

Sliplining Rehabilitates Critical Water Supply Line

It's tough to imagine a more difficult job than rehabilitating a water pipeline passing 25 ft beneath an interstate highway bordered with steep embankments in a busy tourist area, but that's what the Las Vegas Valley Water District faced. **BY JIM FORCE**

UTILITIES ACROSS North America are experiencing numerous nonrevenue water events—ranging from catastrophic failures to simple leaks—caused by water mains and transmission lines reaching the end of their useful lives. Proactive asset management and replacement programs

such as those in place in Las Vegas can help managers and operators spot and correct problems before they affect water quality or utility service.

THE PROBLEM

The Las Vegas Valley Water District (LVVWD) is responsible for delivering

water to more than 1 million people in southern Nevada, including the city of Las Vegas. In 2011, LVVWD used acoustic leak-detection equipment as part of its state-of-the-art asset management program to detect potential leaks in several important lines feeding the Las Vegas Strip. When a line was isolated, closed-

CASE STUDIES

CITIES CHOOSE SLIPLINING FOR PIPE REPAIR

Water utilities are increasingly using sliplining to rehabilitate large-diameter lines with fusible polyvinyl chloride (FPVC).

RHODE ISLAND

The city of Newport, R.I., detected leakage around the city's main pumping station, which serves 80 percent of the region's population and is located in the city's historic downtown. The leaky pipe had no in-line isolation valves or any viable means of a bypass connection. In a single pull through the deteriorating host pipe, the city used 30-in. FPVC to successfully slipline 3,900 linear ft of a 36-in. prestressed concrete cylinder sewer force main. Disruption was minimal—a welcome development during the height of the summer tourist season.

CALIFORNIA

After comparing FPVC with other fused plastic pipe, the California Water Service, Atherton, Calif., opted to use 16-in. FPVC to

slipline 5,280 linear ft of 20-in. riveted steel pipe. The sliplining took place beneath Atherton Avenue in an affluent section of the city. The longer pull length of FPVC compared with the other pipe material was important because of the high cost of pavement repair.

TEXAS

A leaky pipeline passing beneath Zaragosa Boulevard in El Paso, Texas, was prone to leaks, which led to frequent roadway flooding. The boulevard is a major port of entry from Mexico that's traveled by more than 45,000 vehicles daily. The 36-in. prestressed concrete cylinder pipeline was rehabilitated in 2007 by sliplining 16,300 linear ft with 24-in. FPVC. Much less disruptive than using an open-cut method that would have required property easements, FPVC sliplining was also less expensive than heavier plastic pipe that would have required larger installation equipment or shorter pulls.

For challenging pipeline alignment such as the I-215 project, sliplining with FPVC proved to be a feasible, cost-effective alternative to more disruptive methods. In-pit fusion of 10-ft pipe sticks was used to restore the section of pipe directly below the highway (inset).



circuit TV inspection revealed potential corrosion throughout the pipe. In addition, construction inspection reports suggested weld problems during installation.

LVVWD detected leakage in a 36-in. cement- and mortar-lined and coated steel pipe (MLCP). Installed in 1993 and providing water to the Las Vegas Strip, the line runs under Interstate 215 (I-215), which is part of a 50-mile beltway circling about 75 percent of the city. Complicating matters, access to the line was below the interstate, which runs under Las Vegas Boulevard.

EVALUATION

Grappling with site constraints, cost, and reliability, LVVWD engineering and asset management personnel evaluated various pipe materials, techniques, and challenges.

- Replacement with new MLCP would require a new, expensive casing and cost 50 percent more than sliplining with fusible polyvinyl chloride (FPVC) or high-density polyethylene pipe.
- Cured-in-place pipe was evaluated, but there weren't any installations of Class IV pressure lining at the diameter and pressure needed for a potable water system.

- Pipeline alignment changed as the line dropped from Las Vegas Boulevard to below I-215.

Ultimately, LVVWD personnel chose FPVC and sliplining based on cost, risk, and performance.

"We determined that 30-in. DR25 FPVC would provide the maximum cross-sectional flow area for the given inner diameter of the compromised host pipe," said Peter Jauch, LVVWD engineering manager. The project was launched in mid-December 2012.

INSTALLATION

FPVC was inserted into each section of host pipe through an insertion pit. LVVWD's contractor decided that five sections of pipe would be fused above-ground, and the 300-ft below-grade I-215 crossing would be fused in-pit. At each end of the alignment, the water line makes several bends to reconnect to the MLCP line. Restrained standard ductile-iron fittings were used in each case to connect the horizontally offset, fused PVC segments and to connect each end of the remaining steel line.

Because of the highly constrained work area adjacent to I-215, in-pit fusion

of 10-ft pipe sticks was used to restore the section of pipe directly below the highway. Although FPVC is usually supplied in 40-ft lengths, the manufacturer provided 10-ft pipe sections to accommodate the tight worksite. Standard ductile-iron fittings were used for the vertical offsets to facilitate connection to appurtenances and other pipe segments.

"The use of standard ductile-iron fittings simplified connections back to the steel line as well as insertion of various appurtenances," said Ryan Pearson, LVVWD project engineer.

After sliplining insertion and pressure testing on Jan. 25, 2013, the new pipeline was put into service in February. Fieldwork took about 180 days to complete; the pipe was replaced in just 37 days.

A VIABLE OPTION

For challenging pipeline alignment such as the I-215 project, sliplining with FPVC proved to be a feasible, cost-effective alternative to more disruptive methods. As detailed in the accompanying case studies, if pipe-diameter reduction is acceptable, sliplining is a viable option when jack and bore or open-cut methods are impractical.