

Communities with Combined Sewers Adapting to a Changing Climate: Spokane, Washington

Background

The City of Spokane, Washington, has a total population of 232,000 and sits on the traditional homelands of the Spokane Tribe of Indians. The Spokane River flows through its downtown – featuring two sets of falls as well as two hydroelectric facilities. The river also provides for many recreational opportunities including swimming, fishing and kayaking. Downstream from the city, the Spokane River is an important resource for tribal lands.

Spokane's collection system includes about 400 miles of combined sewers. The Spokane River is the receiving waterbody for many discharges, including combined sewer overflows (CSOs), the city's wastewater treatment plant (WWTP) effluent, and stormwater.

Challenges

Spokane has been experiencing warmer winters and more intense storms, which are placing greater pressure on its wet weather infrastructure.

In 2012, the city estimated it would take \$490 million to address CSOs and wet weather deficiencies at its WWTP. However, in addition to CSOs, Spokane was also facing other water quality challenges associated with their WWTP effluent and stormwater discharges including nutrients, metals, and polychlorinated biphenyls.

In order to balance their Clean Water Act priorities and protect public health and the environment, Spokane's Department of Public Works used the [U.S. EPA's Integrated Planning Framework](#) to develop an

Integrated Plan. This allowed for a more holistic approach to reducing CSOs and improving the level of treatment of wastewater and stormwater, while also increasing resiliency to changes in precipitation patterns and storm intensity.

Key Information

- **Location:** Spokane, WA
- **Population served:** 232,000
- **Permit Number:** WA0024473
- **Key hazards:** increased storm intensity and warmer winters



The Spokane River is an environmental cornerstone of the City of Spokane, running through its downtown area.

Climate Impacts

Spokane is already experiencing impacts from changing climate conditions, including more intense storm events during the summer and warmer winters. Warmer winters cause precipitation to fall as rain instead of snow, or as rain on top of melting snow, leading to greater volumes of runoff than would be expected under historical conditions. These more intense storms can increase flooding and overwhelm existing drainage systems.

Solutions

Integrated Planning

The city's original plan to address CSOs was costly, left other water quality concerns unaddressed, and did not consider the residents' ability to pay for the upgrades.¹ As of 2021, 41% of Spokane households were defined as "asset limited, income constrained but employed," meaning they cannot afford basic needs like food, housing, transportation and healthcare even though they are working.²

Given these constraints, the city decided to instead take a more integrated approach. In 2014, they developed their [Integrated Clean Water Plan](#) to holistically consider their Clean Water Act requirements and water quality challenges in the Spokane River and to identify the most cost-effective solutions. This plan allowed the city to address their CSOs, WWTP upgrades, and stormwater needs simultaneously with projected construction costs of \$340 million—over \$100 million less than the sum of the standalone solutions. To help fund the plan, the city sold \$200 million of "green" construction bonds³ in 2014 with an interest rate of 3.08%. This supplemental funding allowed the city to limit future annual rate increases for rate payers to just 2.9% for more than the following decade.

To evaluate treatment alternatives, the city used a multi-objective decision analysis (MODA) approach within their integrated plan. By looking at multiple factors, the city was also able to incorporate community impacts and climate resiliency into their selection process.

Selected solutions within the integrated plan included: 25 CSO storage tanks with 16 million gallons of storage capacity that are actively managed using a Supervisory Control and Data Acquisition (SCADA) system; an advanced membrane filtration system at the WWTP to remove phosphorus and other contaminants; and a range of stormwater projects including tree plantings, underground swales, and infiltration basins. For below-ground infrastructure, the city prioritized incorporation of above-ground amenities to add more tangible value to the community, such as their First & Adams Plaza and recreational fields. The city also involved the community throughout the design and

First & Adams Plaza



First & Adams Plaza is home to Spokane's largest wastewater storage tank, a 2.4-million-gallon tank in west downtown. The city developed a plaza on top of the tank and contracted with a neighboring brewery that programs and manages the plaza including coordinating food trucks and live music.

Recreational Field



Spokane developed a recreational field on top of a wastewater storage tank. A charter school across the street needed green space for physical education classes, so the city agreed to allow the charter school to use the field, and the school maintains it in return.

¹ The median household income (MHI) in Spokane in 2023 was \$65,016, some \$12,000 less than the U.S. MHI and far less than the MHI of Washington state.

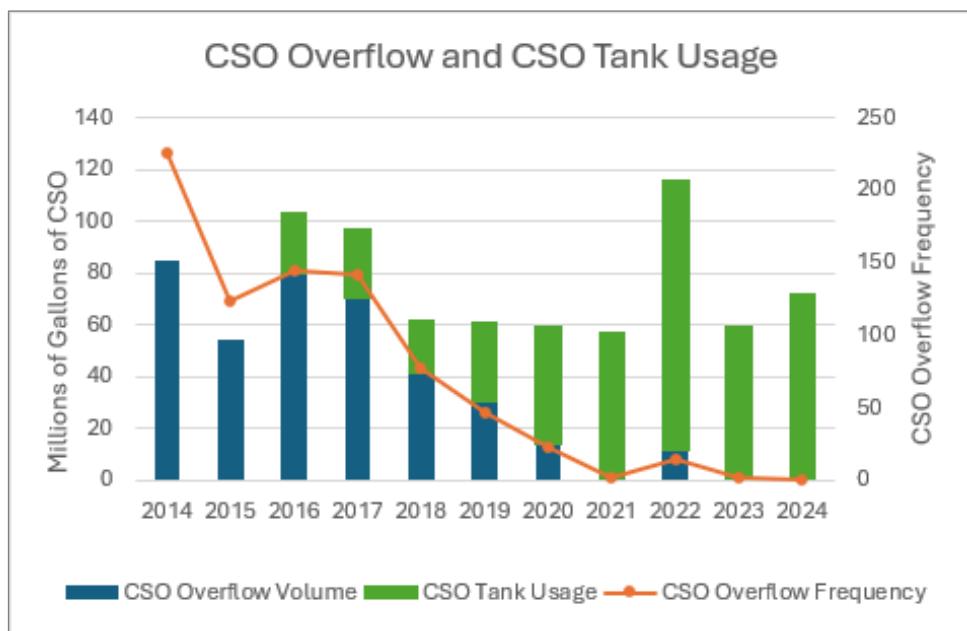
² Based on the ALICE (Asset Limited, Income Constrained, Employed) definition, developed by the United Way.

³ Green bonds are a bond instrument that use proceeds to finance or refinance environmental, water, or clean energy projects.

construction process by sharing drawings of projects and distributing door hangers with additional information. Through public outreach to the community, Spokane was able to highlight the value of protecting the river.

Enhancing Resiliency

The last CSO storage tank was installed in 2020, so Spokane is currently monitoring the system and making operational changes as needed. By actively monitoring the tank levels through their SCADA system, Spokane can manage tank volumes to increase effective storage capacity within the system in response to local storm events, which also increases their resiliency to future climate regimes. It also provides the city with performance data they can use to make ongoing adjustments to their system, such as targeted green infrastructure installations or updated regulator settings.



From 2014 through 2024, an increasing number of CSO storage tanks have steadily captured more and more CSO volume, so that by 2023, no overflows occurred.

Spokane also leverages additional sources of funding to continually improve the resiliency of their wet weather infrastructure. For example, through successful grant writing, the city was able to manage runoff from its largest stormwater basin through a series of projects totaling \$25 million. Additionally, they have set up internal partnerships with the city's Street and Parks department to create more pervious surfaces and enhance stormwater management.

In recent years, Spokane has conducted several studies on the impacts of changing climate conditions and potential impacts to their system:

- Starting in 2021, the city included climate change information from the University of Washington's [Climate Impacts Group](#) in their [Sewer Modeling Synopsis](#), a modeling analysis of the CSO basin and separate sewer basins.
- In 2023, to support the development of their [2023 Water System Plan](#), Spokane included a climate assessment ([Spokane Future Flows – Climate Assessment](#)) of impacts from changes in precipitation and temperature based on the [Intergovernmental Panel on Climate Change Sixth Assessment Report](#).
- In 2024, the city started working with EPA's [Climate Resilience Evaluation and Awareness Tool](#) to model climate change impacts on their water utilities. With this data, the city is preparing memorandums on climate impacts and environmental justice, as well as creating a Climate Vulnerability Index Map and finalizing a Climate Risk and Vulnerability Assessment.

Additional Information

For more information on the [City of Spokane](#), contact Marlene Feist, Public Works Division Director at mfeist@spokanecity.org. Additional information on Spokane's permit, CSOs and climate adaptation can be found here:

- [Spokane's 2022 NPDES Permit \(WA0024473\)](#)
- [The City of Spokane's Public Works and Utilities Wastewater Website](#)
- [The City of Spokane's Integrated Clean Water Plan](#)