

Pipe-Bursting Challenges Provide Valuable Lessons

Problems surrounding the rehabilitation of a leak-prone water transmission pipeline were solved through cooperation and hard work. In the process, the city of St. Helena, Calif., gained valuable insights for future projects. **BY COLLINS ORTON**

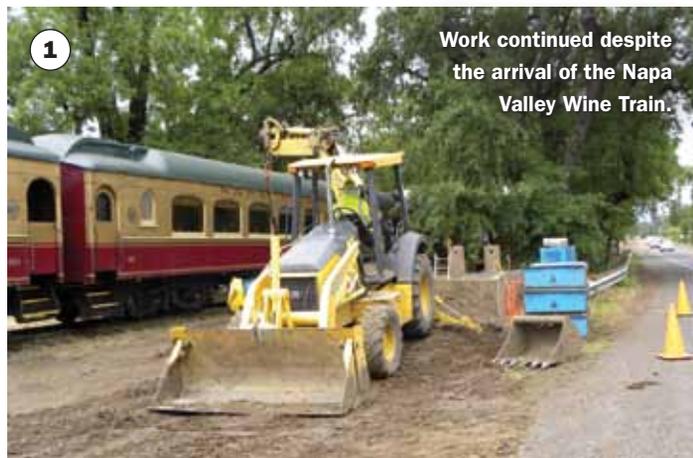
WITH 17 MAJOR leaks having occurred on the Rutherford water transmission pipeline over several years, city of St. Helena (Calif.) personnel knew pipeline rehabilitation or replacement was necessary, but the situation was complicated. The 12-in. welded steel pipe (WSP) was located under a drainage ditch along most of the alignment, requiring

an open trench, a costly undertaking that would encroach onto California Highway 29. The California Department of Transportation wasn't interested in impeding traffic in the area. The existing alignment is located in a narrow right-of-way between heavily traveled Highway 29 and the railroad used by the Napa Valley Wine Train (Figure 1).

Because continuing pipeline leaks were predicted, the city decided to

replace 2,627 linear ft of the 12-in. WSP. Maintaining a reliable source of water to the city and surrounding Napa Valley during construction was critical. Most previous repairs had been made with full-circle repair clamps, a repair method that's costly, usually used in emergency situations, and causes a pipeline to be out of service during repair.

In the fall of 2009, the city bid a project to replace the aging pipeline using static pipe bursting. Trenchless pipe bursting was chosen to accommodate the pipeline's proximity to the highway, Wine Train, and numerous utilities. The 12-in. steel pipe's entire run was joined by couplings at 40-ft intervals, which posed a major pipe-bursting challenge. In addition, scheduling



1

Work continued despite the arrival of the Napa Valley Wine Train.



2

Couplings at each joint needed to be split, delaying the project.



City of St. Helena (Calif.) staff and its contractor faced a complicated trenchless pipe-bursting project, with a state highway on one side of the narrow jobsite and a rail line on the other.

required the project to be completed before the grape harvesting season, known locally as the “crush,” which produces some of the world’s finest wines.

BACKGROUND

A wet winter delayed the project two and a half months. However, after locating and removing all known couplings and repairing the WSP, crews constructed launching and machine pits spaced about 400 ft apart. From these pits, crews attempted to attach the 12-in. fusible C900 polyvinyl chloride (FPVC) pipe to the bursting head and cutter assembly. A floating pulling head for the FPVC pipe was used to isolate actions of the bursting head from the string of new pipe.

The pipe was launched, but the bursting and splitting operation didn’t proceed as planned. Although the WSP was split, progress was stopped in the first 40 ft because of the couplings, requiring the contractor to dig up each coupling to proceed. With only 120 ft of progress made during the next three days, additional technical support was needed. The couplings at each joint required the pipe-splitting system to split the steel pipe and the couplings (Figure 2).

The couplings added several inches to the pipe’s diameter. The contractor contacted the trenchless equipment manufacturer to determine if the pipe and couplings could be split and to explore other options. The contractor

and manufacturer decided it was best to excavate, remove, and ship to the manufacturer a 10-ft section of WSP with a coupling for aboveground testing. Figures 3–5 illustrate how the pipe and couplings were split. A static-bursting machine was used for testing and subsequently for the project. The manufacturer confirmed that the burst test was successful. After viewing videos of the tests, the contractor proposed a new bursting procedure.

BURSTING OPERATIONS

The remaining project footage was divided into four bursting runs, three approximately 400–500 ft each and one about 600 ft. As the contractor positioned pits for 400–500 ft of pulls, the static pipe-bursting system was shipped to the project (Figure 6).

The first run was about 600 lineal ft, splitting the WSP and couplings that ran beneath a fast-running slough. The 600-ft pull was the most difficult portion of the project, because 4- and 6-in. tees, capped from previous connections, existed under the slough in the alignment. The contractor’s crews built two-way machine pits that were used to pull from both directions. The existing WSP was about 7–8 ft deep. Progressing through this area was critical, because a dig-up wasn’t possible. Because of a high water table caused by spring runoff, the contractor’s



3

A cutter head launches during an aboveground test.



4

Roller cutter wheels penetrate the 12-in. steel pipe and coupling.

Distribution



crews had to continually dewater the site and extensively shore the machine and launching pits.

When the excavation was prepared, the contractor's crews threaded the exiting pipe with bursting rods at the insertion pit, and the cutterhead, expander, pulling head, and FPVC pipe were attached (Figures 7 and 8).

The first run was completed in about 2.5 hours of actual bursting time without incident. The second run was performed two days later. To burst the 320-ft pipe section, the bursting unit, which was still in the machine pit, was turned 180 degrees. The next pipe section was rodded, and the cutterhead, expander, and new FPVC pipe were attached. At the second two-way pit, the static pipe-bursting machine was shoe-horned into a vertically tight pit with multiple electric

conduits visible in the upper portion of the excavation. Ultimately, each run was successfully burst and replaced in a couple of hours.

The static-bursting machine—with pulling forces within its working range of 150-US ton capacity—operated without interruption. The cutter and expander reliably split, cut, and expanded the 12-in. steel pipe and couplings in each bursting run.

After the new FPVC pipe was installed, it was connected to the existing piping, a temporary pump station, and several other connections for water and fire services. The line was subsequently pressure tested and returned to service.

LESSONS LEARNED

In retrospect, it may not have been necessary to dig up the repair clamps. A city

representative stated that future projects would specify the type of pipe-bursting system to be used. To help project designers have the proper equipment for future projects, city representatives carefully documented splitting the 12-in. WSP and couplings.

The project's early failures illustrate the importance of advance testing and using proven systems. Substantial expense, lost time, and high stress levels that were associated with this project can be avoided. However, what began as a difficult major pipeline replacement project ended successfully. The efforts of the contractor, city, and pipe-bursting manufacturer resulted in a model of cooperation that led to successful completion of the project. When funding is available, the city is interested in doing more of this work.

