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# MOTOR CITY RENAISSANCE

Sam Smalley and his team make strides to restore Detroit's infrastructure

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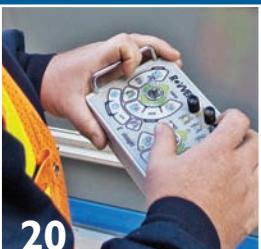
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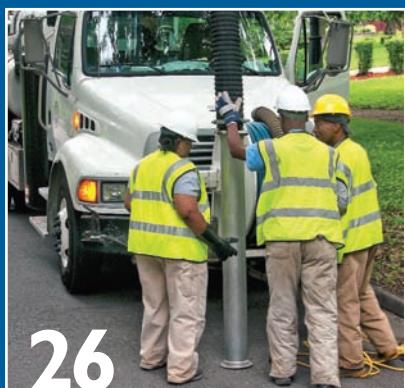
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Sam Smalley, assistant director of asset maintenance for the Detroit Water and Sewerage Department, has led a revival of the city's long-neglected underground infrastructure. Here, repair worker Juanita Oakes, mechanic Ronald Leapheart and repair worker Andre Badgett jet a sewer main using a Vactor truck.  
(Photography by Gerald Bernard)



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#### Special Issue: Water System Maintenance and Rehabilitation

- ◆ Water: Leak detection and metering in Kingsport, Tenn.
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DECEMBER 2010

MUNICIPAL  
**SEWER**  
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**FOCUS: SEWER/WATER**

# MOTOR CITY RENAISSANCE

Challenged by rising costs, a declining population, and declining water sales, the City of Detroit has made great strides to improve its sewer and water systems

By Peter Kenter

**H**ammered by declining water sales, a declining population, fewer personnel, a shrinking industrial base, deteriorating infrastructure and rising costs, the Detroit Water and Sewerage Department (DWSD) faced a quandary.

Sam Smalley arrived in June 2007 as assistant director of asset maintenance to take on the challenge of improving residential customer service and beefing up maintenance and rehabilitation, while keeping water rate increases to a minimum.

He has made tough choices to improve efficiency in the department and to set priorities for improvements to the sewer and water systems. He is also leveraging technology — from simple tools like new root-cutting nozzles to sophisticated approaches like GIS tagging.

## Tall order

Smalley's supervisor, Pam Turner, who recently retired as director of water supply operations at the department, charged Smalley with a mission. "One of my goals with the system was to make sure more

attention was focused on residential customers, and to treat them with the same attention as our wholesale customers," Turner says.

"But underground infrastructure is something nobody sees or notices until something breaks. If we have rate increases, the customer needs to see the value of what they're paying for."

Smalley was recruited from one of the department's wholesale customers: he had been the City

**"One of my goals with the system was to make sure more attention was focused on residential customers, and to treat them with the same attention as our wholesale customers."**

Pam Turner

of Dearborn's water and sewerage utility manager. "Sam told me that he wanted to make some improvements to the department's operations and that it was going to cost some money," says Turner.

"Essentially he said that if we invested, the department would deliver. I approved that plan with one goal: to reduce the number of customer complaints and increase service. Sam's a pretty smart guy,



**Boiler operator Donzell Burns works atop a lift rack with a CIPP liner roller and water feed. (Photography by Gerald Bernard)**

**PROFILE:**  
**Detroit (Mich.)**  
**Water and Sewerage**  
**Department**



**INCORPORATED:**  
1806

**CUSTOMERS:**  
4 million

**AREA:**  
143 square miles

**DEPARTMENT STAFF:**  
2,200

**INFRASTRUCTURE:**  
3,400 miles of waterlines;  
3,600 miles of sewer lines

**ANNUAL BUDGET:**  
\$362 million  
(2009-10 operations)

**WEB SITE:**  
[www.dwsd.org](http://www.dwsd.org)



Repair worker Carl Truitt uses a Vactor truck to clean a sewer main on Detroit's east side.



**Greg Edwards, sewer safety inspector, checks the progress of a camera inspection.**

"That outreach has been credited with significantly improving relations with wholesale customers. We needed to put an equal amount of energy into improving service to retail customers. This is an enterprise utility, and its operations are funded entirely by the people who pay the bills."

It's a delicate balancing act. Water demand in the Detroit area has declined by about 15 percent over the past five years, and customers have to make up the reduction in revenue. In 2009, more than half of the 8.9 percent increase in residential rates resulted from lower demand.

Smalley's first order of business

was to begin to restore customer confidence by reviewing recent complaints received by the department and comparing it to the corresponding backlog of service requests. A red flag went up in relation to the repair of lawns and asphalt after water main break repairs.

"We had a \$17 million backlog of work required for asphalt and lawn restorations," says Smalley. "That may look like a good place to save money, but this is one area where what the department does is most visible. When the repairs aren't done well, it's something the customer sees every day, and it's a difficult thing for people who take pride in their properties and the community."

Smalley asked for and received an additional \$3.5 million for the current fiscal year to address the most needed repairs.

#### **Demolition orders**

A second backlog involved at least 10,000 vacant properties. Detroit Mayor David Bing had made the demolition of these properties a priority.

"Unfortunately, due to difficult economic conditions, these properties have been abandoned," says Smalley. "Many of them are flooding because pipes burst in freezing weather, or due to metal thieves, who strip the houses of copper pipe. The houses can't be demolished without cutting off the service, or the demolition could tear the

## **REVITALIZING THE FLEET**

When Sam Smalley took on the job as assistant director of asset maintenance with the Detroit Water and Sewerage Department he found he had a fleet of 27 combination sewer cleaners at his disposal. Unfortunately, some of them were ready for disposal.

"Of the 27 trucks, I had about six or seven that were roadworthy, and a few that were operating intermittently," says Smalley. "The city hadn't bought a new truck in about 10 years because of budgetary constraints."

The units were almost all Vactor trucks. "My guys know the Vactor brand," says Smalley. "We had a few units from other manufacturers at one point, but if you're trained to use one brand and are familiar with operating it, you don't want the guys jumping into the one truck they're less familiar with when they get out of bed in the middle of the night to answer an emergency call."

"We needed to maximize the assets we did have to get those combination cleaners back on the streets." To devise an action plan, Smalley approached the local Vactor dealer, Jack Doheny Supplies, part of the Jack Doheny Companies.

"We've been dealing with the city for 40 years," says Dan Weber, president of Jack Doheny Companies. "We also happen to be the largest rebuilder of Vactor sewer cleaning equipment in the world."

The first order of business was culling the herd. Non-standard machines or those beyond repair were auctioned off. Weber's crew identified the best of the older units that could be put on the road soonest and at lowest cost. "We evaluated three of their oldest trucks, which were 1996 or 1997 vintage," says Weber. "Generally we wouldn't rebuild trucks older than 10 years, but even though these were slightly out of range, we felt it was the fastest way to get more trucks on the road."

The trucks were stripped to the sub-frame and the key components — water pump, fan and vacuum system, high-pressure hose reels and boom — were replaced. The trucks themselves were treated to new suspensions, brakes, wheels and tires, engine service, and a fresh coat of paint.

In four to six weeks, three units were restored to full service at a cost Smalley estimates at about 40 percent of the price of a new truck. "We started cautiously, but the refurbishing initiative was so successful that we continued," he says. "We've now rehabilitated 11 of those older machines."

With high personnel turnover in the department, Smalley also turned to Jack Doheny for training to help extend the life of the units. "We trained operations staff on maintenance and easily manageable repairs," says Weber. "We focused on things like the walk-around of the truck at the beginning of the day, using the right accessories for the job, the use of specialized nozzles, cleaning the fan housing, and draining water from the pumps at the end of the day in cold weather."

Mechanical department staff members were also given factory repair training. "The city has made great strides in improving its sewer maintenance and cleaning program over the past four years, and we're proud to be part of it," says Weber.

service connections right out of the water main."

To reduce the backlog, Smalley observed the standard method for severing and sealing service connections. "They were digging a hole 3 feet by 5 feet by about 5 feet deep at the property line using hand shovels," says Smalley. "To help speed up the process, we ordered four mini-excavators from John Deere and Caterpillar that can quickly and easily dig holes up to 7 feet deep."

Instead of sending four workers to each site, the department now sends one operator and one laborer. Productivity on severing service connections has increased from two to three per day to 15. As of September, the 10,000-residence backlog stood at 350. The department has also been catching up on delinquent accounts, shutting off service before flooding becomes a problem.

#### Detecting water loss

Smalley says the work is helping to control leakage and stabilize overall water pressure, but it has been difficult to pin down progress. "It's a large system that can support a large amount of leakage," he says. "We have the capacity to pump 1.8 billion gallons of water per day, and on average we move 600 million gallons. Even a change in water temperature on a system that large can skew the

readings significantly. Still, we know we're making a difference."

At 3,400 miles in total length, the city's water mains date back as far as 1875, the largest portion of them cast iron. Newer sections were added as the city expanded. Lines range from 1.4-inch copper tubing to 120-inch concrete mains.

Leak monitoring is carried out in-house and by dedicated consultants. "We largely use acoustical detection," says Smalley. "We also monitor sewers during downtime to detect large volumes of water that appear out of place."

The city is also dealing with sections of water main supplied by a now-defunct manufacturer of pre-stressed concrete cylinder pipe. "As is typical with this product, we're seeing damage to the stress wires that support the shell," says Smalley.

Repairs to water mains are largely dig-and-replace with ductile iron pipe. While the city has been looking at other trenchless methods, it abides by standards set by the American Water Works Association. "Without guidance of the AWWA on trenchless rehab for potable waterlines, we can't plan on using any of those methods," he says.

#### Electrical efficiency

The department has also made efficiency improvements to its five water treatment plants, 22 pumping stations and assorted booster stations by installing variable-frequency drives to reduce energy consumption. The drives adjust the speed of the electric motors to

**Water meter foreman Terry Craig uses a GPS system to check the status of dispatched trucks and print out reports on meter data.**



**Members of the Water and Sewerage Department maintenance executive team include, clockwise, from left, Martin Craig, mechanical maintenance superintendent; Sam Smalley, assistant director of asset maintenance; Luveria Royster, administrative assistant; and Louis Fischione, assistant superintendent.**

meet actual pumping demands. Plant controls have also been replaced by computer-automated treatment process systems.

The city's 3,600 miles of brick, concrete and other sewer lines, varying from 4-inch piping to 20-foot tunnels, date back to 1875 and earlier. "When I got here, a large number of sewers had not been cleaned in some time," says Smalley. "A lot of that had to do with the sidelining of our combination sewer cleaner fleet. The year before I arrived, they had cleaned 40 miles. In my first year we cleaned 75, in my second we cleaned 105, and as of September this year we've already cleaned more than 330 miles with a goal of 400 miles by end of year."

The causes of sewer blockages are typical: primarily sediment, with roots and grease following a

close second. Smalley discovered, however, that the weak link in the root-control program was the technology used to cut the roots.

"We have trucks costing hundreds of thousands of dollars, and when I took a look at our selection of sewer nozzles, they were outfitted only with cheap, small jets," he says. "I retired those and invested in Bulldog nozzles from ENZ USA Inc. They were more expensive but led to a significant increase in our productivity."

With a few hundred miles of sewer line clear of roots, the city contracted DownUnder Municipal Services of Kalamazoo in 2009 to begin a root-foaming program using the Vaporooter product.

#### Dedicated camera truck

The department maintains a dedicated camera truck outfitted



**An outside contractor works for the city on a complete rework of a storm drain.**



The Detroit Water and Sewerage Department crew includes, from left, Robert Davis, repair worker; Muchoki Bryant, repair worker; Anthony Johnson, helper; Steven Way, helper; Craig Staley, repair worker; Juanita Oakes, repair worker; Ronald Leapheart, mechanic; John H. Johnson, repair worker; Joseph Richardson, mechanic; and Jonathan Eli, mechanic.

ronment Drinking Water Operator Certification, which offers five levels of certification, with Level 1 the highest attainable.

"Many of the new hires are already aiming for Levels 2 or 3," says Smalley. "I've also told them that if they get their licenses I will make my best effort to ensure that it means something to them in the future. They're eager to take on the training, adopt the new technologies and help to uncover new efficiencies where they find them. Technology is only as good as the people who use it." ♦

**"Our staff members are eager to take on the training, adopt the new technologies and help to uncover new efficiencies where they find them.  
Technology is only as good as the people who use it."**

Sam Smalley

with a remote-controlled camera from Aries Industries, but the sheer magnitude of the sewer cleanup program precludes a detailed video inspection on every job.

"We also have a video truck with a QuickView camera by EnviroSight on a carbon fiber pole," Smalley says. "After we clean a line segment, we pop the manhole cover, dip the camera into the manhole, and look upstream and downstream to see whether the cleaning has been effective or not. That has worked well for us."

The department is also in the middle of an \$80 million, three-year cured-in-place pipe lining program for its sewer assets, relying on customer complaint data to target the effort. The contractor performing the work is also responsible for a thorough video inspection of the rehabilitated lines, adding to the Detroit video database.

To help better plan sewer and water maintenance, Smalley has divided the city into four districts — east, west, north and central. Five of the city's 18 Vactor combination cleaners are dedicated solely to cleaning sewers on a scheduled basis. Others are dedicated to each district.

Specialized equipment is shared

among all districts. That shared pool includes an industrial vacuum loader (Guzzler Mfg.); an Elgin Sweeper; a continuous rodger; easement machine and bucket machines (Sewer Equipment Co. of America); a 3,500-gallon-capacity liquid vacuum truck from Presvac Systems; and a pair of fuel trucks.

#### GIS tracking

All work orders and problem reports are now computer-logged and tagged with GIS information using the ArcGIS system from ESRI and its built-in reporting software tools. "When we run our reports, we get a graphic representation of which district requires most of our energy," says Smalley. "If we have a basement flooding complaint, it goes on the GIS system.

"When we plot a water main break, it shows up on the GIS system. It's much easier to target main replacement efforts when you can see the data on a GIS display instead of in database form."

The department is also using GIS technology to keep tabs on system infrastructure. Even the city's 28,000 water mains are being inspected, photographed, and tagged with GIS information, along with a report on their condition.

The majority of the depart-

ment's maintenance and repair fleet is also monitored by GIS. "We know when the PTO of a Vactor truck is engaged, and we know it's being used as a piece of equipment instead of just driving around the city," says Smalley. "We know the locations of the vehicles and the status of the main engine. We've achieved a significant reduction in fuel consumption based on eliminating unnecessary idle time."

Most GIS reports were initially accessible on dedicated computers available to managerial staff only. A new initiative is aiming to make many of the reports available to technical staff as well, by exporting the data to a more user-friendly Web-based platform. Even residential water customers can now access daily Web-based reports on the volume of water pumped through the system.

Despite the emphasis on technology, Smalley credits hard-working staff members for helping to turn the department around. Many of the best ideas for department efficiencies come from employees, who advise Smalley on what works in the field.

A considerable number of staff members are also voluntarily working toward Michigan Department of Natural Resources and Envi-



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