

The Athens Alternative

Low-pressure system with grinder pumps replaces old gravity sewer.

By Bill Nestor

The small rural town of 14,128, located midway between Chattanooga and Knoxville, had a problem. An inadequate, aging conventional gravity system could no longer handle the amount of sewage and wastewater being produced. The increase of water infiltration and inflow levels worsened the situation.

Athens, TN, faced a daunting task and a dire situation. Population hadn't grown much since the 1960's, when the now-failing gravity system was originally installed. Growth in recent years had been limited because the state of Tennessee had denied Athens permission for any additional sewer hookups.

"The town has been under a state-ordered sewer connection moratorium since 1990, preventing much-needed growth of industry, manufacturing, and population. Today, however, projects are ongoing to improve and alleviate this situation," said Wayne Scarbrough, Athens Utility Board (AUB) Assistant General Manager.

"A \$20-million wastewater treatment facility renovation, completed in 2005, was part of the solution, but still not enough. Several mini projects around town are ongoing as part of our overall effort to lift the suspension. One of these projects is the recently completed Railroad Avenue abandonment plan that goes a long way to eliminate infiltration and inflow," added Scarbrough.

Rather than exchange the conventional gravity array with a newer version of the same technology, the AUB opted to abandon the old for an alternative replacement and selected a problematic, wastewater-challenged section of town for the undertaking.

"Rainwater run-off that bypassed the pump station contributed considerably

to the problem, especially in spikes during wet weather flow. We had to replace the gravity system and decided on Environment One's (E/One, www.eone.com) low pressure system with grinder pumps," said Randy Harrison, AUB Wastewater Construction Supervisor.

The forward-thinking decision made by the AUB to substitute an existing failing conventional gravity with a new low-pressure (LPS) system did the trick. It not only is earmarked by operational cost reductions, but the LPS system also yielded a savings in excavation, infrastructure, and materials costs with considerably less disruption to the land.

"Because we installed smaller mains, construction was much less intrusive on our customers and in some cases not recognized except for the installation of the [grinder pump] station. We directionally drilled and plowed in quite a bit of the main and little yard damage was noted. We plowed service lines and used a small excavator for installation of the stations.

"One of our biggest positive impressions with the E/One system is that we have now permanently eliminated all infiltration and inflow," said AUB Superintendent Jill Davis.

Athens Utilities Board

The Athens Utilities Board is the full-service utilities organization for some



Individual grinder pumps installed at each site push slurry of wastewater from homes and other sites to the central sewer or treatment plant.

13,000 customers in the Athens and surrounding McMinn County. The AUB provides electric power, natural gas, water, and wastewater services for residential, commercial, and industrial consumers.

General manager Eric Newberry oversees the water and wastewater, power, and natural gas divisions. The AUB directs, controls, and administers 7,698 water connections:

- 4,622 residential inside city
- 1,921 residential outside city
- 1,029 commercial inside city

- 99 commercial outside city
- 25 industrial
- 2 in neighboring Riceville and Niota

The AUB also directs, controls, and administers 5,149 wastewater connections:

- 4,225 residential inside city
- 7 residential outside city
- 890 commercial inside city
- 4 commercial outside city
- 22 industrial
- Riceville School

“The Athens Utility Board operates separately under a town charter. Five city council members are elected to two-year terms. The council selects four residents appointed at large and a fifth from the council who serve on the AUB. The board then hires a general manager. He hires an assistant general manager and superintendent for each division,” Scarbrough said.

Randy Harrison, a 17-year veteran with AUB, is construction supervisor. “He coordinates the building of all water and wastewater projects. Randy Millsaps is the maintenance supervisor, responsible for treatment plant operations, as well as servicing lift stations and grinder pumps. They are both hired by the superintendent,” said civil engineer Jill Davis, water and wastewater superintendent.

Abandonment-Replacement Strategy

An isolated mini-basin section in north Athens was targeted to implement the gravity abandonment replacement plan. The actual location of this undertaking, referred to as the Railroad Avenue Project (RAP), has minimal elevation change. The highest point is 1,123 ft and is characterized by ridges and valleys.

Sedimentary rock (limestone, dolomites, shale, and some sandstone) in the Railroad Avenue district is relatively shallow. The soils consist primarily of loams.

“We encountered few difficulties with



Soils in the Railroad Avenue district consist primarily of loams, and sedimentary rock is relatively shallow.

rock in the project area. We did find several springs and high water table conditions,” Davis said.

The AUB opted to install the E/One Sewer system using their GP 2010 grinder pump stations at each hookup.

There are 206 connections each with a grinder pump station including residential housing, small businesses, a school, and a church. They include 204 simplex units (190 residential, one day care, one restaurant, 11 businesses); two duplex units (one school with about 300 students in grades four-six, one restaurant).

Choosing a System

“We had some experience with E/One having worked with them previously on a limited basis at home sites that didn’t fit the conventional system—low lying sites in depressed topography. So there was some familiarity with the product. E/One’s low pressure system with grinder pumps guaranteed stopping infiltration and inflow,” Harrison said.

The E/One Sewer system employs sophisticated technology known for its reliability, minimal maintenance, low upfront costs, reduced operating expenses, and ability to be installed at any site, regardless of topographic challenges.

The GP 2010 simplex grinder pump

station used is a design well-suited for the Athens application. Individual grinder pumps installed at each site push slurry of wastewater from homes and other sites to the central sewer or treatment plant. It uses an unobtrusive, small-diameter pipe installed right below frost line and conforms to the natural topography.

Unlike conventional gravity central sewers, which can use up to 24-in. pipe and often require deep excavation, the E/One Sewer system is not destructive to the landscape’s natural or built features. It also costs significantly less to install and operate than a gravity system and requires less maintenance.

Both the gravity sewer system and the E/One Sewer system are known as central sewer systems. Most cities and many villages use central sewer systems, which simply means that waste is transferred, usually by a pipe or main, to a central treatment plant.

Gravity sewers are the “original” central sewers, with origins in the Roman aqueducts. Unfortunately, the technology behind gravity sewers is also centuries old: they’re bulky systems using a large main and can require major excavation to install. They must be accurately placed and bedded along a continuous downward grade. They can be expensive and are not entirely efficient in transporting waste because of leakage.

“Grinder pumps at each house, business, school, and church also eliminate the need for costly lift stations. With training and guidance from E/One and WASCON [the local E/One distributor, www.wasconinc.com], our crew installed the lines, grinder pumps, and did the hookup at each site. The crew also buried the deficient gravity system by collapsing old lines,” added Harrison.

WASCON, Inc. has been providing products and service in the Tennessee and Kentucky municipal water and wastewater business since 1979. The company is highly regarded and well known as a customer service organization.

“E/One provided much of the engineering and other technical support. WASCON supplied the product, provided training for town personnel, and support including coordinating with E/One, which contributed greatly to the success of this project,” Davis said.

Paying for the Project

In 2001, an initial grant application was submitted to the Appalachian Regional Commission at the governor’s office in Nashville. The lengthy process including comprehensive engineering, paid off when the AUB was awarded a 50/50 grant, similar to community development or block grant, of \$473,000 for the Railroad Avenue project in 2003.

Work commenced in January 2005. The conventional gravity abandonment and E/One replacement project was completed and operational by May 2007. “Environment One supplied much of the engineering,” Davis said.

Performance, Cost, and Savings

“The Railroad Avenue gravity abandonment project has been operational for over two years. There have been virtually no problems and little service or maintenance required,” Davis said.

“Pump station records have verified that some 700,000 gallons less was measured as being eliminated from wet weather spike flows in the first year after installation. In 2003 there were 500,000 gallons of water overflow—from nine events, in 2007 there were zero gallons and zero events,” Davis added.

“Our records indicate a reduced flow through the Railroad Avenue pump station to our treatment plant of 27,500,000 gallons per year with a yearly savings of \$89,212 in treatment cost alone. Installation of the E/One Sewer system has produced a significant reduction in wet weather overflows. Eliminating overflow levels that are state violations helps our standing with state regulatory officials,” Harrison said.

“Not having to treat the excess water from infiltration and inflow reduces costs as does elimination of stop-ups,” Scarborough said.

“The construction savings by choos-

ing the alternative E/One system was 25 to 35 percent. The actual cost included abandonment of the old gravity main, which would have been required regardless of the technology chosen,” Davis said.

“The low-pressure system has needed little time or attention and savings from reduction of wastewater infiltration and inflow through the treatment plant is significant. Pump run time is also greatly reduced. Maintenance time for stopping to clean the system has diminished and less overtime will likely produce additional savings,” Davis said.

What’s Next?

There are other areas in the town where the aging conventional gravity system, infiltration, and inflow may need attention in the future. The Athens Utilities Board continues to address their needs.

“We are continually working on the system to evaluate, repair, and if needed, replace. In another part of town where the system is deficient we are eliminating a major trunk line of 15-in. concrete, replacing it with an 18-in. PVC pipe.

“Grinder pumps are being considered in at least one specific application that is currently on the boards in the study stage,” Harrison said. 

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