

City of Richmond

REAL-TIME DIGITAL ANALYTICS IDENTIFIES MORE THAN 180 MILLION GALLONS OF ANNUAL CSO REDUCTION

For decades, the City of Richmond's Department of Public Utilities has been working to reduce combined sewer overflows (CSOs) and improve water quality in the James River. Despite making significant improvements, the City still experiences between one and three billion gallons of annual overflow and is actively working to reach Department of Environmental Quality (DEQ) water quality goals. This lingering challenge, combined with a growing population, over 20% of the existing population at or below the poverty line and an increasing number of severe weather events, has led Richmond to seek out innovative and cost-effective technologies to help deliver sewer performance improvements.

Challenge

In 2020, as part of an effort to reduce pollution in the James River, the Virginia General Assembly mandated CSO reductions necessary to meet water quality standards by 2035. The General Assembly required the creation of an Interim Plan – short-term projects which could be started within one year of the Plan's submission, be completed by July 1, 2027, and which would result in quantifiable, positive improvement to both operational costs and overall water quality – and a Final Plan to be submitted by 2024.

Richmond had historically relied on a static hydraulic model to identify system overflows. This method often has limited accuracy because it does not consider critical factors that can impact the wastewater system, such as population shifts, rainfall disparity across the city, and system upgrades. The City began addressing these limitations in 2018 when it partnered with Xylem to install a series of real-time sensors across the network and increase visibility to its combined sewer system.

Now in need of a partner with the technology and expertise to help them analyze its data, provide actionable insights, and make justifiable project recommendations, Richmond turned to Xylem once again.

Solution

Harnessing the expertise of Xylem's hydroinformatics engineering team, the City utilized **Xylem Vue powered by GoAigua's SSO/CSO Prediction and Prevention applications**, a real-time visualization



"Working with Xylem has allowed us to stop relying on guesswork and ensure operational decisions are based on real-time sensor data that reflects current system conditions."

– Pat Bradley, Deputy Director, City of Richmond
Department of Public Utilities

PROGRAM HIGHLIGHTS

- Expected CSO reduction of 182 million gallons annually
- CSO reduction will be achieved for an average of \$0.18 per gallon, more than a 70% decrease from previous mitigation projects
- Improved performance of H&H model due to use of real-time data
- Expanded real-time sensor network increased system visibility, providing operators with more accurate flow data and recommendations to optimize capacity

and decision support system, and part of the Xylem Vue digital portfolio. By combining engineering, data and decision science, and industry-leading water expertise, Xylem would identify and evaluate sustainable, efficient, and cost-effective projects to help solve Richmond’s CSO challenges.

Data were initially aggregated from 34 sensors (this number has since grown to 99 for improved granularity) within the system - including flow meters, level sensors, and rain gauges - with Xylem working alongside utility staff to guide the analysis and provide a clearer understanding of how the system was operating. Xylem’s solution allowed the City to combine these data into a centralized, user-friendly interface to clearly visualize the operations of its network.

At the same time, Xylem’s hydroinformatics engineering team reviewed network data from historical storms to determine which assets could be upgraded to further increase capture.

Outcome

Richmond is now measuring the real-time response of its system with current weather conditions as well as identifying when an overflow occurred and how much volume was discharged. These collected data are also used to support updates to the City’s existing hydrologic and hydraulic (H&H) model and improve its level of accuracy. Utilizing these data, Xylem developed a list of 18 potential projects which would reduce CSO events across the City. Xylem then performed advanced modeling work, running simulations for each project to determine which would have the largest impact. These results were combined with cost evaluations and additional project-specific community, environmental, and operational benefits, to narrow down the initial list to a final group of 10 projects which were included in the City’s Interim Plan to meet the requirements of the legislation.

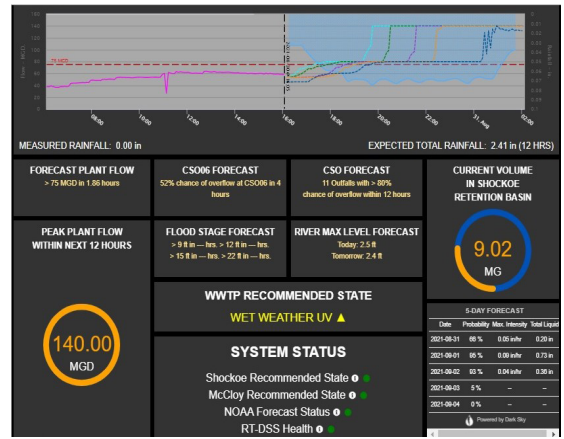
The projects identified by SSO/CSO Prediction and Prevention are expected to reduce approximately 182 million gallons of annual CSO volume with an average mitigation cost of only \$0.18 per gallon - more than a 70% decrease from previous CSO reduction projects.

The City is also leveraging the solution to provide new levels of transparency to its ratepayers and the community. Xylem developed a publicly accessible online map powered by the system’s real-time data which provides alerts for any CSOs within the last 48 hours. This resource identifies areas of the river that have experienced overflows and allows residents to make informed decisions about when and where to plan activities in the James River.

Together with Xylem, Richmond established real-time network visibility across their sewer system to predict flows, optimize capacity, and enable intelligent, data-driven decision making more accurately. With an actionable and defensible plan in place, the City avoided costly and unnecessary new infrastructure and is now on the path to regulatory compliance and achieving transformative outcomes for both the utility and the community it serves.

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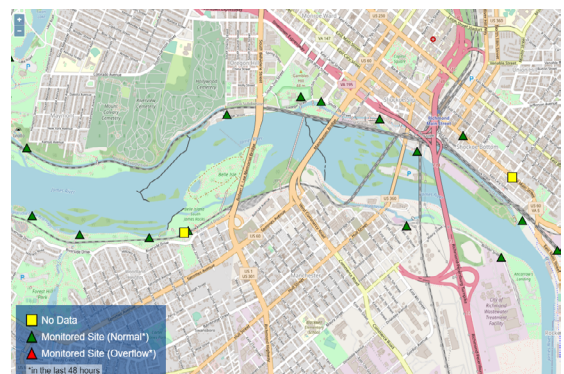


This SSO/CSO Prediction and Prevention dashboard predicts flow to the plant over the next 12 hours and offers the City of Richmond guidance around whether or not to use a Wet Weather UV system.

We have been impressed with Xylem, not only their understanding of the technology, but their team's responsiveness and collaborative approach.



Pat Bradley, Deputy Director for City of Richmond Department of Public Utilities



The public-facing online map developed by Xylem and recently released by the City of Richmond provides those looking to use the James River with up-to-date information regarding recent CSO activity.