

Communities with Combined Sewers Adapting to a Changing Climate: Buffalo, New York

Background

Buffalo Sewer Authority (BSA) is a New York state public benefit corporation that owns and operates the collection system for the City of Buffalo and eleven nearby communities, serving over 550,000 people. Over 90% of the collection system, or approximately 790 miles, is combined sewer. BSA's CSO long-term control plan (LTCP) was originally approved in 2004 but was modified in 2014 to add additional evaluations related to climate impacts and incorporate planning of real-time controls and green infrastructure to address flooding and equity concerns.

Climate Impacts

Buffalo is in a low-lying area that borders Lake Erie and often experiences the impacts of lake effect weather. The lake effect creates hyper-localized weather conditions for the city that influence wind and precipitation patterns. Due to the lake effect, South Buffalo typically receives more precipitation than North Buffalo, overwhelming the southern portions of the collection system sooner and more frequently than the northern portions. Compounded with lake effect weather, Buffalo is also experiencing increasingly intense storm events. Further, BSA has found it challenging to predict changes in rainfall intensities from historical data as the nearest long-term weather station is just outside of the city and does not accurately capture Buffalo's local climate characteristics.

Lake Erie is also susceptible to the formation of seiches, which are standing waves that create a sloshing effect on the shores of the lake. Seiches from Lake Erie can result in hour-long storm surges, causing street flooding, backflow into the sewer system, and basement backups. With an increase in storm intensity and frequency, the city has observed seiches becoming stronger and more frequent; five of the eight highest seiche events in the 150 years of recorded history, including storm surges of up to 12 feet, have occurred in the last 3 years, with several 10-foot storm surge events in the last 4 years.

Key Information

- **Location:** Buffalo, NY
- **Population served:** over 550,000
- **Permit Number:** NY0028410
- **Key hazards:** increasing storm intensity, increased precipitation, seiches and storm surge



Aerial view of the Bird Island Wastewater Treatment Plant in Buffalo, NY, located on the shore of Lake Erie.

What is a seiche?

A [seiche](#) is a standing wave oscillating in a body of water. Lake Erie is particularly known for seiches given its orientation to storms that often blow from the southwest to the northeast.

Solutions

Green Infrastructure and Equity

As part of their CSO control strategy, BSA has been working towards greater green infrastructure implementation. Around 2008, as part of their LTCP update process, BSA engaged stakeholders to address equity and climate concerns, which kickstarted their [Raincheck Program](#). The Raincheck Program is committed to implementing green infrastructure controls equitably and plans to implement over 1,300 acres of green infrastructure for stormwater management. As of 2024, BSA has implemented green infrastructure projects throughout the city and has developed a [grant program](#) to fund green infrastructure retrofit projects on private property. They have also obtained an [Environmental Impact Bond](#) to help fund future projects.

The next phase of the Raincheck Program will include an equity index based on social, economic, and educational factors. BSA approaches projects in each neighborhood differently, making sure to engage residents in each neighborhood in the planning process, providing job training to the community, and using local contractors to keep jobs, knowledge, and money in the community.



Niagara Street Corridor Project

BSA's Niagara Street Corridor project will be one of the longest green corridors in New York once completed. Previously, many of the lots and storefronts along Niagara Street were vacant, but BSA has seen new businesses open along the corridor since the project started. The green infrastructure projects include vegetation with underground filtration and storage. The projects that have been completed have already provided air quality and heat island benefits, water quality improvements, and surcharge relief.

Smart Sewers and Weather Forecasting

The City of Buffalo has experienced over a 50% decline in population since 1950, which has resulted in excess capacity in the collection system. Since 2014, BSA has invested over \$1 million in a real time control system, which allows them to anticipate and react quicker to storm events and utilize the excess capacity in the collection system to their advantage. During wet weather events, BSA can use their real time control network to divert excess combined wastewater to areas of their collection system with available capacity, offering a means of temporary storage. This real-time flexibility is particularly useful for BSA, as lake effect storms often put pressure on only certain portions of their collection system. Through this approach, they've already observed improvements in the volume and frequency of CSO events.



Construction of [real-time control project](#) at Hertel Avenue and Deer Street to reduce CSOs by controlling flow to the wastewater treatment plant during wet weather.

BSA is also using the data collected by their sensor network to help improve their ability to predict local climate events, such as using temperature data to predict seiche events. Additionally, they are creating an artificial intelligence model based on local data in combination with [NOAA Atlas 14](#) data to generate better predictions of future storm intensities.

RAINCHECK 2.0

Green opportunities are everywhere.

Let's find them together.



6 Sewer Basins Prioritized

What we'll look at in these sewer basins to identify opportunities



Building Partnerships

Outreach with neighborhood property owners and stakeholders to understand the opportunities



Making Projects Happen

Getting projects off the ground to keep the stormwater challenge in check through new partnerships and projects



Additional Information

For more information on [Buffalo Sewer Authority](#), contact Rosaleen Nogle, Principal Sanitary Engineer, at rnogle@buffalosewer.org. Additional information on BSA's permit, CSOs and climate adaptation can be found here:

- [Buffalo's 2014 NPDES Permit \(NY0028410\)](#)
- [Buffalo's 2014 LTCP](#)
- [Buffalo's Raincheck Program](#)
- [IDF Curve Projections for the State of New York](#)