

Evansville water and sewer utility

Real-Time Decision Support helps cut combined sewer overflow volume by 100 million gallons and reduces capital needed for regulatory compliance

Evansville is located on the north bank of the Ohio River in southwest Indiana. The City's sewer system, parts of which are more than 100 years old, serves a population of 163,000, with combined sewers making up almost 40 percent of the total sewer area.

The challenge

These combined sewers are in Evansville's historic downtown district and tend to experience operational and system capacity problems during heavy rainfall. Because of their inability to transport all the combined sewage to the wastewater treatment plants, Evansville was discharging 1.8 billion gallons of untreated sewage annually across 22 combined sewer overflow (CSO) outfalls into the receiving tributaries of the Ohio River and Pidgeon Creek.

In 2011, Evansville entered into a consent decree with the EPA requiring the City to increase capacity of its sewer system to minimize, and in many cases, eliminate these overflows. The City has a long-term control plan (LTCP) budget of nearly \$1 billion, which must be fully implemented no later than 2037.

As part of the settlement, the city agreed to take immediate steps to upgrade the treatment capacity of its two wastewater treatment plants.

The solution

Shortly after the decree was issued, EWSU partnered with Xylem to apply its decision intelligence approach using [Xylem Vue's SSO/CSO Prediction and Prevention applications](#). Based on a data-driven Sense-Predict-Act methodology, this approach would create a Real-Time Decision Support system (RT-DSS) and empower the utility to better understand, control, and optimize operations of their existing infrastructure, starting with the West Side collection system.

EWSU wanted to first understand how the sewer system behaved based on real data. They could then leverage that data to build a system model with the goal of maximizing their existing infrastructure to achieve early reductions in overflow volumes. Ultimately this would allow EWSU to better predict performance and optimize operational efficiencies for significantly less cost.



SSO/CSO Prediction and Prevention monitoring hydraulic grade lines, CSO outfall, and control gates for Evansville Water and Sewer.

Program highlights:

- Reduced overflows by 100 million gallons annually for less than \$0.01 per gallon — less than 5% of the next lowest cost solution
- Real-Time Decision Support (RT-DSS) provides operators with treatment capacity and operational forecasts 30 to 60 minutes into the future
- RT-DSS provides pumping rate recommendations to eliminate guesswork during wet weather events
- Decision intelligence approach enables EWSU to minimize the capital required for regulatory compliance

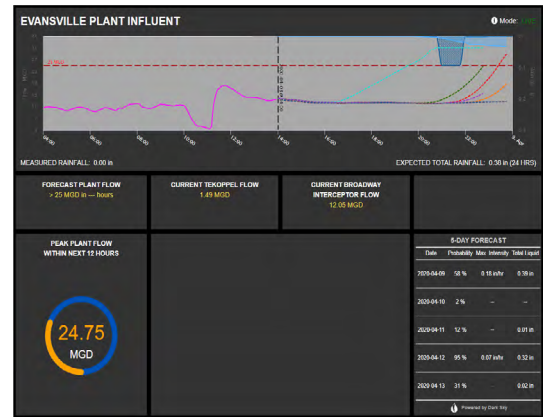
EWSU started by “turning on the lights” — using real-time monitoring of their sensor networks to gather and integrate all critical level, flow, and rain gauge data. Using artificial intelligence and machine learning, this data was integrated with previously existing hydraulic models to develop a digital twin of EWSU’s sewer network. By enabling both real-time visualization and a forensic review of collection system operations, the digital twin provided EWSU with a real-time holistic view of the hydraulic dynamics for their entire collection system.

This real-time operational model then began forecasting future outcomes by conducting thousands of continuous calculations based on the analysis of real-time data. These easily reviewed predictions, empowered EWSU staff to proactively make decisions to best optimize the performance of their existing sewer infrastructure.

The results

Working together, EWSU and Xylem identified significant opportunities to cost-effectively improve system performance. By using a real-time decision support system approach to manage their existing sewer assets, sewer network’s CSO gates, and its main lift station on 7th Avenue, the team was able to fine-tune operational responses during wet weather events. This resulted in **more than 100 million gallons of annualized CSO reduction** for the City.

Operators now have real-time situational awareness of critical data points from throughout the collection system, combined with recommended pumping rates to match future plant capacity. The RT-DSS shows wet well levels and available capacity at the treatment plant 30 to 60 minutes into the future and provides pumping rate recommendations to eliminate guesswork and number crunching during significant wet weather events. When combined, these benefits **enabled EWSU to meet the requirements of their consent decree at a significantly lower cost to the community they serve** — translating into infrastructure that is more resilient and more affordable.



Using real-time modeling to predict potential flow to a wastewater treatment plant based on an anticipated wet weather event.