

Trenchless TECHNOLOGY

Nashville - Davidson County, Tenn.

Performance-Based Contract Key to Sewer Rehab Project





Whites Creek Performance-Based I/I Reduction Project

By James W. Rush

Metro Water Services of Nashville and Davidson County, Tenn., have been a longtime proponent of trenchless rehabilitative techniques. In fact, Metro was the recipient of the first *Trenchless Technology* Project of the Year — Rehabilitation in 1993. The winning project, the Oak Valley Drive project, was a pilot project that paved the way for a five-year, \$30 million rehab program that was vital to improving water quality in the Cumberland River Basin. The Oak Valley project also demonstrated that significant, additional inflow-and-infiltration (I/I) reduction could be achieved by rehabilitating service laterals simultaneously with public sewer rehabilitation.

Given Metro's history of being on the cutting edge of trenchless technologies, it's no surprise that the agency was the first to utilize a performance-based contract for sewer rehabilitation. The five-year, \$7.5 million program achieved a 41 percent reduction in I/I in the Whites Creek Basin. As a result of the innovative

approach and the success of the Whites Creek Performance-Based I/I Reduction Contract, Metro Water Services — along with design-build partners Reynolds Inc. and Arcadis, as well as abatement program manager Consoer Townsend Envirodyne Engineers (CTE) — has been recognized as the 2006 *Trenchless Technology* Project of the Year — Rehabilitation winner.

In total, the project involved the installation of more than 94,000 lf of cured-in-place pipe (CIPP) from 8 to 24 in., the rehabilitation of 415 manholes, the renewal of more than 860 service laterals and the cleaning and televising of more than 250,000 lf of sewer lines.

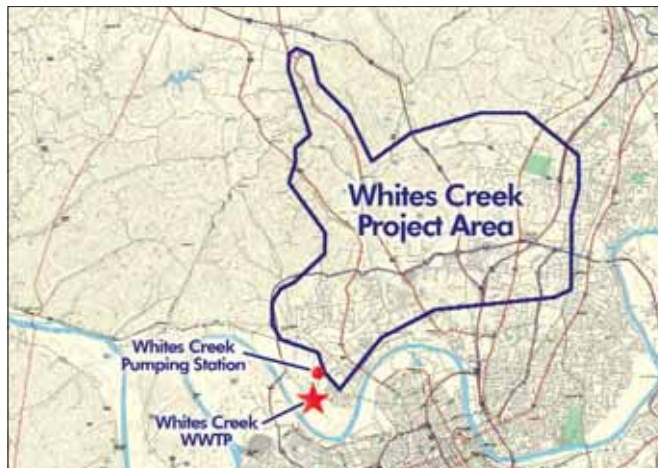
"The success of the rehabilitation program was due in part to the successful and close coordination between owner, contractor and engineer, which allowed quick, economical transitions from investigation to design to construction," said David Bible, project manager for Arcadis.

Background

Metro's Overflow Abatement Program began in 1990 as an aggressive program to upgrade pumping station and treatment plant capacities, as well as repairing leaking sewers and reducing combined sewer overflows (CSOs).

To date, Nashville has spent more than \$700 million on overflow abatement projects, in the process reducing the number of overflow points from 160 to just more than 30.

In 1999, Metro issued a Request for Proposals (RFP) for a design-build type approach to rehabbing the Whites Creek Basin, a mostly residential area north of downtown covering 20,000 acres and 160 miles of sewers. It was chosen for the performance-based contract because the basin had been largely untouched by previous rehab projects, allowing a clean slate for the design-build contractor.



Many of the pipes in the region were made of vitrified clay installed in the 1960s and early 1970s and suffering from leaky joints and broken services, according to Larry Purlee, vice president of Reynolds Inc. Manholes were also a major source of I/I.

The contract was conceived to involve the contractor in the planning process. "We did not specify how the work was to be done, including what methodologies were used, because we were looking for the design-build

team to find cost-effective approaches," said Greg Ballard, project manager for Metro.

The RFP included a stipulation that bidders tie some performance-based incentives into the bid and the means by which the compensation would be evaluated. The Reynolds-Arcadis team proposed a guarantee of a 20 percent reduction in I/I, with a \$500,000 bonus if the reduction exceeded 30 percent and a \$500,000 penalty if the 20 percent reduction was not achieved.

By terms of the contract, Metro covered the cost for labor and materials through a negotiated "a la carte" menu of services, including CIPP, pipe bursting, lateral rehab and manhole rehab. This approach allowed for the contractor to work without the disincentive of having extra work or unforeseen conditions eating into profits. Crews used the Inliner CIPP process for the majority of the mainline repairs.

Getting the Job Done

Once the contract was awarded to the Reynolds-Arcadis team in 2000, the first order of business was establishing a baseline, which meant accurately measuring existing I/I within the Whites Creek Basin — something easier said than done.

It was originally envisioned to use a single monitoring point at the downstream end of the basin to measure the flows. Overloads upstream, however, made it difficult to get reliable data from a single monitoring point. So, the design-team and Metro agreed to establish multiple monitoring points up into the system.

“One of the lessons we learned on this project was that it is critical to make sure that you have good, verifiable flow monitoring data at the start of the project so that you can establish a benchmark,” Bible said. To achieve that level of verifiable monitoring data, the Nashville program used ADS meters, which were tested and verified under EPA’s ETV (Environmental Testing and Verification) program. The engineers also learned that the calculation of baseline I/I also needed verification.

Traditional techniques of I/I analysis were tested, but the results were subject to analyst bias, and the computed I/I baseline values lacked a high level of confidence. Once this problem was recognized, all parties agreed to use non-proprietary, standardized I/I analysis procedures that have been used in the Nashville Overflow Abatement Program for the past 12 years. On average, the 95 percent confidence limits for the revised baseline values (using the same original sets of raw flow data) were improved by a factor of three.

To achieve rapid reductions early in the project, the Reynolds-Arcadis team used a “find-and-fix” approach based on existing information provided from Metro, such as flow data and CCTV and smoke test reports. The Phase I efforts focused on sub-basins with the greatest total I/I.

An interim analysis of flow monitoring data documented a 26 percent reduction in I/I volume for a five-year design storm. Additionally, Metro reported a noticeable reduction in overflows from the basin’s pumping station. While work to find and fix sewer defects within the basin continued, the team maximized the available data from the first phase with great success.

During the second phase, the team used interim flow data coupled with knowledge gained from the Phase I efforts to focus the next find-and-fix efforts. Again, work concentrated on the sub-basins that were contributing the majority of I/I. The team used more intensive field investigations such as CCTV investigations, manhole inspections and wet weather segmental isolation to locate additional sources of I/I. Initial efforts focused on mainlines, but crews found that additional sealing and rehabbing of lateral connections and manholes were needed to achieve maximum reduction of I/I.

“At Metro, we had a policy of sealing the laterals whenever we did any rehab work, and this project verified that we were using the right approach,” Ballard said.

Following completion of the second phase find-and-fix rehabilitation efforts, Metro and CTE analyzed flow-monitoring data to document the effectiveness of the find-and-fix rehabilitation program. Metro documented 29.05 million gal (MG) in I/I volume for a five-year rainstorm prior to construction. The I/I volume had been reduced to 17.03 MG after completion — a 41 percent reduction.

Learning Process

Being the first of its kind, both the design-build team and the owner/program manager went through a learn-



The project involved 94,000 lf of CIPP ranging from 8 to 24 in., the rehab of 415 manholes and renewal of 860 service laterals.

ing process. That made teamwork between the parties involved much more critical.

“This project shows what can happen when the owner, contractor and engineer are all on the same team,” said Denise McClanahan, director of engineering for Reynolds. “On this project, decisions were made in the field and achieved immediate results.”

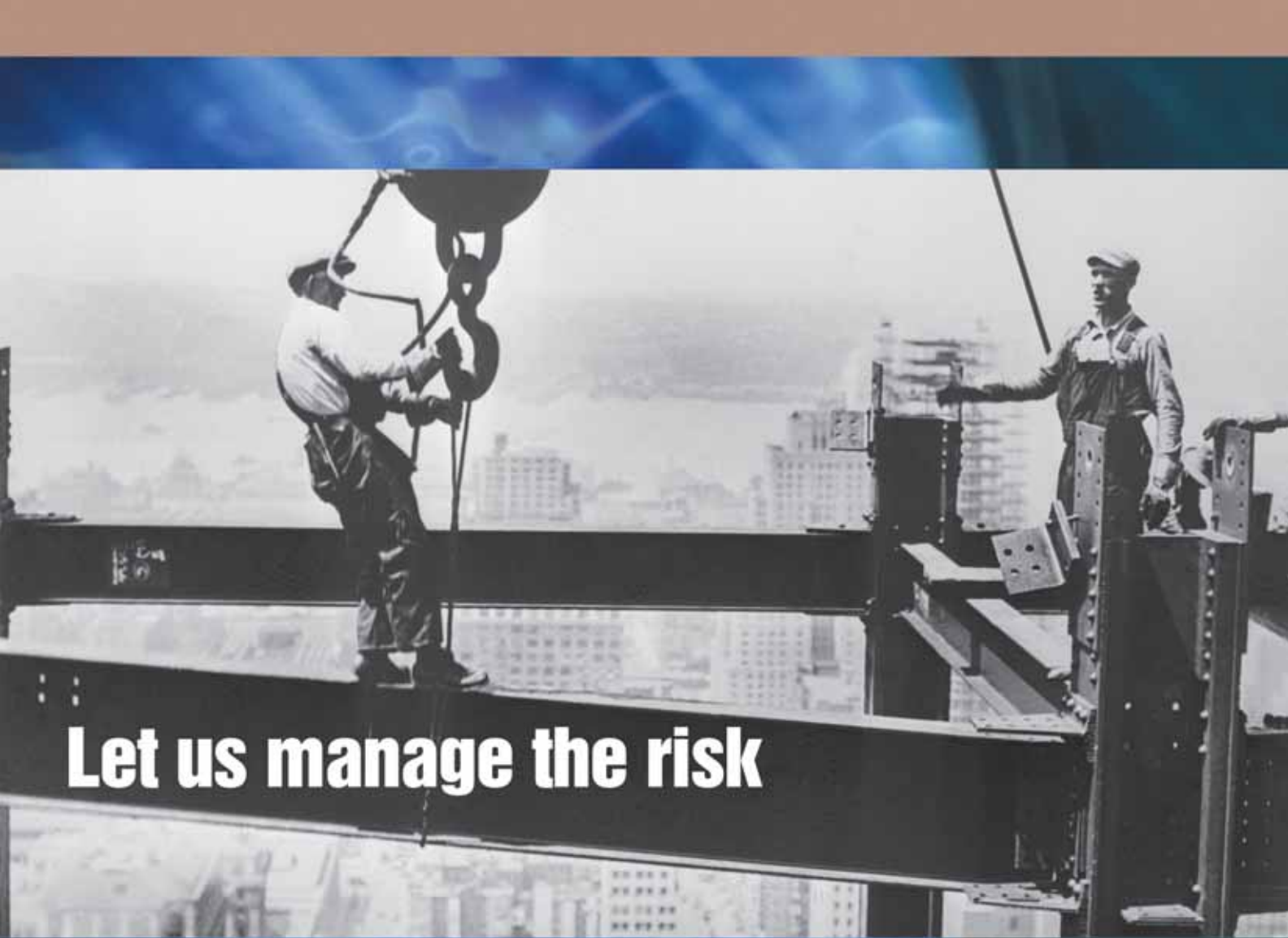
That approach, of course, meant a different role for the owner. For one thing, the owner does not have direct control over all facets of the work — the contractor can choose to leave some minor defects, for example. Additionally, it makes it more difficult to coordinate with public notification and street re-paving programs. However, the fact that the contractor could plan on crews being active for a long period of time could have pricing benefits passed on to the owner, Ballard said.

Paul Stonecipher of CTE indicated this was a “positive environmental/contract experience. Future use of this contract form would be considered and perhaps include higher threshold I/I removal levels closer to NOAP history and different term/standards considerations.”

“Another big advantage of this type of approach is that it significantly reduces the time and effort it takes to get a project from investigation through planning and into construction,” Bible said. “It also puts the design-build team and the owner on the same page with the shared goal of reduced I/I, with the contractor having the incentive to get the most bang for the buck in achieving results.”

James W. Rush is editor of *Trenchless Technology*.

Owner	Metropolitan Government of Nashville and Davidson County-Metro Water Services (Key personnel: Greg Ballard, Leanne Scott, Cyrus Toosi, Scott Potter)
Engineer	Arcadis G&M Inc. (David Bible)
Contractor	Reynolds Inc. (Key Personnel: Larry Purlee, Denise McClanahan)
Program Manager	CTE (Key Personnel: Paul Stonecipher, Charlie Brown)



Let us manage the risk

with design-build solutions.

Public works projects are fraught with opportunities for disaster. One misstep by anyone involved in the engineering and construction chain can be catastrophically costly to you.

Inliner Technologies will put you on a stable footing with well-conceived, well-executed design-build solutions for your sewage and stormwater projects. Inliner brings years of engineering and construction expertise to the table and offers a singular point of accountability for your complete success, from the drawing board to the drainage ditch.

It's time to get yourself out of the business of risk taking and back into the business of problem solving. When you choose innovative design-build solutions from Inliner, you'll never have to go out on a limb. Call us today and learn more about the opportunities.



812-723-0704 / inliner.net