After decades of work, light at end of CSO tunnel

By **Mary MacDonald** - July 23, 2021 2:11 am

DIGGING IT: Workers for the contractor CB3A start working on the main shaft of the combined sewer overflow tunnel that will run more than 100 feet below the city of Pawtucket. The shaft, located on School Street in Pawtucket, will be 60 feet in diameter and will allow a boring machine to be lowered in. / COURTESY NARRAGANSETT BAY COMMISSION/PETER GOLDBERG

What happens beneath the streets of Providence and surrounding cities is unseen by residents, but after heavy rainfall, the result always ends up in nearby rivers and Narragansett Bay.

For decades, following storms, the street drains and sewers that are part of the city's underground infrastructure had overflowed, discharging untreated water into waterways. A massive undertaking begun more than 20 years ago by the Narragansett Bay Commission, to replace its century-old sewer and water runoff infrastructure below ground, has entered a final phase.

In late June, the commission started construction of the third and final tunnel that will capture as much as 58.5 million gallons of this mixed overflow and retain it so it can be safely treated before discharge. The final phase of the Combined Sewer Overflow Abatement Program affects the Seekonk River, which flows into Narragansett Bay and includes communities such as East Providence, Pawtucket and

Providence.

The planning for the program dates in the early 1990s. Officials say the first two CSO storage tunnels dug with massive boring equipment – one completed in 2008 and the second in 2014 – have been a huge success. The first tunnel has prevented about 1.1 billion gallons of wastewater from flowing into the bay before being treated, according to NBC.

Tests have shown that pollution levels in the bay have dropped to the point that shellfish beds near Providence have been opened for the first time in decades.

But the Seekonk River remains a source of pollution, particularly after heavy rainstorms.

Upon completion, the third tunnel is expected to further reduce the frequency of closures of shellfish beds.

For the project engineers, the final phase marks the end of a long-term commitment.

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> **MELISSA CARTER, Stantec Inc. vice president**

They have designed the Pawtucket tunnel, a 2.2-mile-long, 30-foot-wide tunnel that will run below Pawtucket and Central Falls.

The $450 million construction project is being handled through a design-build contract that includes CB3A, a U.S.-based subsidiary of a French construction and engineering firm, and Massachusetts-based Barletta Heavy Division Inc.

The tunnel is expected to be completed in 2027. It will replace a system that now relies on piping that combines sewer discharges from homes and businesses and runoff from roads, buildings and other impervious surfaces, according to Jamie Samons, NBC public affairs officer.

"This was great technology in 1872, but in 1972, under the federal Clean Water Act, all of those became illegal," she said of the original systems.

From an engineering standpoint, the challenge of the latest phase included finding cost savings that would not hurt the responsiveness of the new system, according to Melissa Carter, a vice president at Stantec Inc., the Canadian company leading design and engineering on the project since 2014.

"The main challenge was trying to optimize the plan," Carter said. With phase three, engineers examined earlier models and started revising the plan to try to minimize costs. "We really wanted to look at minimizing cost but getting as much out of the existing performance system as we could," she said.

One of the results of those engineering changes was a decision to raise the final tunnel by 25 feet. It will now run from about 115 feet to 155 feet deep, sloping to a pumping station that will then deliver untreated water to the Bucklin Point Wastewater Treatment Facility in East Providence.

To determine whether such changes would work, engineers used a digital modeling tool, called a digital twin, and went into the field to capture real-time data following storms. They were able to determine whether the modified system would work under various conditions.

Tunnel projects are always challenging, Carter said, because engineers can't "see" underground. To determine the conditions, the engineering companies involved in the project, including Pare Corp., of Lincoln, took deep-rock borings several hundred feet apart all along the proposed route "to try to characterize the rock as much as we can," Carter said.

That process took about two years, according to Brandon Blanchard, managing engineer for Pare.

Providence is among many communities in the country that have embarked on the combined sewer overflow systems, Blanchard said. Similar efforts have been undertaken in recent years in Boston, in Hartford, Conn., and in New York and Philadelphia. Each system is unique, however, as the soil and setting conditions differ.

Before the first CSO tunnel was completed, Samons said, the Narragansett Bay Commission's system had 75 to 150 sewer

overflows a year. The goal of the program is to provide enough underground storage to capture the flow from a three-month storm, one that could drop as much as 1.65 inches of rain in six hours.

"So the goal, at the end of the program, is we see only a few overflows each year," Samons said.

When construction of the connection to the existing sewers begins, vertical shafts will be created using controlled blasts. But people above ground should not feel much of that, given the depth, Carter said.

A tunnel boring machine, with a diameter of 30 feet, will slowly drill through the earth to clear the space for the tunnel itself, continuously grinding the rock in front of it, Carter said.

The third tunnel will have a wide impact when completed, Carter said. "Not just to the environment but to the community," she said. "Even though it is a long-term project and seeing the payoff is not going to be immediate, at the end of the day it's very rewarding."