

by Jeff Griffin ■ Senior Editor

Tennessee Boring

Auger Unit With Special Cutting Head Powers Through Limestone

For more than 50 years, the First Utility District of Knox County, TN, has served residents and businesses in the southwestern portion of the county and the town of Farragut.

From a small pumping station placed in operation in 1955 capable of pumping about 500 gallons of drinking water to about 700 customers, the district has grown into one of the state's largest water and wastewater utility districts, last year supplying 3 billion gallons of water to nearly 26,000 customers.

To keep pace with growing demands, the district has constantly expanded and improved its infrastructure. Currently under way is a \$17 million project to upgrade the district's water treatment plant. Completion is projected before the end of 2007. Haren Construction Co., Etowah, TN, is the general contractor; the engineering firm is Jordan Jones & Goulding, with offices in Knoxville, TN, and Atlanta, GA.

The project will significantly increase the capacity of the water treatment plant to meet the needs of future growth in this area, said Evan Haren, president of Haren Construction, and includes a new sedimentation and filter complex, clearwell, raw water intake, electrical improvements, a large quantity of piping throughout the plant and other facility improvements.

As do many projects of this type, circumstances often require specialty contractors. On this one, it was necessary to place a 140-foot segment of 72-inch diameter casing beneath two busy tracks of the Norfolk Southern Railroad. Installed in the casing were a 36-inch diameter raw water intake, 12-inch gravity flow sewer mains in a 22-inch steel pipe, an 18-inch steel pipe for future use and electrical conduit and cable.

Original plans called for the steel casing to be installed by tunneling, but for economic reasons the decision was made to use auger boring instead. Selected as the boring contractor was Southern Horizontal Inc., Sale Creek, TN.

"Conditions were very difficult," said David Deerman, Southern Horizontal presi-



dent. "Soil conditions ranged from clay containing boulders to extremely hard limestone to 24,000 psi. The location was very close to the Tennessee River – the bore pit was about 30 feet away and five feet below river level at the low winter pool. We operated a 10-inch electric pump 24 hours a day, every day of the job."

The bore was made with an American Augers 72-1200 boring machine with 72-inch auger on five-inch hex drive for spoil removal. The cutting head was a 72-inch Robbins SBU.

The 72-1200 auger boring machine was used because of its ability to withstand the rigorous loads posed by the challenging geology. With 250 horsepower, it can provide continuously-available thrust force of 1.2 million pounds.

During normal operation, the thrust of the auger boring machine is used for a dual purpose. First, it supplies thrust to the cutting head and the force required to move the casing and auger into the heading. The load sensing hydraulics on the machine minimizes the possibility that the cutter head is overloaded. In a known geological situation, advance speed can be predicted and the hydraulic system can be tuned to match that performance without overloading the cutter head.

Robbins SBUs extend the range of soft-ground auger boring equipment to work in hard rock from 4,000 to 25,000 psi and are intended for use on bores to lengths of 325 feet. They are available in any casing diameter between 24 and 72 inches.

To prepare for the bore, a 14-foot-deep starting pit was excavated and a concrete slab poured for rails and a concrete kicker to support thrust. The pit was shored with a 40-foot-long trench box.

"We utilized a Cat 345 excavator and a 50-ton Link Belt crane to move and set the heavy casing and cutter head," Deerman said. "We also used two wire welders to weld the 1-inch thick steel casing. This process and the help of two welders cut in half the time required to weld the casing together. Once the 72-inch pipe was in place, utility lines were installed in the pipe at the proper line and grade."

Deerman said the boring machine had plenty of power to spare at the end of the bore, and the SBU handled the solid rock and mixed soil conditions well with very little cutter wear and no breakdowns. The bore was completed in two weeks working 10-hour days.

"There were those who said the bore could not be done because of the difficult conditions," said Deerman. "But we completed it on time and well under what it would have cost to do the job by tunneling."

Southern Horizontal is a southeast based road boring contractor specializing in rock boring and large outside-diameter boring and has been in business since 1991.

Established in 1939, Haren Construction provides commercial and industrial building, mechanical and electrical construction of public and private utilities, and highway and heavy construction for government and private project owners. Utility projects include pipelines, water and sewer systems, pump stations, water and wastewater treatment plants and raw water impoundments.

FOR MORE INFORMATION:

Auger boring equipment:

American Augers (Div. of Astec Underground), (800) 527-6020, astecunderground.com

Cutting head:

Robbins, (800) 323-5894, robinstbm.com