Clean Solutions for Omaha with a Trenchless Focus

Using project-specific contracting mechanisms to control cost and risk

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1300 Linear feet, 96-inch microtunnel crossing within a residential area

The City of Omaha, Nebraska, like hundreds of other U.S. Cities, is in the process of decreasing the combined sewer overflows that are a major cause of water pollution in adjacent streams and rivers. Approximately 43 square miles of Omaha east of 72nd Street house the remnants of a combined sewer system dating back to the 1800s. Prior to the Environmental Protection Agency's consent decree, approximately 3.7 billion gallons of raw sewage mixed with stormwater overflowed annually into the Missouri River and Papillion Creek. In 2006, the city created the Clean Solutions for Omaha (CSO) program to address combined sewer overflows and to improve the quality of the local waterways. The three goals of the program are:

(1) regulatory compliance of enacting a long-term control plan was enacted to capture 85 percent of combined sewer overflows generated in an average year;
(2) economic affordability to minimize the financial burden on rate payer and customers; and
(3) community acceptance to facilitate open dialogue with the public on program timing and project information (City of Omaha).

Currently, 56 projects are planned to help achieve and maintain the City's long term clean water goals by 2037.

One of these Omaha CSO projects is the Forest Lawn Creek Inflow Removal and Outfall Storm Sewer project. Located in the Minne Lusa Basin, this project is intended to separate the stormwater and sanitary flows in the project area and remove and/or reduce inflow into the existing combined sewer system. Stormwater flows from Forest Lawn Creek will be directed to the Missouri River during all rain events. This will provide additional capacity in the local collection system and reduce the potential for street flooding and

96-inch microtunnel crossing was successfully completed in June 2023

back-ups into basements. Sanitary sewer flows will be directed to the conveyance sewers and then routed to the Missouri River Water Resource Facility for treatment. The Forest Lawn project includes 13,000 linear feet of new storm sewer and 7,500 linear feet of new sanitary sewer winding through a residential area.

Along Weber Street within the residential neighborhood, a trenchless method was selected to install a section of the storm sewer that, due to grade requirements, would have required open cut trenches up to 40 feet deep. A 96-inch diameter HOBAS™ pipe was specified for the trenchless installation.

During the design process, a detailed risk register was created to collectively identify, analyze, and address potential issues associated with the trenchless crossing. The use of the risk register allowed the design team to fully understand the factors that could affect cost and schedule of the project, and to help in development of a geotechnical baseline report and specifications which were not overly conservative, and project specific. During this process, it was determined that some of the greatest risks associated with this crossing were related to uncertainties in the artificial fill, the potential for oversized materials, and mixed face conditions within the native soils.

RMNASTT sponsored tour of the microtunnel construction

Artificial fill was known to exist above the trenchless crossing from derived re-workings of the Peoria Loess and existing utility installations. The samples collected indicated the fill was undocumented and contained glass, slag, and brick fragments. Based on this uncertainty, obstruction quantities and sizes were baselined. This meant the contractor had to properly select a cutter head configuration that could ingest and break down these types of obstructions.

The native soils in the project area include the Peoria Loess. The Peoria Loess is a very fine grained material which is known to vary in consistency along the alignment from weight of hammer to 20 blows per foot. These mixed face conditions could potentially cause MTBM steering issues along the alignment. Multiple strategies were implemented within the Contract Documents to address this, including baselined levels for mixed face conditions, requirements in the specifications for experienced operators, specifying survey intervals, and steering correction criteria.

The specifications set clear experience levels with a minimum of 10 years of experience of operating jacking projects and a minimum of 5 projects of similar size, length, and ground characterization to that baselined. These requirements ensured an experienced contractor and operator could handle these tough ground conditions and know how to properly make corrections, as needed. Specific survey intervals were also specified to ensure the single pass installation stayed within the project tolerances of 1 inch on grade and 3 inches on line.

Steering criteria were also implemented to ensure that hard steering corrections were not utilized that could increase jacking forces or ultimately create a stuck machine. The criteria allowed 1 inch of corrections with 25 linear feet of tunneling. Prior to construction, CM staff met with the MTBM operators to discuss the expected ground conditions and how the machine might behave during tunneling. This exercise proved to be a useful tool to manage expectations of ground conditions and response.

Successful completion of the trenchless crossing within project specifications

These measures were successful in balancing the risk of the trenchless crossing between the Owner and the Contractor and also created a fair and reasonable bidding environment that resulted in uniform and realistic bids and decreased the cost of the trenchless portion of the project ensuring the second goal of the CSO program: affordability. The 96-inch microtunnel crossing was successfully completed in June 2023 by J.W. Fowler and Roloff Construction without issue. The Forest lawn project was also featured for a site tour by the Rocky Mountain Chapter of NASTT allowing Owners and engineers to see trenchless in action.

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