

## \$300-Million Pipeline Is Soggy Solution in North Texas

A lingering drought and population boom in North Texas have prompted the Wylie-based North Texas Municipal Water District to undertake water-use restrictions while embarking on a \$300-million project to build a 48-mile pipeline from Lake Texoma to the 300-million-gallon-per-day Wylie raw water treatment plant, bypassing Sister Grove Creek, a natural tributary of Lavon Lake. The closed pipeline also will prevent any invasive species, including freshwater zebra mussels, from being released into the environment while restoring a major portion of the region's lost water supply.

President Barack Obama signed House Resolution 6007 last December, giving the water utility an exemption from an old federal law that bans transport of "injurious species," such as the zebra mussels, to allow it to resume pumping water once the project is complete in January.

Lake Texoma, a 2.5-million-acre-ft man-made reservoir formed by the Denison Dam on the Red River in Bryan and Grayson counties in Oklahoma and Texas, respectively, is playing a key role in meeting burgeoning water needs in North Texas. The region's municipal water district serves 1.6 million residents across 61 cities, towns, and special utility districts over nine counties, altogether spanning a 2,200-sq-mile area.



### Underwater threat

The district draws upon several surrounding lakes to quench its thirst, including Lake Texoma, which provides 28% of its water supply.

Zebra mussels, however, have since emerged and multiplied across the lake—clinging to and clogging water pipes. Raw water intakes can carry the microscopic free-swimming larvae directly into treatment facilities. Under the Lacey Act of 1900, interstate transport of zebra mussels and related nuisance species is a criminal offense with penalties of up to \$500,000 for each violation.

As a result, the Army Corps of Engineers, which supervises the lake, ordered the municipal water district in 2009 to stop pumping until it could devise a system that would prevent zebra mussels from spreading from the Red River Basin into Lavon Lake and the Trinity River Basin. The district consequently has been unable to draw 84,000 acre ft of water a year.

"Our primary water supplies are below normal levels due to less than average rainfall," said Jim Parks, the district's executive director, in a statement. "We need to conserve the supplies we have and reduce our water use by at least 10%."

### Constructing a Remedy

In September 2011, the district hired Fort Worth-based Freese and Nichols Inc. as design engineer while evaluating more than 20 pipeline alignments and gaining rights-of-way from 300 property owners. Kansas City, Mo.-based Garney Cos. Inc. was tapped as construction manager at-risk in January 2012.

"This was the district's first construction manager at-risk project. Our early involvement allowed us to become involved in the design, offering feedback on cost and constructibility for real time numbers," says Garney project manager David Burkhart. "It also allowed us to identify and troubleshoot any gaps for material procurement."

The water district and Garney consequently acquired key materials prior to 100% plan design completion, including 84-in.- and 96-in.-dia C200 cement-mortar-lined polyurethane-coated steel pipe. The project, which broke ground last November, consists of 48 bid packages with a total of about 40 contractors and suppliers. Project segments are being built simultaneously, with 350 workers on site during the peak of construction activity.

"During the predesign stage, there were areas that we were able to identify that saved time and money, such as using an open-cut method for parts of the pipeline alignment as opposed to tunneling," says Garney construction manager Jason Jansen. "Essentially, construction management at-risk enabled us to compress the schedule and finish in half the time."

### **Massive Piping**

The project consists of an 80-acre berm ring dam that serves as a 250-million-gallon balancing reservoir. The earthen geomembrane-lined structure is built using soil cement—a highly compacted mix of aggregate, Portland cement and water—to capture the outflow from Lake Texoma. The reservoir equalizes water for a more uniform flow to the treatment plant via a 100-mgd pipeline that is 100% gravity fed. There is a 350-ft drop in elevation from Lake Texoma to the Wylie water treatment plant.

Construction entails digging an 11-ft-wide, 15-ft-deep pipeline trench with tunnel sections up to 40 ft deep. The length and alignment present workers with diverse geotechnical conditions, from seeping soil to limestone. The job requires nearly 3 million cu yd of excavation, with 20,000 truckloads of aggregate backfill and embankment.

"With the amount of materials on this project, we have a load of something every 7 feet," says Jansen, who estimates there are up to 225 trucks working on the job.

Hanson Pressure Pipe, a unit of Heidelberg Cement Group, and Northwest Pipe Co. will deliver the project's pipeline in 5,000 truckloads. The pipeline trench, which will carry water monitoring fiber optics, delivers raw water to the 770-mgd Wylie plant that is 25 miles outside of Dallas. The plant is undergoing upgrades with 20 new structures to accommodate the pipeline, including the addition of five above-ground concrete wire storage tanks. The largest, which is 56.5 ft tall and 128 ft in diameter, has a 2.7-million-gallon storage capacity.

Sleeve valves reduce the high pressure or throttle flow of incoming raw water. Lake Texoma pipeline water will enter treatment at about 200 psi. There are also cast-in-place and precast tilt-up chemical, electrical and control buildings as well as two mixing boxes that combine Lake Texoma with other raw water to create a uniform liquid prior to treatment.

The plant is currently being converted to an ozone treatment process under a separate \$112-million contract with McCarthy Building Cos. as general contractor. Ozone disinfection destroys bacteria and other microorganisms with fewer dangerous by-products, odor problems or impacts on taste. The ozone upgrades, designed by Black & Veatch, will finish in January.

"The pipeline extension will bypass Lavon Lake containing any zebra mussels in the pipeline until they can be treated and removed at the water treatment plant," says water district spokeswoman Denise Hickey. "The extension will also provide system flexibility and enable emergency access to water from Jim Chapman Lake, Lake Tawakoni and the East Fork wetlands if terminal storage in Lavon Lake was ever compromised." Zebra mussel management, however, will be an ongoing challenge.

Mussels have spread to 600 lakes since arriving in the U.S. in the 1980s, says the Texas Parks and Wildlife Dept. They grow to only about 1.5 in., but can each produce up to 1 million microscopic larvae that attach to boats and trailers. Wildlife officials are mandating owners to clean, dry and drain boats after they have been in colonized waters or face a misdemeanor.

"There is no known way to eradicate them once they are established in a body of water," says Tom Gooch, Freese and Nichols water resources group planning manager. "In the long term, zebra mussels will provide operation and maintenance challenges to our clients."