

Inspecting Storm Sewer Assets Because

A RIVER RUNS THROUGH IT



CCTV pipe inspection system gathered more data than anticipated.

By Mark Grabowski, IT Pipes

With the picturesque and environmentally-sensitive Big Thompson River running through its heart, the City of Loveland, Colorado does what they can to protect it. That's why in 2018, the city's Public Works department prioritized storm sewer inspection and maintenance, bringing light to any buried assets.

Currently, the city is undertaking the Gardfield Harrison Storm Drainage Improvement Project. This \$18MM, four-year project is designed to implement several improvements to infrastructure in the area including replacing and upgrading existing stormwater infrastructure to address existing drainage issues and meet current stormwater standards, installing 18- to 60-inch diameter storm sewer pipes, replacing existing waterlines and valves to address aging infrastructure, and providing stormwater quality treatment measures within the stormwater system.

The monstrous project will occur in four separate phases with approximately one phase completed per year.

"This important work has many benefits to the public. Local street flooding will decrease and we can also better clean the stormwater going into our waterways like the Big Thompson Canyon. The quality of the water distribution system will be improved greatly and lead to fewer leaks," said Eric Lessard, City of Loveland civil engineer. "On the surface, the public will benefit from updated curbs, gutters, resurfaced streets and ADA improvements such as handicap accessible ramps on the sidewalks."

Big investments for big results

A four-year, \$18mm project isn't exactly a small undertaking. That's a large amount of money, consumption of city resources,

and disruption to residents. But for those in Loveland nine years ago, they won't soon forget the floods of 2013.

"It was a six-month nightmare" said Capt. Pat Mialy, Loveland's Emergency Manager.

In early September, 2013, the Big Thompson River experienced peak flow rates near Loveland of 4,500 CFS before the floodwaters destroyed the gauge. Larimer County, where Loveland is located, had 1,120 square miles affected by flooding, and 1,500 homes and 200 businesses destroyed. Extensive road damage in Big Thompson Canyon cut off-road access to many communities. Damaged sanitary sewer lines dumped raw sewage down the creek and into the Big Thompson River.

And while no storm sewer system could stop a 1,000-year-flood, it did help bring to light some of the system's defi-

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ciencies. With the city located at the bottom of a canyon, floods and massive rain will always be a part of life for those living in Loveland and surrounding areas. However, Loveland knew they could do better when it came to handling their regular rains, while protecting the river that makes Loveland what it is – the Big Thompson River.

Adding to Loveland's decision to invest in their storm sewer system assets was that, like a lot of communities, Loveland was experiencing exponential growth. When many of these storm sewers were installed in the 1960s, Loveland's population was under 10,000. Since that time, people have been moving to Loveland in droves, year after year. That same storm sewer infrastructure that supported the roads and surfaces built for 10,000 residents wasn't going to support the roads and surfaces that were now needed for 85,000 residents.

War is 90% information

Loveland knew they had to start at the beginning. To fix the situation, they needed to know what the situation was. The needed confirmation as to what buried storm assets actually exist – not just what a piece of paper said exists. Also, what condition is it in? The city knew they would need to look where they have never looked before – underground. Many of their storm sewers had never been seen since they were installed over half a century ago. Loveland needed to first understand if they had buried assets or buried liabilities.

Working with local outfit Dawson Infrastructure Solutions (North Washington, CO), the city purchased a cargo truck-mounted Ibak CCTV pipe inspection system. The 16-foot box on this truck would become the mobile office and work area for a tenacious crew of two. Outfitted with 1,000 feet of inspection cable, and camera tractor that was capable of inspecting pipes from 8 up to 144 inches, they were soon on their way to gathering more data on their storm sewers than they had anticipated.

With the storm sewer inspection data flowing in, the last thing Loveland wanted was for this vital information to be siloed. The city already utilized Esri ArcGIS and Cityworks Asset Management System and sought a pipe inspec-

tion software that integrated with both.

Once again, working with Dawson Infrastructure Solutions, Loveland was introduced to the ITpipes platform. ITpipes consumes Esri Feature Services, having been built on Esri's latest technologies. Also, ITpipes has an automated bi-directional integration with Cityworks, meaning that when data goes into ITpipes, it automatically goes into Cityworks, and vice-versa.

Utilizing ITpipes Mobile, Sync, and Web, they were able to efficiently streamline their workflow. With a whole city of storm sewers to inspect, and only one crew, Loveland knew they had to maximize productivity where they could. With these seamless software integrations, they were off to a great start.

"These integrations allow the camera operator to select a pipe on the Esri map, which immediately opens the inspection for that asset in ITpipes, pre-populated

With 1,000 feet of inspection cable, the camera tractor was capable of inspecting pipes from 8 up to 144 inches

with pertinent header data." says Eric Wilson, Senior GIS Analyst with Loveland Public Works. "This prevents the operator from having to enter the data manually on each pipe, as well as greatly reduces the chances for errors. Seemingly little time saving efficiencies become much larger when the crew is inspecting ten or more pipes per day" adds Wilson.

One bite at a time

The journey of a thousand miles (of pipe) begins with a single step, and Loveland decided the first step would be inspecting all pre-1987 storm pipes. These pipes not only had the highest chance of being compromised, but also had the highest likelihood of being hydraulically overloaded in a storm.

With the city expanding so rapidly, many of the downstream storm pipes were bottlenecks in the system, and Loveland had to get the data to figure out which ones.

It didn't take long until the inspection team was finding issues – not only with the pipes, but also with the City's existing GIS data. The inspection crew was discovering new buried assets, incorrect pipe diameters, unknown manholes, and different alignments from what was shown on the records. Previously, discrepancies like this often got "lost in the shuffle" and never made it to the GIS team for correction. However, that could no longer happen. This data was vital to Loveland's investigation. That is where ITpipes Sync helped the city.

Each night, the CCTV inspection truck goes back in the shop as the crew leaves for the night. Via an internet connection to the truck's PC, pipe inspection data collected that day automatically up-



loads throughout the night and syncs to the cloud. This bi-directional sync not only uploads all the pipe inspection data collected during the day, but also downloads any GIS changes or Cityworks workorders. When the day begins, the CCTV inspection crew has the latest updated map and work for the day, and the engineering teams have the latest storm sewer inspection reports and videos. Additionally, the GIS team has the data they need to make the pertinent corrections to the map layer.

"With over 10 inspections per day, there is a lot of data that is coming in every night" adds Eric Wilson. "With this workflow, pertinent data doesn't fall through the cracks."

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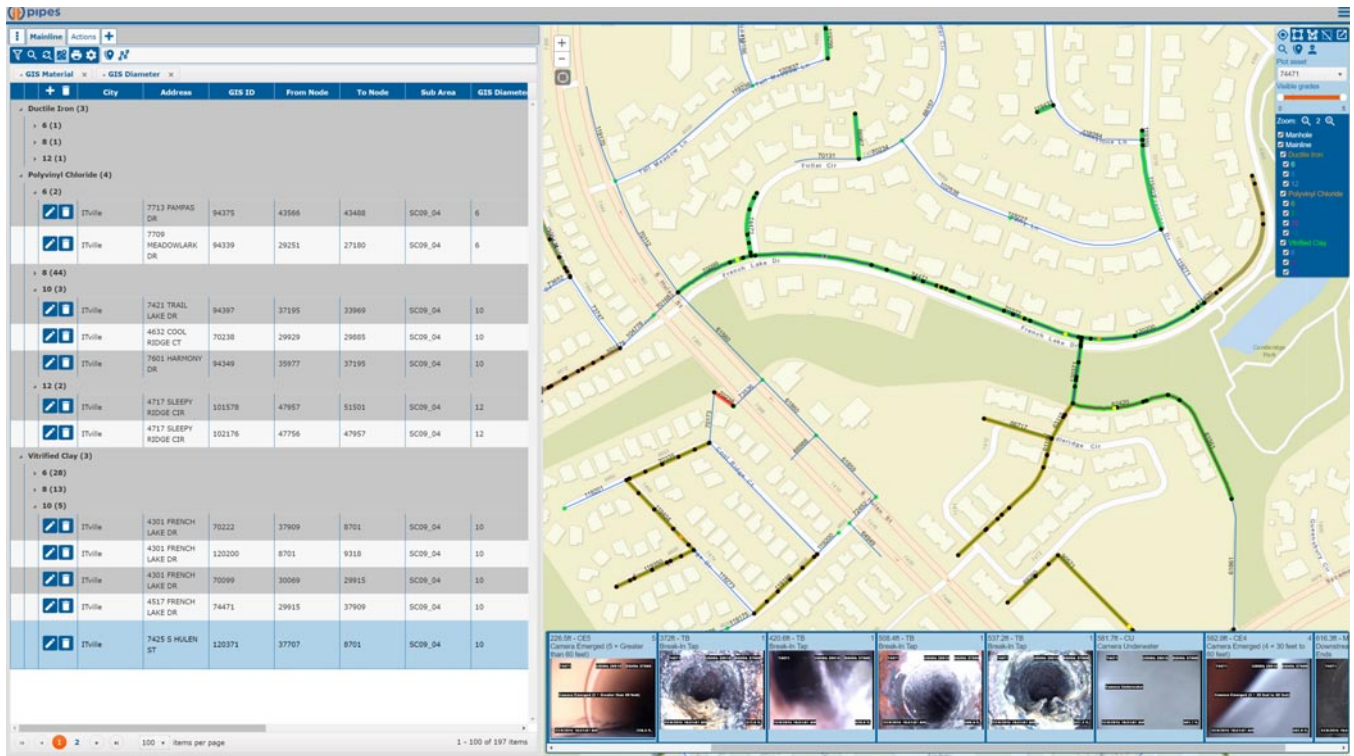
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Justifying the investment

City budgets are scrutinized every year – often by board members who unfortunately may not fully understand the importance of investment in buried infrastructure management. The software, equipment, but mostly the time investment – none of it is cheap. However, Loveland has been able to justify the expenses, with all costs tracked in Cityworks. With Itpipes’ automated bi-directional integration, anytime the crew inspects a pipe with Itpipes Mobile, a workorder is made in Cityworks allowing the city to accurately track time and materials. This automated workflow not only tracks costs, but also reduces burdensome paperwork, allowing for Public Works to justify budgets annually. Most importantly, however, it shows the residents of Loveland that their tax money is being wisely reinvested in their infrastructure while helping protect their Big Thompson River. This data also helps rationalize additional investments, like a new jet vac combo truck.

“Thanks to our storm pipe inspection program, we were able to justify the

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investment in a new combo truck. With that truck and our inspection program, we have cleaned more storm pipe in the last five years than in the city’s history. These targeted cleanings not only drastically improve flow, but capture debris before entering the Big Thompson. It also recovers vital capacity within the pipe” says Eric Wilson.

Looking forward

The 4-year Gardfield Harrison Storm Drainage Improvement Project is just the start for Loveland. Owing to their considerable investments in equipment and software, information is efficiently disseminated across the city’s public works department. Anyone in the city with access and a connected device can access pipe inspection data, anywhere, at any time via Itpipes Web. This provides stakeholders quick and easy access to pipe inspection data. This means operators in the field can easily pull up pipe inspection videos on their phone to see where a blockage is, just as easily as an engineer in the office can formulate a prioritized capital improvement plan.

Decades of old buried infrastructure can’t be fixed overnight. Nor can it be done cheaply. Loveland’s investment in efficient data-gathering tools and systems will help them assure that when the shovels begin moving dirt, their residents are getting the best bang for their buck when it comes to flood reduction and storm sewer improvements. And the biggest winner of it all is the Big Thompson River.

About the author

Mark Grabowski is an almost 20-year veteran of the water & wastewater industry, specializing in the inspection and rehabilitation of collection and distribution systems. His career has included contracting, equipment design, and software for the underground utility industry. Mark holds a BS in Mechanical Engineering from UCF and is active in multiple state and national industry associations.

