

CIPP Spells Success

In Swampy Area

If only a crystal ball was available many years ago when sewer pipes were built along streams and rivers. At the time, the thought behind their placement made sense – place pipes in areas where not much else is located. Since levels, lasers and other more sophisticated technology were unavailable, these pipes were established to mirror the downward flow of the water. Now fast-forward a century.

Aging concrete pipes are compromised by tree roots and are struggling to carry the ever-increasing flow of water they receive to local wastewater treatment facilities. Population and industrial growth have had a detrimental impact on our country's sewer collection systems. Decaying pipes result in cracks and gaps that enable excess rainwater and groundwater to infiltrate the pipe. This infiltration causes a chain reaction. Water entering treatment plants is now at a higher level, particularly during and after rainfall events. Treatment facilities aren't designed to handle the additional inflow of water which results in overflows in the system, causing environmentally unfriendly materials to leak into the country's rivers, lakes and, ultimately, the ocean.

Pipe deterioration and major infiltration of sewer pipes are two of the biggest challenges facing cities around the country. Given the proximity of the pipelines to rivers and streams, and the potential impact on these and other environmentally-sensitive locations, the time has come to fix these growing problems. An aggressive program by the city of Greenville, NC, is addressing the problem.

In fact, Greenville is really no different than many other communities around the country. Greenville's sewer lines – concrete main trunk lines for the community – were built about 40 years ago along its streams and rivers. More than 15 miles of pipe make up the main sewer lines known as Green Mill Run, Tar River Outfall and Parkers Creek Outfall. The Tar River Outfall is in the most environmentally-sensitive area since it runs parallel along the banks of the Tar River, a popular location for boating and fishing. If a failure or overflow occurred, it could result in a sewer spill that could send thousands of gallons of wastewater into the river. Fortunately that issue has been solved.

Defining the problem

About five years ago, a thorough inspection of Greenville's main sewer lines found sig-



nificant corrosion. Some 80,000 linear feet of pipes showed some level of deterioration. As a result, the Greenville Utilities Commission (GUC) hired an engineer to review the videotapes and evaluate the extent of the damage. The engineer used the Pipeline Assessment & Certification Program (PACP) established by the National Association of Sewer Service Companies (NASSCO) to analyze the tapes and provide a specific rating for each line. The highly regarded PACP is a uniform protocol for systematically and effectively analyzing the videotapes. This analysis helped GUC prioritize which lines to rehabilitate first.

"We had more sewer pipe than we had money, so we had to prioritize and decided to do the worst, most corroded areas first," said Steve Porter, systems engineer for the Greenville Utilities Commission. "We also chose areas that were environmentally-sensitive, such as the Tar River Outfall."

The first phase of the rehabilitation began in 2000. GUC's long-term plan is to keep funding projects until all the corroded areas of the 80,000 feet are rehabilitated.

For Phase II, GUC contracted with Newport News, VA-based URS Corporation to design the project, which was awarded to Am-Liner East Inc., Sterling, VA. Phase I had already been successfully constructed by Am-Liner East, a company that provides high quality, full service sanitary sewer and manhole rehabilitation to the trenchless industry.

The project consisted of rehabilitating over 15,000 linear feet of pipe ranging from 18 to 27-inches in diameter and 580 verti-

cal linear feet of manhole rehabilitation.

Cured-in-place pipeline rehabilitation (CIPP) was chosen in lieu of excavation for its flexibility, durability and proven success rate. "Excavation was not cost-effective because the city would have had to get the area dry first since so much of it was in a swamp," said Mark Miles, Am-Liner East southeast operations manager. "It would have been nearly impossible without major work."

"We've had great success using CIPP and believe it's the technology that works," said Porter. "It's proven, minimally-disruptive and cost-effective."

Work begins

At the start of the project, a bypass plan was established after careful planning and review of the pre-construction video. Significant effort was made to protect the trees while tree limbs were trimmed during the early stages of the job site preparation. Sunbelt Pump & Power of Raleigh, NC, performed the bypass of lines through the swamps and KLB Construction built the access roads. Once the bypass was effectively established, the concrete lines were cleaned and inspected by KRG using a CCTV camera. This inspection confirmed that the pipelines were free of silt, debris, tree roots or other intrusions.

Premier-Pipe USA Cured-In-Place Piplining Process for Sewer Mains from JWM Environmental Inc. of Eden Prairie, MN, was selected as the rehabilitation method. Applied Felts' Polyester Felt Tubing was

chosen for the relining due to its high success rate. As the industry's only ISO-9002 certified liner manufacturer, Applied Felts actually helped create the CIPP rehabilitation process and its first liners more than 30 years ago.

Pipes were lined by Am-Liner East using the Premier Pipe water inversion method for CIPP rehabilitation. The basic process begins by taking the lead end of the Applied Felts liner and turning it inside out for a predetermined length and clamping it to a collar over the manhole. Water is then introduced into the turned back section creating a head, which causes the lining to continue turning inside out along the defective pipe. The constant addition of water maintains the inversion head, inverting the liner and ensuring it is held firmly against the host pipe. When the installation is complete, the water in the liner is circulated through a mobile hot water boiler to gradually raise the water temperature to achieve a controlled cure of the resin. Once the cure is complete, the end of the newly formed pipe is cut and trimmed.

"Because excavation is avoided using the CIPP method for pipe relining, it eliminates significant costs, time and destruction that would have been a result of digging up the old pipes," said Miles.

Dun-Right Services rehabilitated the manholes using Raven 405 Epoxy Coating.

"Am-Liner East and its subcontractors, KRG, Sunbelt, Dun-Right Services and the Greenville Utilities Commission, along with Chris Garrett, P.E. of URS Corp., all worked extremely well together as a total team," said Mel Willett, Am-Liner East vice president.

Challenges

Nothing says "challenge" more than a sewer rehabilitation project conducted during hurricane season in an area that is mostly swampland. No matter how well planned and designed, every sewer rehabilitation project has its share of challenges. Creative solutions were needed to overcome the challenges of this project which was unique for several reasons:

- The majority of the project was in a swampy area with steep embankments, making access extremely difficult;
 - Work was performed during peak summertime heat and hurricane season;
 - The three sections of sewer line were located in different parts of the system and only portions of each line were designated for rehabilitation;
 - Varying terrain – swampland, woodlands, etc. – required different approaches; and
 - Snakes and beavers were prevalent creatures on the job site.
- Access to the job location impacted near-

ly every aspect of the project. Swamp mats were used to enable required vehicles to slowly move into the area. Vehicles had to carefully back out the same way they came in. The bypass pumping, handled by Sunbelt Rentals, was done in phases to minimize the amount of equipment that had to be snaked through the swamp. Almost 5,000 linear feet of fire hose was needed to supply water from the fire hydrants to the job site. Long liners, which are risky, harder to process and difficult to transport, were required due to lack of access to every manhole. In fact, in one section of 27-inch pipe, the liner was nearly 1,500-feet in length. Standard liners are usually 400 feet between manholes.

"Applied Felts was really the best solution for the liners because they custom manufactured them to meet our specific requirements," said Willett. "Given the job specs, we needed liners in varying diameters and lengths and they were able to meet our needs and schedule with great precision."

The crew worked long hours in the peak summer heat. A light rain shower would have been welcome; instead torrential downpours from a hurricane added more water to the swamp and made work nearly impossible at times. Tropical Storm Ophelia knocked out a couple of hundred feet of access road that had to be rebuilt. Water was everywhere and getting in and out of the job site was difficult. Snakes and beavers complicated things even more as crews fought to keep them at bay. Two beavers in particular were adamant about keeping their home which caused some minor delays one day. On Friday the crew disassembled the beaver dam and over the weekend the beavers built it back again.

Because the job was in various locations, the contractors and subcontractors moved around a lot, especially for the bypass pumping. At least eight different locations were needed where the contractor had to mobilize or demobilize to at least eight different locations over the course of the project.

Different soils

Varying terrain presented additional problems. Although the majority of the job was located in a swampy area, parts of the job were in the woodlands which also made access difficult. Differences in soil also impacted the approach. The Tar River has clay-based soil. Green Mill Run is known for its sugar sand soil. And, the Parker's Creek line is located in an area where the soil is very sandy. As a result, fine sand kept infiltrating the line. The team repeatedly cleaned the line, but tiny sand particles kept getting in. If sand remained in the pipe, bumps would result when the pipe was relined and

capacity would be reduced. Fortunately, the problem was fixed when the leaking joints were chemically grouted, which stopped the sand from entering the pipe. The line was then effectively cleaned and relined.

"To overcome the many challenges, we focused on teamwork," said Miles. "Coordination of all the subcontractors, Am-Liner East administration, GUC officials, etc., and keeping the lines of communication open between everyone involved was key. Public and customer service to the community was also important to keep the residents who could be affected informed of our actions and possibly disruptions to their daily routines."

"Am-Liner East has always stressed that planning and preparation are the backbone to any successful project, but it is their people that you see Am-Liner treat as their biggest asset," said Jim Mortell, president of Premier-Pipe USA. "When challenges did arise on the job, I was there to see Miles well supported to use his skills and expertise to overcome the challenges and keep his job on track."

Results

Despite the many challenges of this unique rehabilitation project, within six months the project was substantially completed. Thousands of feet of Greenville's sewer mains are now pipe within a pipe – safely relined to last for many decades.

"Using qualified and professional companies was key to getting the job done as quickly as possible while still providing high quality results," said Miles.

"I'm real satisfied with the CIPP technology," said Porter. "This Phase II showed us again how well it works. All in all it's been a job well done – all the players involved – contractors and subs really showed what teamwork really is and together they overcame many challenges to succeed."

FOR MORE INFORMATION:

Pipeline Assessment & Certification Program:

NASSCO, (410) 486-3500, www.nassco.org

Felt tubing:

Applied Felts, (203) 426-5948, www.applied-felts.com

Utility contractor:

AM-Liner East, 877-265-4637, www.amline-reast.com

Manhole coatings:

Raven Lining Systems, (918) 615-0020, www.ravenlining.com

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Premier Pipe USA, (952) 944-8093, www.premierpipeusa.com
Rental equipment: Sunbelt Equipment Rentals, (888) 334-7570, www.sunbeltrentals.com