

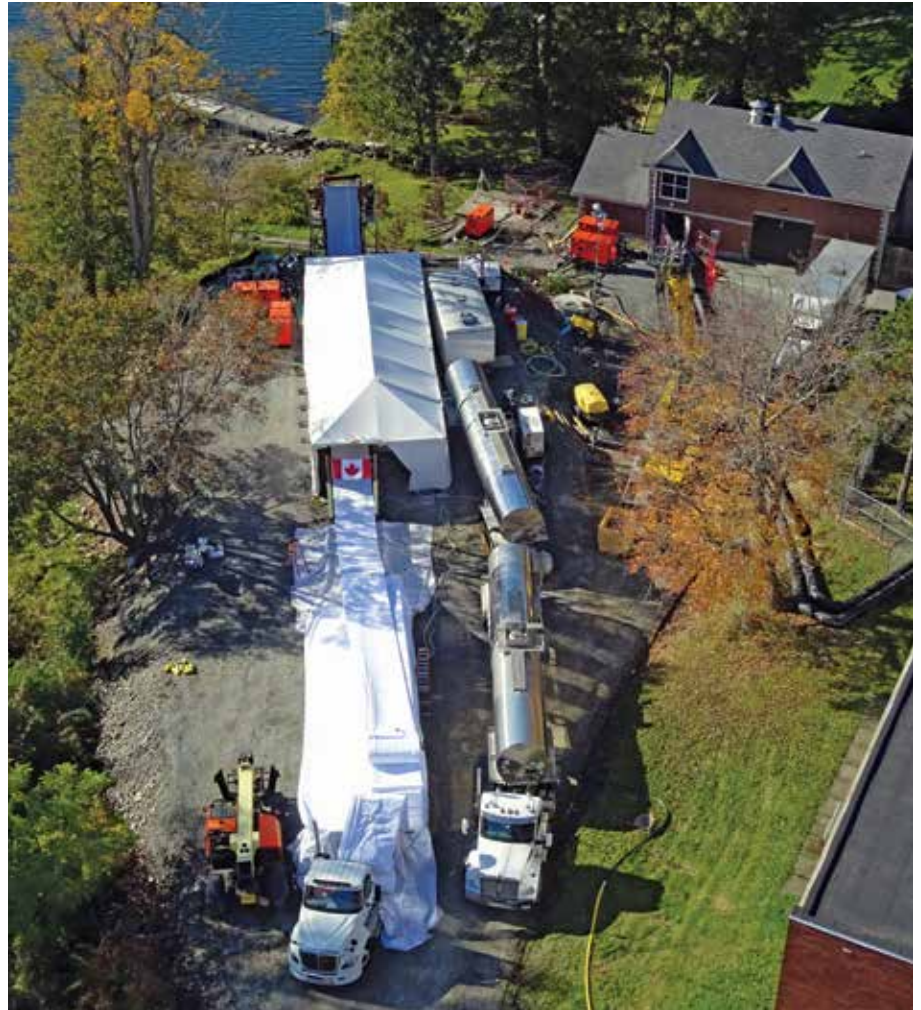
Project of the Year

REHABILITATION — RUNNER UP

NATS Trunk Sewer Rehabilitation

The Northwest Arm Trunk Sewer (NATS) in Halifax, Nova Scotia, first began service in 1917. It had been constructed using open excavation and tunneling at depths ranging from 300 mm to 5 m. The sewer runs parallel to the Northwest Arm, an inlet off the Atlantic Ocean that adds recreational and economic value to the community and increases its quality of life. The NATS sewer alignment is 0 to 15 m from the shore and generally located in an easement on privately owned multimillion-dollar residential properties. The sewer's existing pipe varied in shape and materials, consisting of the following components: 1,200 mm diameter round poured concrete pipe, 1,200 mm diameter round segmental clay block, 1,200 mm x 1,500 mm (height x width) arched segmental clay with concrete bottom, 1,200 mm x 1,500 mm (height x width) poured concrete arch pipe.

The project scope described in the RFP allowed bidders to propose the use of either cured-in-place pipe (CIPP) or a combination of CIPP and grouted-in-place pipe (GIPP). The round sections of the NATS were required to be CIPP, while the arch sections could be either CIPP or GIPP. The winning proposal involved rehabilitating all 4,000 m using CIPP, including the arch sections. To successfully complete the re-



Robinson Consultants

Over 40 years of Engineering Expertise

Municipal
Transportation
Water Resources
Asset Management
Trenchless Technology
Land Development

CONGRATULATIONS
to our fellow team members
who collectively made the
Northwest Arm Trunk Sewer Lining
the 2018 Rehabilitation
Project of the Year
Runner Up!

Ottawa Office
350 Palladium Drive
Ottawa, Ontario
Canada

Hamilton Office
911 Golf Links Road
Hamilton, Ontario
Canada

Kingston Office
253 Ontario Street
Kingston, Ontario
Canada

www.rcii.com

habilitation, it was necessary to overcome numerous technical challenges, including extremely limited access, load restricted bridges, bypassing flows, onerous cleaning of debris (700 m³), and complex engineering design and installation of CIPP in an arch-shaped pipe structure — all on an accelerated completion schedule. There were also unique challenges related to explaining the project to the community and other stakeholders to obtain their support.

Engaging property owners was a vital component of the project's success. Because the sewer was located through an easement running parallel to the shore of the Northwest Arm in the front yards of residential proper-

ties, it was critical to stay in contact with property owners throughout the project. The project team began engaging with these and other stakeholders early on — during the design process — through a multi-channel communications plan that included formal open houses. The project team invited the whole community, issuing personalized invitations to waterfront property owners, and had all collaborators (HW, Robinson Consultants, CBCL and Liquiforce) present.

The ambitious goals of this project presented several significant challenges, including: extremely limited access and steep topography, an accelerated completion schedule, complex engineering design for CIPP in an arch-shaped pipe. The location and topography surrounding the sewer presented significant accessibility challenges that resulted in approximately 3,000 m of the 4,000 m being installed from four access locations. This resulted in numerous CIPP installation lengths being completed in excess of 400 m. The CIPP installation lengths averaged more than 400 m, with the longest installation completed at 680

m setting a new Canadian record. A unique complication required the 680 m long inversion to include a transition from 1,200 mm to 1,425 mm. The transition section was built into the felt liner designed specifically for the pipe section, with the transition occurring 50 m from the tail manhole. Complicating these installations was the need to fabricate the CIPP liners on site due to the load restrictions of Canadian National Railway bridges. CIPP is typically impregnated with resin and shipped to a project site via refrigerated truck. For the NATS project, due to the load-restricted bridges and the size of the CIPP to be installed, the resin impregnated liners for each installation could not be transported across the bridges complete on a single truck. The resin volumes were typically 90,719 kg, with the largest single installation requiring approximately 136,078 kg. This meant it was necessary to impregnate the felt tube with resin on site directly over the installation manhole, allowing small resin tankers (shuttles) to cross the bridge in multiple loads to comply with bridge weight restrictions. The

site's topography also presented challenges associated with the laydown area for the on-site wet-out and curing of the liner. The most difficult location required the laydown area to be set up on a 15 percent grade, requiring a large scaffolding structure to be erected 9.14 m high at one end and at grade on the other. This approach was effective for most of the locations, however one location lacked a sufficient working area for onsite wet-out facilities. To get around this unique situation, an infield splice joining two sections of wet CIPP was completed mid-inversion, allowing two wetout sections to be transported across the bridge separately.

Project Owner: Halifax Water
Engineer: Robinson Consultants Inc./CBCL Limited
Contractor: Liquiforce, Insituform, UniJet, Empipe and Atlas Dewatering
Manufacturer/Supplier: AOC
Value of Trenchless Project (US\$) \$17.5 million



RUNNER-UP

Trenchless Technology Project of the Year

Congratulations to Halifax Water and everyone who contributed to the successful completion of the Northwest Trunk Sewer Rehabilitation Project.

Insituform is proud to have been a part of this challenging project!