its 18-hole PGA Championship golf course. When the snow comes, they ski, tube and snowboard 25 acres of slopes that drop some 500 feet in elevation.

The sewer and water system built for the resort in the 1960s was folded into Shenandoah County's Stoney Creek district 20 years later, one of two sanitary districts

in the county that began as private systems. Though the district replaced the resort's original waterlines, many of the original sewer lines continue to carry wastewater — and I&I — to the district's sewer treatment plant.

While the legacy sewer lines from the resort are not notably old as infrastructure goes, the private system was poorly constructed, Hirsh says, which has aggravated the problem. Furthermore, some cracking is occurring in the old pipes and invasive mountain timber roots are breaching sewer line joints.

**"When we bought the equipment and started relining our sewer system, we knew this would probably be a 15- to 20-year project."**

Stad Hirsh

The result is lots of water making its way into the system. Operators at the treatment plant monitor the flow and let Hirsh know when the I&I volume mounts, as it did much of last year. Actually, 2018 was a bit of an I&I trial for the district. "It was extra bad with all the rain we had. We average 30 to 33 inches of rainfall a year. Last year we were 100% above our average with 67 inches."



Mike Barick feeds a UV light curing assembly into the manhole where Ronald Miller positions it for the curing operation.

## STONEY CREEK SANITARY DISTRICT Shenandoah Valley, Virginia

### WEBSITE:

[www.shenandoahcountyva.us/water/stoney-creek](http://www.shenandoahcountyva.us/water/stoney-creek)

### CUSTOMERS:

1,600 service connections, 1,200 full-time residents

### SHOP/FIELD EMPLOYEES:

2 full-time water and sewer system operators, 5-person construction crew, 2 full-time maintenance persons, and 1 mechanic

### SERVICE AREA

1,500 acres

### WATER USE VOLUME:

170,000 gallons a day

### WATER INFRASTRUCTURE:

7 wells, 3 storage tanks, 40 miles of waterlines

### COLLECTIONS INFRASTRUCTURE:

300,000 feet of sewer lines,  
1,400 manholes

## LINING PROGRAM

The district's response to the chronic I&I problem was to launch a program to insert liners in the oldest sections of its 300,000 feet of sewer line. The task is 10 years along now and still far from complete. Calling on its own five-person construction crew, the district is, month after month, systematically inserting UV cured-in-place liners in underground lines.

"All the old pipe is still in the ground," Hirsh says of the trenchless solution. "We don't dig up and replace very much." Most of the sewer pipe is 8-inch-diameter stock, though across the system the pipe ranges from 6 to 18 inches.

Stoney Creek's relining project is methodical — that's the only word for it. Almost plodding. "We try to do as much relining each week as we possibly can," Hirsh says. "On average we'll line 300 feet a week, weather permitting. We try to do at least 5,000 to 6,000 feet a year. If we can get 10,000 feet, that's great." So far, Hirsh has not identified pipe problems outside the core area in the old resort lines, so the effort to increase the overall integrity of the system is gaining ground.

The rehab work would drag out even further than is scheduled were the district located in a more hostile climate. While snow regularly flies in the Allegheny Mountains section of the Eastern Continental Divide, winter generally is not a deterrent to the relining effort. Consequently, Hirsh says, his construction crew is able to work pretty much year-round.

For relining materials, Stoney Creek relies upon a firm conveniently headquartered not far away in Saltville. Reline America has the North American rights to a lining material called Alphaliner (formerly Blue-Tek). It is a plastic material reinforced with glass fiber and cured in place with ultraviolet light. The liner is created using a patented technology that lets it adapt to any conventional pipe shape, including elliptical and square. Resins are specially formulated to withstand the particular chemical makeup of the fluid being transported through a pipe. The company also manufactures the specialized equipment employed to insert the liners.

Inserting Alphaliner is not the only repair option Stoney Creek exercises as it works to make its collections system whole. When an isolated failure in a pipe is found, point repair work is undertaken by the construction crew, usually through the winter and into early spring months when weather can be iffy for other projects. Stoney Creek officials settled several years ago on Romac Industries stainless steel couplings and clamps as the preferred choice for sealing off failed pipe joints or fixing a random puncture in the wall of a pipe. The Romac products have been around for 50 years.

Maintenance responsibilities go beyond patching and relining sewer pipes. As part of the I&I upgrade, the district is on the verge of switching to a new generation of flowmeters. The new equipment — make and model have



Ronald Miller (left) and Mike Barick keep an eye on the monitor while feeding a camera (RIDGID) into a sewer line for a post-cleaning inspection.



Mike Barick and Ronald Miller clean a sewer line with a US Jetting 4018 truck-mounted jetter.

not yet been selected — will replace ultrasonic flowmeters used as submersers and deployed in sewer main flumes.

### FRESH VIEW

Stoney Creek was slow to adopt CCTV inspection technology, not only due to the expense, but because moving camera trucks into position for some inspections seemed impossible with the ruggedness of the district's terrain. This is a water and sewer system, after all, that drops 800 feet in elevation, some of it rather precipitously.

The reservations about cameras disappeared in 2011 when a robotic camera deployed by RedZone Robotics successfully navigated 30% slopes and 2-inch interior bumps in sewer lines. After a trial run, the district contracted with RedZone to assess the condition of 250,000 feet of pipe. Besides showing areas endangered by roots and debris, the survey gave the district up-to-the-minute data on the overall condition of the pipes.

Today, the district's construction crew does its own camera work using a RIDGID KD350 SeeSnake unit with a high-resolution monitor. After a camera is run through a targeted section of sewer line to determine its condition, the crew concentrates on removing any discovered rocks, roots or other debris. A truck-mounted US Jetting 4018 jetter is transported to the insertion point and a 4,000 psi stream is unleashed into the interior of the pipe. "We leave the pipe pretty well spotless, particularly before we're going to reline it," Hirsh says. Then the relining work begins.

### FIGHTING CORROSION

The district's 1,400 manholes are a separate maintenance concern. Ninety percent of connections from the district's residential customers empty into manholes. "That is not as common in towns or cities," Hirsh says. "In this mountain terrain, though, our manholes are not set very far apart, so we can pick up lines from three or four houses and drain them directly into a manhole."



Standard equipment doesn't cut it in Stoney Creek's rough terrain. The relining crew transports its equipment in a 10-wheel-drive, 2 1/2-ton military surplus truck from World War II.

## GEARING UP FOR TERRAIN

When your water and sewer system traverses rugged, mountainous terrain and the rolling equipment in your equipment yard has to do the same, you gear up accordingly.

Stoney Creek Sanitary District is located some 1,200 feet above sea level in the picturesque Shenandoah Valley of northwest Virginia. Picturesqueness comes with some challenges, however. Systematically maintaining lines and manholes is tough enough. Undertaking a years-long pipe relining project is something else.

"Most companies that reline are used to working on flat ground in towns and cities," says Stad Hirsh, maintenance and construction supervisor at Stoney Creek. "When they first tried the relining here, getting to the work sites was the biggest obstacle to overcome."

The obvious solution was to acquire a fleet of equipment suitable for the terrain. Consequently, the 1-ton maintenance and construction crew trucks are four-wheel drive, as is the box truck carrying the district's camera inspection and monitoring equipment. The district's relining equipment is transported in a military surplus so-called deuce and a half — that is, a 10-wheel-drive, 2 1/2-ton model dating from World War II.

Of the district's four military surplus trucks in its fleet, one of them is dedicated to toting around a 5-ton boom crane. Other tools parked in the equipment yard include three backhoes (Case, John Deere and Caterpillar, by brand) and two Cat compact track loaders.

And the relining work rolls along.

Hydrogen sulfide has done a number on many of the manhole walls. Hirsh says 50% of the vertical structures are in need of repair. This upgrade work is mostly subbed out to a Washington metro-area firm, Pleasants Construction. The firm's technicians apply an epoxy coating to the wall of each manhole to seal and stabilize it and return it to service an hour after being coated. "If the manhole is too deteriorated for the coating, the crew returns another day

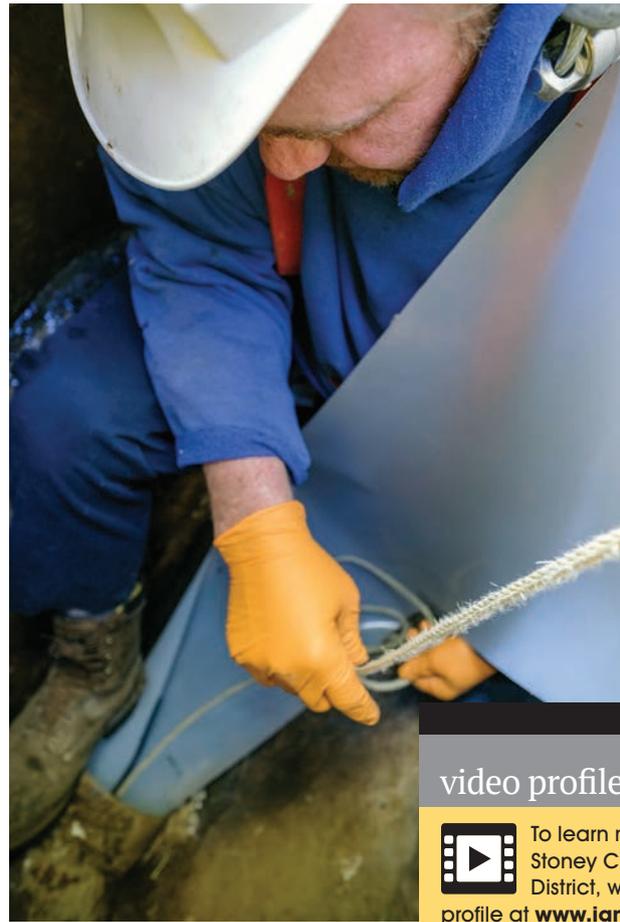
and does point repairs with fast-drying cement before applying the epoxy.”  
The company started rehabbing manholes again in April, doing five per week.

## RESOURCES

Hirsh is a relative newcomer to Stoney Creek district affairs, signing on 2 1/2 years ago. He is not a newcomer to the area, however, having grown up in the valley and been a licensed plumber for 20 years, sometimes working on Bryce Resort lines. His crew comprises local people, too, several of whom have worked for the district for more than 20 years.

“The senior supervisor has been here 24 years. He has built his crew, and they know what they are doing,” Hirsh says. “I say to the guys all the time, ‘I don’t have to tell you what to do. You know what to do, especially the construction crew.’”

He says the tenure and experience of the district employees is a great asset. “We have the desire to self-perform. We have learned over the years what to look for and where to concentrate our efforts. Having people stay here in the district for years and wanting to do the job is a very valuable resource.” **I&I**



Mike Barick positions a guide in the sewer line ahead of the pipe liner.

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**Romac Industries, Inc.**

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800-538-8464 | [www.usjetting.com](http://www.usjetting.com)

### video profile



To learn more about Stoney Creek Sanitary District, watch a video profile at [www.iandimag.com](http://www.iandimag.com)

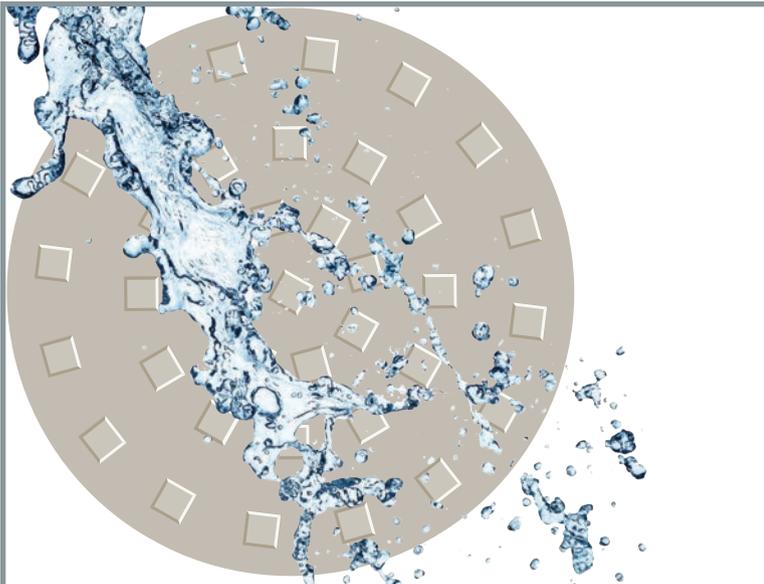
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By Craig Mandli



## MANHOLE RISERS INSTALL QUICKLY AND COST EFFECTIVELY

### PROBLEM:

Home to Birmingham, and more than 660,000 residents, Jefferson is Alabama's most populous county, and the local sewer network contractor Champion maintains includes 3,600 miles of pipe and 80,000 manholes. Though manholes themselves are durable infrastructure, they do need to be kept at grade. If they are set low, water collects around the manhole lid, causing excessive infiltration. If they are set high, they become a traffic hazard, jarring vehicle tires, the lid and rim continually.

### SOLUTION:

Champion uses **Pivoted Turnbuckle Manhole Risers** made by **American Highway Products**. They are based on a simple concept: Tough, galvanized, flexible rings of steel are placed in old manhole rims and expanded with a pivoted turnbuckle (turned by hand with a screwdriver) that exerts thousands of pounds of force. This sets the riser tightly and precisely into old rims, even if they're worn or out of round.

**Result:** They're quick and easy to install in five to six minutes, according to Champion. They are safer for crews due to their relatively light weight and are cost-effective compared to jackhammering and manual lifting. And they have a good track record. Champion keeps them in stock and has been using them for at least 18 years.

888-272-2397; [www.ahp1.com](http://www.ahp1.com)



## JOINT SEAL SYSTEM ELIMINATES INFILTRATION AND SOIL EROSION

### PROBLEM:

In May of 2017, the Michigan Department of Transportation discovered pavement failures in the westbound lane of Interstate 94 in New Buffalo near the weigh station just inside the Michigan border. Further investigation revealed that a 1,000-foot, 72-inch reinforced concrete pipe conduit under the interstate highway had joint separation issues, which were allowing the very sandy native soil to migrate into the pipe, undermining the roadway bedding above. Engineers consulted with the American Concrete Pipe Association to come up with some options for repairing the joints.

### SOLUTION:

The engineers were referred to **Cretex Specialty Products**, which assisted by recommending the **Cretex HydraTite Internal Pipe Joint Seal System**. In early June 2017, a site visit by Cretex representatives was conducted and the number of seals and appropriate seal widths were determined by walking the pipeline and physically inspecting each joint. The Michigan DOT was in an emergency to complete the repairs, which consisted of pipe-joint seal installation and grout injection from the surface to help stabilize the soils around the pipe. The job bid on July 7, 2017. A large underground utility contractor was awarded the job, and construction began Aug. 21, 2017. The surface prep and installation teams completed the installation of the 115 joint seals in approximately one week.

**Result:** A punch list required retightening a small number of seals found to be still leaking, but once that was completed, all joints had been sealed. The ground stabilization grouting was completed, the pavement settlement has stopped and the life of this conduit has been extended by many years.

800-345-3764; [www.cretexseals.com](http://www.cretexseals.com)

## MORTAR USED ON HUGE MANHOLE REPAIR JOB

### PROBLEM:

The Los Angeles County Sanitation District needed to stop infiltration, restore structural integrity and protect against corrosion in its manholes.



### SOLUTION:

National Coating & Lining Co. used **Strong-Seal High Performance Mix** from **The Strong Co.** to repair these manholes. It is a 100% pure-fused calcium aluminate mortar. In addition to stopping infiltration and restoring structural integrity, this cementitious liner is specifically designed for protection against microbiologically induced corrosion. The company rehabilitated manholes owned by Los Angeles County in Lancaster, Monterey and Rancho Palos Verdes in March, April and June 2018. In Lancaster, they repaired over 600 vertical feet (45 structures) as part of the Trunk "F" Sewer Rehabilitation job. In Monterey, they repaired over 200 vertical feet (16 structures) as part of the Monterey Park Relief Trunk Sewer Rehabilitation job. Finally, in Rancho Palos Verdes, they repaired over 130 vertical feet (16 structures) as part of the Monterey Plaza Trunk Sewer Rehabilitation job.

**Result:** In total, there were 77 sealed, structurally sound manholes with maximum corrosion protection.

800-982-8009; [www.strongseal.com](http://www.strongseal.com)

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longer distance. The Superior 3C Classic Smoke Candle produces a volume of 40,000 cubic feet of smoke in just three minutes. Multiple W3C Smoke Candles can be together to create larger volumes of smoke visible for longer periods of time. The company's fluid systems offer a liquid-based alternative for mainline sewer inspection and feature a stainless steel injector to maximize dry smoke output, producing a higher-quality, liquid-based smoke. Superior Smoke's testing techniques were developed over 60 years ago and are still made in the U.S.

800-945-8378; [www.superiorsignal.com/ii](http://www.superiorsignal.com/ii)

## LINING SYSTEM HELPS STOP WATER INFILTRATION AT UNIVERSITY

### PROBLEM:

A university had old pipe that needed extensive cleaning and also leaked, meaning it needed to be repaired due to health/safety concerns. After video inspection, the repair contractor could see they were having major infiltration problems, with leaking both at the joints and pipe. With manhole access, the contractor first tried to cap the pipe to stop the infiltration, but it still leaked, so relining the pipe was the best solution. The clay tile pipe was 315 feet long and 8 inches in diameter.

### SOLUTION:

This was a large job with over 485 pounds of resin. So, to make sure the resin cure was slow, the contractor ensured the right combi-

nation of mixing, temperature and sun control. It took 1 hour and 20 minutes to mix resin, wet-out the liner using a Quik-Roller and shoot it into the ground using the **Quik-Shot system** from **Pipe Lining Supply**. They finished the project by curing the liner by tapping into a nearby fire hydrant and using two Quik-Heaters running back to back to get the correct Btu.

**Results:** After diagnosing the problem with a camera, using a vac truck to get as much infiltration out as possible, using a preliner, then shooting a new line and heat-curing it, the university has 315 feet of new pipe that is not leaking, and they did not have to dig up the campus.

888-354-6464; [www.pipeliningupply.com](http://www.pipeliningupply.com)

(continued)



## LINER USED TO END I&I ISSUES IN PRECAST MANHOLES

### PROBLEM:

Along one length of the Carroll County (Maryland) Bureau of Utilities' sanitary sewer force mains, there are nine precast manholes. As with most aging municipalities, they required regular attention and rehabilitation in order to eliminate I&I through their leaking joints.

### SOLUTION:

Pleasants Construction recommended **Epoxytec's CPP Sprayliner**. This 100% solids, high-build epoxy paste is blended with fiber-reinforced polymers, providing high strength with flexural properties. The product was applied using an Epoxytec CPP Sprayliner rig. Materials flow through separate (part A and part B), continuously heated hoses. The system has a fixed ratio of 1-to-1 by volume. This structural product was sprayed to achieve a thickness of 100 mils.

**Result:** Applied by a four-man crew, the entire application to all nine manholes took five days. "When searching for manhole solutions, it's important to find a product with hydrogen sulfide resistance and sealed I&I barrier protection," says Ron Callahan, director of construction for Pleasants Construction. "CPP Sprayliner offers that protection in an easy-to-apply method."

The successful application and completion of this project will eliminate I&I from these manholes, thus eliminating the costly routine maintenance that was previously required.

877-463-7699; [www.epoxytec.com](http://www.epoxytec.com)



## MICRO DETECTION TECHNOLOGY EMPLOYED IN PILOT STUDY

### PROBLEM:

Officials in Jefferson County, Alabama, sought a way to reign in inflow and infiltration losses brought on by major rain events.

### SOLUTION:

A three-phase pilot project conducted by **Duke's Root Control** and Eastech Flow Controls indicated there were multiple entry points for rainfall-dependent I&I in larger pipes and 8-inch lines comprising many of the microbasins. Most sites showed little or basically no response to what is considered to be a major 3-inch rain event, while two showed sizable increases during each rain event. With only 14 **iTracker sensors**, manufactured by Eastech and distributed by Duke's Root Control, the technology was capable of monitoring and performing a full I&I analysis of 13 microbasins, plus a "microsegment" analysis of two of the 13 microbasins all the way down to a set of adjacent manholes.

**Result:** Evidence of major infiltration was discovered in a section of 15-inch pipe, with the majority located between two manholes. Cameras were immediately dispatched, and it was quickly determined that the large volumes of I&I were due to faulty laterals. They were quickly repaired.

800-447-6687; [www.dukes.com](http://www.dukes.com)



## CHINESE CITY PROVIDED WITH SPEEDY AND EFFICIENT MANHOLE REPAIR TOOLS

### PROBLEM:

Being a bustling and fast-paced city, Guangzhou, China, needed a faster, more efficient way to handle manhole frame adjustments. Guangzhou is huge, with congested streets and an estimated population of 13 million people. Along with this, the city is home to a large number of manholes in roadways that require constant maintenance. Ultimately, Guangzhou contractors were in need of a manhole repair solution that happens very quickly so traffic can be restored as soon as possible.

### SOLUTION:

**Mr. Manhole** had the opportunity to visit Guangzhou and train a large group of employees with a local contractor so they could properly use the **Six Shooter manhole repair tools**. The training took place using the Mr. Manhole Gold Series Six Shooter. The goal was to introduce this technology to the Chinese workforce and train them to quickly and efficiently repair manholes throughout China.

**Result:** By sharing Mr. Manhole techniques and technology, the Guangzhou company was introduced to a speedy and more efficient way of repairing manholes. Currently, the city uses a

hinged manhole frame that swings open, and Mr. Manhole was able to develop a system to do this very quickly. Some of the manholes in Guangzhou also use a precast manhole frame and lid system. This method is unique to China, and Mr. Manhole was able to develop a technique to quickly adjust these structures to road level. Mr. Manhole also suggested Pamrex manhole frame and lid products for easy repair, as the frames have an easily removable lid compared to the pinned (nonremovable) lids on the Chinese models. Furthermore, Mr. Manhole also supplied the company with their Gold Series Six Shooter cutter for faster repairs. More training sessions are being planned. **419-741-9075; www.mrmanhole.com**



## SEALING PRODUCTS STOP MANHOLE LEAKS IN MINUTES

### PROBLEM:

During a newly developed inspections program in the town of Ithaca, New York, infiltration was found throughout the system's manholes. Joseph Slater, Water & Sewer maintenance supervisor for the town's Public Works department, needed to find an economical solution for active leaks that could be handled entirely with in-house personnel.

### SOLUTION:

**PARSON SEAL-TITE** and **PARSON QUICK PLUG**, both part of the manhole rehabilitation product line from **Parson Environmental Products**, were chosen because of their ability to stop active leaks in minutes. **PARSON SEAL-TITE** is a moisture-insensitive, two-component, fast-reacting hydrophobic polyurethane grout

designed to stop high-volume active leaks up to 50 gpm. It is injected at or near the source of the leak, using a manual dual-component caulk gun. The product cures to a dense, rigid mass in approximately 30 seconds and contains no solvents, CFCs or HFCs. **PARSON QUICK PLUG** is a hydraulic cement material that is mixed with clean, potable water to produce an extremely rapid setting plug. It is inserted into prepared areas to stop active leaks under low to moderate pressure and is suitable for sealing around pipes and conduits.

**Result:** The products were able to quickly and effectively stop the active leaks, even in the most difficult areas on the bottom side of the pipe at the invert.

**800-356-9023; www.parsonenvironmental.com**



(continued)

## LINER SYSTEM PROVIDES DURABLE SOLUTION FOR AGING CULVERTS



### PROBLEM:

In Ontario, the aging steel culverts under Route 401 had become a concern for the utility. Over time, sections of these culverts severely deteriorated due to their exposure to road salt. The thoroughway is adjacent to one of the Great Lakes in Ontario, and the water from the culverts runs into the lake. There were environmental concerns about the use of traditional cured-in-place pipe products due to the water-soluble chemicals within the resins that potentially could leach out into the water, causing harm to the aquatic life.

### SOLUTION:

Utility engineers in consultation with Municipal Sewer Services concluded that **Thermoform** from **Warrior Trenchless Solutions** was the best solution. It is a PVC-alloy, fold-and-form pipe liner that provides a durable solution, removes environmental concerns and has a long life expectancy. It is manufactured in a factory-controlled environment, with rigorous material testing to ensure it conforms to and exceeds the expected standards. It does not contain any water-soluble chemicals and therefore removes the risk of any pollution.

**Result:** Municipal Sewer Services, because of the durability of Thermoform, was able to rehabilitate culverts considered too high-risk for other materials. It provided a seamless, tight-fitting liner that increased the structural integrity of the culvert and prevented any further I&I. Following the initial successful installation, the Municipal Sewer Services and the utility have continued using Thermoform as their preferred method of culvert rehabilitation.

716-601-7760; [www.thermoformliner.com](http://www.thermoformliner.com)

## LINER SYSTEM HELPS WASTEWATER PLANT AVOID MAJOR SHUTDOWN

### PROBLEM:

In 2017 the Rivanna Water and Sewer Authority was constructing odor control improvements at their wastewater treatment plant in Charlottesville, Virginia. The project included the installation of aluminum covers above several treatment structures, which were emitting odors. Before the concrete structures could be covered, a protective liner was to be installed due to potential corrosion caused by hydrogen sulfide gas. During the project, significant concrete deterioration that required repair was discovered in the primary clarifier distribution box. This posed a significant challenge to the design team since all of the flow coming into the wastewater plant passed through this critical structure, which could only be shut down for 72 hours due to the plant's limited storage capacity.

### SOLUTION:

Hazen and Sawyer was the design engineer and looked at several alternatives to make the repairs within the short shutdown window. Several coating contractors were contacted and none could repair the concrete and install the coating system in less than seven to 10 days. They contacted **SpectraShield Liner Systems** and sent them photos and drawings of the primary clarifier distribution box. SpectraShield determined they could complete the work within the 72-hour time frame using its liner system to rehabilitate the deteriorated concrete and protect the concrete from hydrogen sulfide gas. Crews worked around the clock and completed the work on time, allowing the wastewater plant to resume operation.

**Result:** Due to the fast and easy application, the distribution box was quickly repaired and lined, and a major plant shutdown was avoided.

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Inflow and infiltration are a problem for Kansas City's 66,000 manholes, which are mostly brick and very old. The city's contractor has been successfully rehabilitating the manholes with the Permacast system from AP/M Permaform.



## MORE THAN A MAKEOVER

### Kansas City rehabilitation renews manholes structurally and stops microbiologically induced corrosion

By Angus W. Stocking

The sewer system in Kansas City, Missouri, is big and old, nearly 318 square miles of combined and separate sewer networks including many still-functioning sections built pre-Civil War.

A century and a half later, the mostly clay and brick infrastructure is, understandably, failing. This is particularly true when it comes to manholes. "Kansas City has more than 66,000 manholes in its system, mostly brick, and mostly very old," says Andy Shively, special assistant city manager. "And prior to the Smart Sewer program, there was no formal maintenance program in place to address manhole issues."

The Smart Sewer program is a massive, 25-year, \$4.5 billion public works initiative — the largest in Kansas City history — aimed at reducing the volume and frequency of sewer system overflows. Investment in sewer infrastructure is always a good idea for municipalities of all sizes, but in Kansas City it's more than just a good idea, it's the law — the program was formed in response to a Federal Consent Decree issued as part of Civil Action No. 410-cv-00497-GAF. The 87-page document lays out strict guidelines for "implementation of sewer system remedial measures and post-construction monitoring" including certification, inspection, funding and penalties.

Spending on inflow and infiltration reduction alone is earmarked at \$250 million, and manhole rehabilitation is a big part of that. "I&I is cumulative — it gets into our system from laterals, pipelines and of course manholes," Shively says. "And 80% of manhole I&I is from the chimney, so we want complete rehabilitation of manholes, not just new lids or joint sealing."

Many of those manhole chimneys will be sealed and structurally rehabilitated with a spraycasting or spincasting system named Permacast, devel-

oped by AP/M Permaform. The process applies multiple, thin, smooth layers of fine aggregate composite concretes and an anti-microbial admixture, manufactured by ConShield Technologies.

"Epoxy doesn't work well in Kansas City: It seems to fail after the freeze-thaw cycle," Shively explains. "We have experience with centrifugally cast concrete pipe systems and spraycasted systems going back to 1993, and we're sure that this structural, long-lasting rehabilitation will meet our I&I reduction goals here."

**"We have experience with centrifugally cast concrete pipe systems and spraycasted systems going back to 1993, and we're sure that this structural, long-lasting rehabilitation will meet our I&I reduction goals here."**

Andy Shively

#### EFFICIENT PROCESS

"I think the city is doing everything they can to eliminate manhole I&I, and they're emphasizing structural and anti-microbial rehabilitation methods with very long life cycles," says Bryan Dobson. "That's a great approach, and it's going to benefit Kansas City for many decades."

Dobson is operations manager for Ace Pipe Cleaning (Carylon), a sewer cleaning firm with national presence that's headquartered in Kansas City. Ace Pipe Cleaning has been applying the Permacast process to the city's manholes for about two years and in that time has rehabilitated nearly 1,500

manholes, which equals about 15,000 vertical feet of rehabbed manhole. “We shoot for 50 vertical feet per day, per crew, and will have three crews working if there’s enough work,” Dobson says. “And it looks like we have at least another 10,000 to 12,000 vertical feet coming up.”

Ace Pipe Cleaning crews can do this much work in a day because Permacast is extremely efficient. Manhole work begins after sewer pipe rehabilitation is complete, and the first step is high-pressure blasting, 4,000 to 5,000 psi, applied with a rotating tip that is lowered into the manhole and withdrawn. Once the manhole is cleaned, spraycasting — with a handgun or a bidirectional spincaster — begins immediately.

“We can apply a 1-inch-thick coating in one session, building up thin layers and spraying from multiple directions to fill in ‘shadows’ and get even, smooth coverage,” Dobson says. “Then we inspect visually, hand trowel as needed and move on.”

The materials applied are an important feature of the Permacast system. In Kansas City, Ace Pipe Cleaning is spraying MS-10,000, a fine-aggregate composite concrete that incorporates precisely graded quartz sands, non-metallic fibers and other complex admixtures to achieve a unique blend of strength, adherence, short cure times, thixotropy (viscosity) and other desir-

which is a contributing factor to sewer failures in most Midwest cities. “The MIC damage depends on where in Kansas City we’re at, and some areas are worse than others,” Dobson says. “But applying ConShield to every manhole fix is a good idea because permanently ruling out MIC is a good idea.”

Unlike surface coatings, like epoxy, ConShield’s antimicrobial action doesn’t depend on keeping acid-producing *Thiobacillus* colonies away from concrete. Rather, ConShield modifies the cement matrix and makes it intrinsically hostile to microbes so that *Thiobacillus* colonies don’t form in the first place. As a result, they never produce concrete-destroying sulfuric acid.

“We’ve been using it for four years, and when I’ve followed up on our early projects, I’ve verified that ConShield really does eliminate corrosion — the concrete on those projects still looks new,” Dobson says.

Shively reports Kansas City is happy with the manhole rehabilitation project so far. “The quality of work is good; we’re on schedule and within budget,” he says. “And since we finally had some rain this year and have installed 150 new flowmeters, we were able to verify that we are substantially reducing I&I — enough to make a real difference. It looks like our sewer system is going to perform well for another 150 years!” **I&I**



Rehabilitating aging brick manholes is a significant part of Kansas City’s \$4.5 billion Smart Sewer program.



A rehabilitated manhole with a 1-inch-thick coating of MS-10,000, a fine aggregate composite concrete with an anti-microbial admixture.

able properties that make it an excellent choice for vertical pipe rehabilitation. “MS-10,000 covers and sticks well, and when it cures, it’s stronger than the original manhole, with very little reduction in manhole diameter” Dobson says.

Part of the Smart Sewer program is extremely rigorous inspection and quality control. After a minimum curing period of seven days, Ace Pipe Cleaning’s Permacast work is vacuum-tested to 10 inches Hg. “That’s pretty rigorous, and we’re always happy when we pass the vacuum testing,” Dobson explains. “It’s tough to restore hundred-year-old brick manholes to like-new condition, so you have to celebrate that.”

## ENDING CORROSION

Another feature of the Kansas City work is the routine use of ConShield, a concrete admixture that prevents microbiologically-induced corrosion,



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# DIGGING INTO HISTORICAL DATA

Your utility could benefit from a different approach to quantifying I&I and measuring success

By Cory Dellenbach

**G**eorge Kurz knows inflow and infiltration, and he's willing to help your utility, free of charge.

Kurz, P.E., DEE, is a consulting engineer with a specialty in I&I quantification and reduction. He has 29 years' experience in municipal engineering focused on reducing overflows and designing rehabilitation projects to reduce I&I. He has performed contract work for JACOBS, ResourceTek, BWSC (Nashville, Tennessee) and JMT (Sparks, Maryland).

At the recent No-Dig conference in Chicago, he presented a paper: "Simple Tool for Operators to Quantify I&I, Detect Leaks & Measure Rehab Progress." This paper was the most recent installment representing seven years of his personal research on measuring I&I in municipal systems and included measurements for every municipal NPDES permitted system (523) in the states of Tennessee and North Carolina.

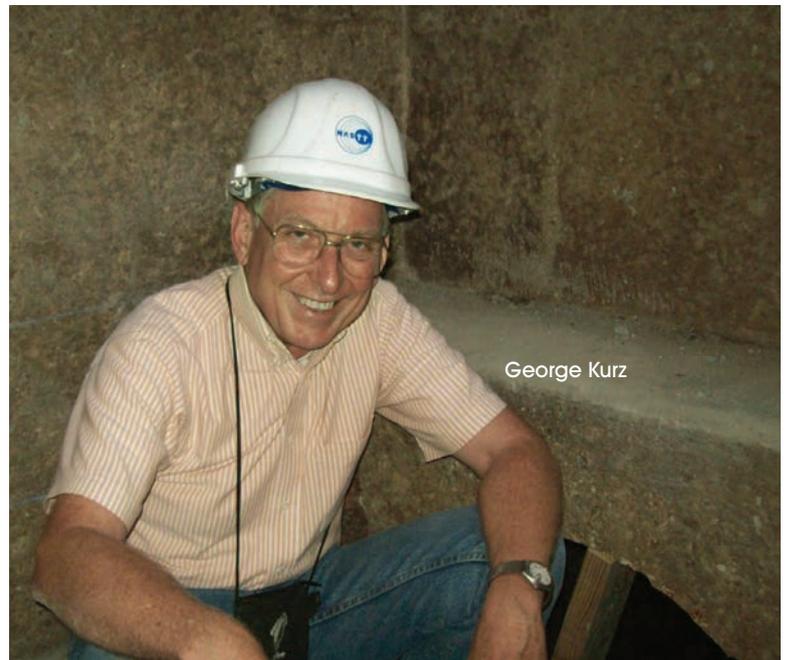
Kurz says his study represents the first time I&I has been quantified for every municipal system in a state. Additionally, at the end of his presentation he offered to analyze a year's worth of data for any municipal system in the U.S. and Canada — for free. Later, I caught up with Kurz to discuss his research.

**I&I:** I&I studies have been conducted ever since the implementation of the Clean Water Act in 1972. How does your research differ from that earlier work, and how does it benefit our industry?

**Kurz:** That is correct, I&I studies were part of the 201 planning process (Section 201 of the Clean Water Act). Those early studies were generally conducted by engineering companies for individual municipal agencies needing funding for new facilities or expansion of existing facilities. Sometimes the results were published as articles or presented as papers for those individual systems. However, extensive compilations of the I&I results are not generally available. Except for a study for Maryland, which projected I&I statewide from the results for 50 systems, I found nothing in the literature for other statewide studies. I hope the results from this study will eventually stimulate development of a comprehensive national strategy for I&I reduction based on facts rather than estimates.

**I&I:** So, how did the U.S. Environmental Protection Agency conduct its gap study (formally: Clean Watersheds Needs Survey) to estimate the cost of I&I correction reported to Congress in 2012?

**Kurz:** That information was mostly based on surveys by state agencies of municipalities to compile their estimates about the magnitude of their local I&I problem. It was not based on systematic and uniform I&I measurements of every public system in a given state. I suspect such estimates grossly



George Kurz

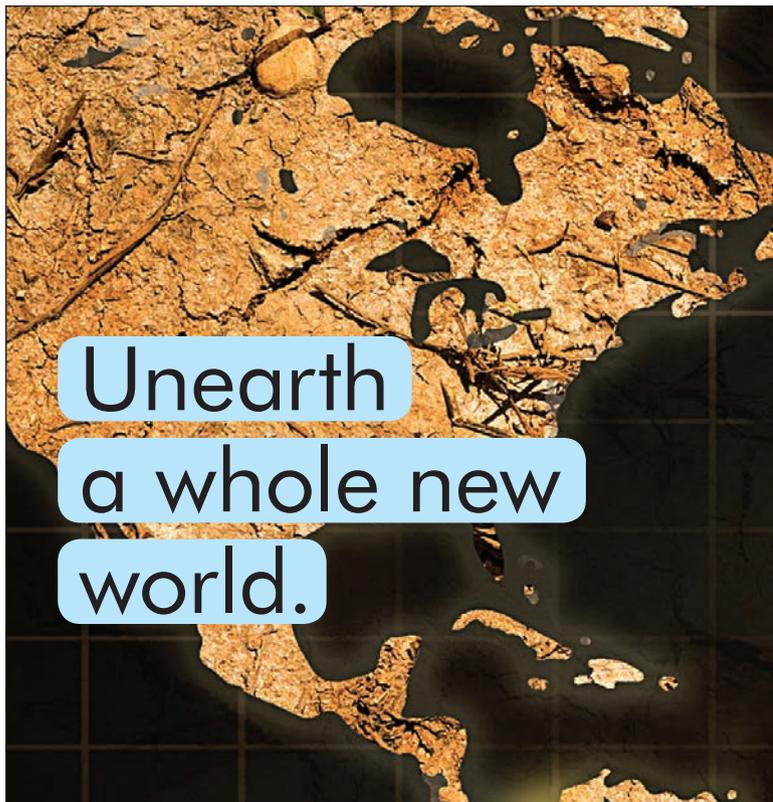
**“I hope the results from this study will eventually stimulate development of a comprehensive national strategy for I&I reduction based on facts rather than estimates.”**

George Kurz

underestimated the actual amount of annual I&I. This suspicion was corroborated when I compiled the individual estimates of I&I included as part of every municipal NPDES permit application in the state of Tennessee. The aggregate amount of annual I&I statewide estimated from the permit applications was about 20% — less than half of the measured annual I&I in those same systems.

**I&I:** What volume of I&I did you measure in public systems in Tennessee, and how was that measured?

**Kurz:** The Tennessee study evaluated daily influent flows, influent organic load (BOD or CBOD), and rainfall for one year for each of the 243 systems. This is the information typically recorded by operators for their Monthly



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Operating Reports (MORs) sent to the state. The raw data was transcribed into a simple Excel spreadsheet and analyzed using the formulas described in the No-Dig paper. The results showed that those systems treated 120.79 billion gallons of clearwater annually. That represented 45.38% of all influent to Tennessee wastewater treatment facilities. Additionally, I&I represented more than half the annual flow in two-thirds of those systems. Very conservatively, I&I is costing Tennessee ratepayers about \$217 million annually based on operation and maintenance costs alone. Using rehabilitation project experience from large projects in Tennessee, it may likely cost over \$1.14 billion to reduce I&I by 50%. If municipal agencies have the vision and determination to invest in the future, that means the savings in O&M costs over time would pay for rehabilitation projects in 11 to 12 years (not considering interest rates).

**I&I: Have you shared this with the state of Tennessee?**

**Kurz:** Yes, over the past two years the Tennessee Division of Water Resources is using the individual I&I results and the spreadsheet to evaluate requests from municipal agencies for moratorium relief. The Tennessee Division of Water Resources analyzes the annual I&I and the rainfall-dependent I&I for successive years to determine if rehabilitation work conducted by a municipality has been effective for I&I reduction.

**I&I: Was your method just a variation of the method published by the U.S. EPA in its 2014 guidance?**

**Kurz:** No, it differs in two ways. First, the method described in this No-Dig paper can be applied to current and historical treatment plant data recorded daily. No adjustments or estimates are needed. In contrast, the 2014 EPA guidance requires a measurement of the low nighttime flows (midnight to 6 a.m.) for calculating groundwater infiltration. The problem that I observed with the EPA method was that none of the 528 treatment plants recorded

**“I wanted to make this a simple method that operators could use to diagnose I&I in their own systems.”**

George Kurz

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data for that specific six-hour interval. All of the data on the MORs were reported for 24-hour periods. It is certainly feasible for operators to record the six-hour flow results in the future, but that means the historical plant data cannot be analyzed with the EPA method. Second, I found that analyzing influent BOD concentrations gave an indication of dry-weather infiltration that may be missed by traditional methods that only rely on hydraulic analysis. I wanted to make this a simple method that operators could use to diagnose I&I in their own systems. This spreadsheet is not intended to replace a comprehensive engineering study (if that is ultimately needed), but it can be a starting point for communities with limited funds.

**I&I: Is your offer of a free analysis limited to the No-Dig conference?**

**Kurz:** My offer applies to any system in the U.S. or Canada. Anyone (engineer, private citizen or public agency) can contact me through my website — [www.sewercapacitymanagement.weebly.com](http://www.sewercapacitymanagement.weebly.com) — for information on how to submit annual data to get a report. My intention is to broaden the base of my study, and this seemed like a good way to obtain public data. **I&I**

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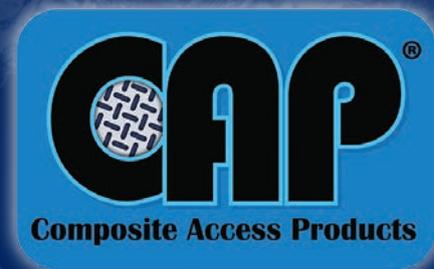
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