FLOW of DATA

Sewer flow monitoring brings big benefits to communities

By Tawny Quast

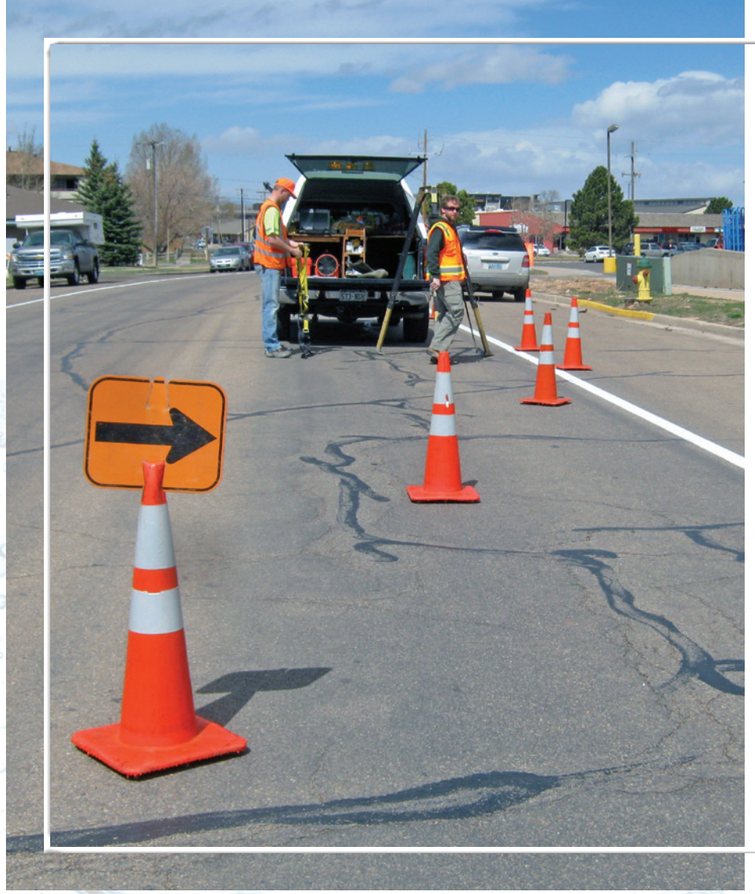
Crawling into a wastewater sewer manhole likely doesn't make most people's bucket lists. But Ayres Associates' municipal engineering staff members in Fort Collins, Colorado, actually enjoy their time spent in these large pipes to help their municipal clients.

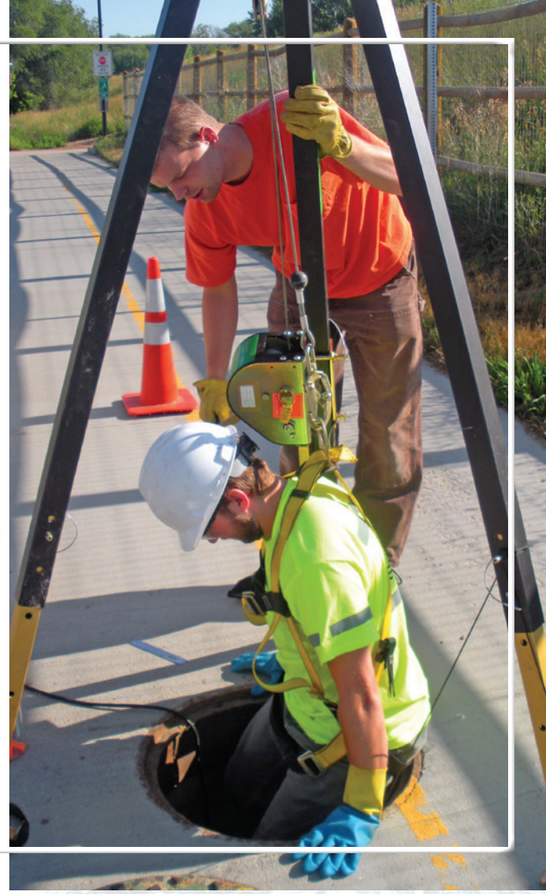
Sewer flow monitoring involves placing a sensor into the wastewater flow. The sensor measures the depth and velocity and uses those parameters to calculate the flow rate. Ayres Associates engineers place the sensors in the sewer pipes and hang a data collector near the top of the manhole.

The flow data then can used to calibrate a municipality's wastewater model, which is used to determine whether its pipes are undersized in a particular location, what pipes need replacing, or what impact a new development will have on the sewer system downstream, among other things.

The northern Colorado City of Loveland has been working with Ayres Associates on developing a sewer model that accurately simulates its wastewater collection system. A computer model can simulate wastewater flow but can be inaccurate without comparing the model to actual field conditions, said Chris Matkins, water utilities manager for the City.

Loveland needed to understand the capacity in its sewer lines to plan for infrastructure improvements and upgrades, Matkins said. "Basically we build the model, and then we use flow monitoring to verify the results," he said. "The decisions you are making are very large, expensive decisions. You're talking about costly infrastructure upgrades, and you need to make sure you're basing your decisions on good results."





Spending money on a sewer flow monitoring program saves in the long run, Matkins said. The flow monitoring data, in some cases, may show that sewer pipes do not need to be replaced. "If we can delay capital investment projects because we have accurate results, those are big costs and direct savings to our rate payers."

Additionally, when a new development comes into the City, the flow data allows the City to determine the impact that development will have on wastewater flow further downstream, Matkins said. The developer then can pay for the upgrades to accommodate the new growth. "It's a more equitable way to distribute the cost to those who are creating the need." he said.

Ayres Associates engineer Chris Pletcher, who leads the sewer monitoring program, agreed that flow monitoring equals cost savings for municipalities. Besides Loveland, Ayres Associates has performed sewer flow monitoring services in Fort Collins and Longmont, Colorado, and Laramie and Cheyenne, Wyoming. "Better data allows the city to make decisions without increasing its risk," he said. "Utilities are strained to manage their assets with as little capital costs as possible; this helps them achieve that goal."

In Fort Collins' case, the City was experiencing inflow issues to its wastewater treatment plant after an intense rainstorm in 2009, said Matt Fater, an engineer with the City. Rainwater was finding its way into the wastewater system and down to the treatment plant.

"We decided we needed to do a more intensive flow monitoring program to track down where it was entering the system," Fater said. "It's like finding a bunch of needles in a haystack. You have miles and miles of sewer lines, and you need to find out where the rainwater is getting in. It's a tough task."

Above left: *Civil engineers Sam Lowe, left, and John Eklund, right, set up a detour route around a work zone as they prepare to conduct sewer flow monitoring.* ***Above right:*** *Eklund enters the sewer while Lowe stands by as the attendant, the person responsible for maintaining constant contact with the sewer entrant.*

The City of Fort Collins has just wrapped up the monitoring phase with Ayres Associates, after about three years of intensive work, Fater said. Now the City is using the data to go into the field and pinpoint exactly where the openings are in the system and why they exist, whether it is leaking manholes, broken pipes, or some other problem.

Beyond finding – and ultimately fixing – the source of the leaks, Fater said flow monitoring has had other benefits, such as finding areas where there are capacity problems and using the data to compare with its hydraulic models. “The better data we have, the better equipped we are to solve any problems that may crop up,” he said.

Both Matkins and Fater have been pleased with Ayres Associates’ service. “Ayres Associates works closely with our operations crew; we have a high degree of trust in them,” Matkins said. “In fact, the trust is so high that Chris (Pletcher) is almost considered an extension of our staff; he is able to make decisions and changes on the fly. We’re lucky to have Ayres right down the road.”

Fater said having engineers doing the flow monitoring brings many benefits. “Ayres has been great. It’s not an easy job to go and crawl into manholes; it’s certainly not a glamorous job,” he said. “It’s good having someone in the manholes with knowledge of hydraulics; they know what they’re looking for.”

And for Pletcher, he said he relishes the opportunity. “The whole reason I went into civil engineering is because I love going outdoors, but really a lot of engineering is sitting at a computer. To be able to go outside and see real things happen – sewer monitoring does that.” ■

Above: *Civil engineers Florian Fiebig, left, and John Eklund, right, view the inside of the sewer while conducing sewer flow monitoring activities.*

Down Under:

What’s it really like inside a sewer manhole?

Ayres Associates civil engineers Chris Pletcher and Sam Lowe like to call what’s inside a sewer manhole “organic stuff” – which they figure is a lot better than calling it what it really is. But just because they may use a euphemism to describe human waste doesn’t mean they find the job of going inside manholes unwelcome. In fact, they truly enjoy the work.

“I like the problem-solving aspect of it,” Lowe said, describing the job of sewer flow monitoring. “We’re trying to solve the mystery of where rain is getting into the system, and we’re looking for clues.”

For Ayres’ crew, safety is put first when working inside the manholes. The group requires three people present for each confined space entry: an attendant, an entrant, and a supervisor. The attendant is always watching the entrant, or person “in the hole.” The job requires specialized training for confined space entry and first aid/CPR.

“We make sure safety of our staff is paramount,” Pletcher said. The group uses an air monitor for checking the atmosphere inside the manhole for safe levels of hydrogen sulfide, oxygen, and carbon monoxide, and making sure there is nothing combustible. “If there is no hazard, then all we are dealing with is an offensive odor,” Pletcher said.

But not that offensive, Lowe said. “In my opinion it’s a somewhat sweet, moderate odor, but not necessarily rank most of the time,” he said. “That’s because it’s moving water, not stagnant.”

“Stagnant water is the worst,” Pletcher added. “Otherwise, it kind of smells like coffee and cocoa.” He said it doesn’t tend to stink except in the case of a pipe with a lot of silt and muck. “When you disturb the silt, it stinks.”

However, dealing with the smell may be an acquired taste. “We’ve had first-timers who overthink the process, and that can gag you,” Pletcher said.

On a frigid day or a sweltering summer day, being in a manhole isn’t so bad, Lowe said. “It’s climate-controlled because it’s underground – it’s always 50 to 60 degrees. I recall a day in Cheyenne it was bitterly cold out, but in the manhole it was pleasant.”

— Tawny Quast