



ST JOHN'S

Rehabilitation of a storm sewer to support current and future precipitation patterns

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Source: City of St John's

THE SCIENCE

Several parts of the country are expected to experience an increase in the frequency and severity of weather extremes – particularly more frequent high-intensity rainfalls – as a result of climate change. This presents a challenge that may be most evident in the design, operations, and maintenance of infrastructure that aims to provide service to the public over a long period of time. As changes in precipitation patterns impact municipal stormwater infrastructure, it is crucial for municipalities to plan for the rehabilitation of storm sewers in a way that accounts for future rainfall projections, in order to reduce costly damage and potential harm to the population.

THE TRIGGER

St John's is a coastal city that has been impacted by several severe storms including Tropical Storm Gabrielle (2001), Hurricane Igor (2010), and many other large rainfall events that resulted in urban flooding, which highlighted the need to upgrade the existing sewer system. The City prioritized its intervention on Kenmount Road, one of St John's main commercial streets that connects the eastern and western parts of the community. The existing storm sewer system on Kenmount Road was deteriorating and did not have the capacity to handle severe rainfall events. During those storms, the system would become inundated and storm water would run down the street, flooding buildings and endangering motorists. The replacement of Kenmount Road's storm sewer was prioritized based on a combination of considerations, including the existing sewer's diameter that was no longer sufficient to accommodate very large flows, the amount of maintenance that was required as a result of the deterioration of the sewer, and the risk associated with some of the existing corrugated metal pipes that were severely corroded and had caused numerous sinkholes along the road over time.

THE APPROACH

When approaching the design of the new sewer for Kenmount Road, the engineering team made it a priority to plan the new infrastructure in a way that would ensure its performance under future climate conditions. To do this, the team used an XPSWMM model, a proven approach used by engineers and stormwater managers to improve the management of stormwater. The model allows the project engineers to simulate hydrology, hydraulics, and surface flooding for the entire catchment area surrounding the new sewer. This tool models interactions between flood waters and drainage systems for various elements, allowing for a complete understanding of risks and system performance. The information gathered through the modelling allowed the team to decide to plan the design of the new sewer based on a return period of 25 years. The new sewer ranges in size from 200% to 400% greater than the previous pipes that were in place.

Given that the sewer replacement project in St John's was happening on a high-traffic route, the City planned the replacement process over a four-year period and invested a lot of resources to ensure proper communication with residents and local business owners to minimize the impact of construction on the population. Mark White, Manager of Construction Engineering for the City of St John's, mentioned "One of



Figure 19: The new sewer ranges in size from 200% to 400% greater than the previous pipes that were in place. (Source: City of St John's)

the biggest challenges was fitting the new storm system in Kenmount Road while maintaining traffic and access to businesses. However, while this was one of the most difficult aspects of the project, it was also one of the biggest successes. Traffic was always top of mind and, with proper planning, communication, and completion of specific tasks outside of peak time, we were able to successfully complete the work with minimal disruption."The replacement of the Kenmount Road sewer was recently completed and despite a few large rainfall events, the street has been free of flooding.

THE OUTCOME

The replacement of the Kenmount Road sewer was a capital project for the City of St John's that was made possible with contributions from both the provincial and federal government. The City estimated that incorporating future climate projections into the design of the new storm sewer increased initial costs by approximately 15-20%. These initial additional costs were not a concern for the municipality who anticipated that lifecycle savings would outweigh the additional capital cost. This investment also reduced operating and maintenance costs, damage claims, and premature asset replacement for the City.

Most importantly, the sewer rehabilitation reduced flooding on Kenmount Road

