



Adaptive Control Technology and Public Partnership Advance Ford's Stormwater Management in Dearborn

By Erich Smith, Wade Trim

The Ford Motor Company's Dearborn Research & Engineering Center (REC) is transforming into a state-of-the-art, connected, and environmentally inclusive campus for thousands of the automaker's employees. Groundwork for the 10-year redevelopment included a mission to improve regional stormwater capacity and quality, while protecting critical facilities from the impacts of major storm events. The solution is a new, flexible stormwater management system that combines active stormwater control with 2 million cubic feet of stormwater storage for the campus, significantly reducing discharge rates and flooding risk for Ford and the surrounding community. The project's keys to success – a close partnership with the City of Dearborn and active control built into the smart stormwater network – demonstrate effective approaches to stormwater management.

Advancing Community CSO Control

Ford's 320-acre REC campus and the City of Dearborn have historically been served by a

combined sewer system that contributes to flooding issues during major storm events. To comply with federal mandates, the City's combined sewer separation program is slated to be complete by 2035. The challenge for Ford became meeting Dearborn, Great Lakes Water Authority, and State Municipal Separate Storm Sewer System requirements due to the size of its campus, because Dearborn's development standards were established for sites typically 5 acres or less. An historical drainage study and hydraulic analysis was completed that revealed post-development discharge rates from the campus would decrease for a 100-year storm event. Connection points to the City's system were also analyzed using the Dearborn-wide combined sewer network model to show there was a decrease in upstream tailwater conditions, further minimizing upstream flooding risks.

Ford partnered with Dearborn to repurpose part of the City's combined sewer for stormwater storage. More than 150,000 cubic feet of stormwater capacity

was created using nearly 4,000 feet of repurposed sewer with diameters ranging from 72 to 102 inches. In turn, Ford rerouted the City's combined sewer on campus and converted it to storm-only sewer to advance Dearborn's combined sewer separation plan. This avoided the need for the City to later dig new deep storm sewer through the campus around three critical buildings. Ford re-deeded drainage easements to repurpose the sewers for stormwater conveyance to their campus.

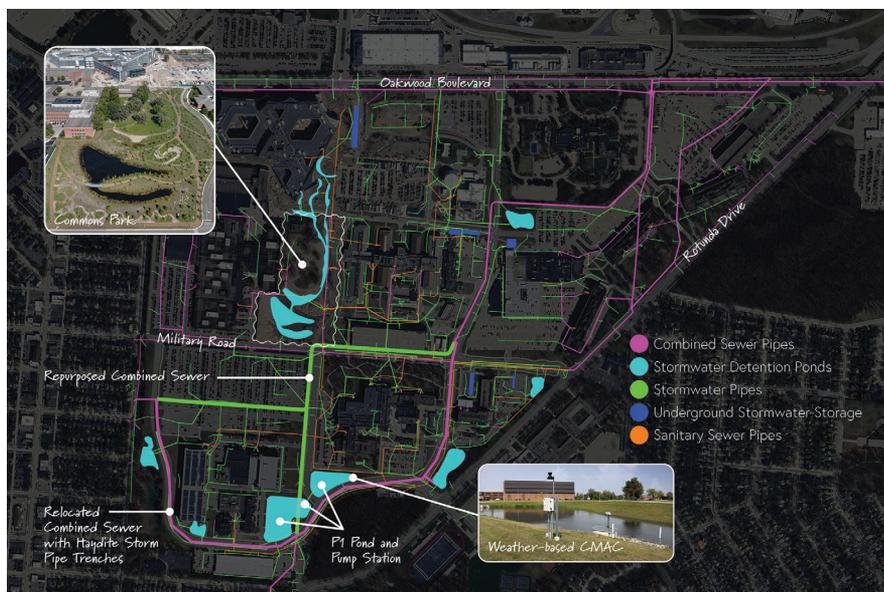
Dearborn City Engineer Soud El-Jamaly has been involved with the municipality's combined sewer separation for the past 20 years. He is pleased with the partnership between the City and the automaker and believes it has been beneficial to both parties.

"As the City works towards compliance with National Pollutant Discharge Elimination System mandates and the Clean Water Act, Ford's sewer separation advances our efforts to convert Outfall 13 at the Rouge River to a complete clean storm sewer," said El-Jamaly. "Their project will also make it easier to channel site stormwater into the City's storm line in the future."

Ford's stormwater system design incorporated new combined sewer under Carroll Shelby Way, as well as future connection points for the City along Rotunda Drive right-of-way to utilize for its separation plan. The system's increased capacity has provided mutual benefits to Ford and Dearborn, helping to reduce flood risks and eliminate major expenses.

Active Stormwater Control Enhances New System

Understanding the implications of climate change that has intensified wet weather events, Ford embarked on a pilot program to incorporate active, automated technology into their stormwater management system that enables forecast-based control of stormwater infrastructure through cloud-based solutions. This Continuous Monitoring



A massive network including 5 underground storm traps, 9 detention ponds, and 2 miles of in-line infiltration trenches and pipes throughout the campus helps capture, store, and treat stormwater via controlled discharge into City pipes during large storm events.



Combined sewer separation, relocation, and repurposing required precise coordination to keep critical campus buildings open at all times. Relocated Dearborn sewers were placed under perimeter roadways on the campus, allowing for easy connections for future City separation projects.

and Adaptive Control (CMAC) technology is new to the AEC industry and has a smaller footprint than traditional stormwater management methods that provide passive storage. Passive stormwater management facilities such as detention ponds and/or treatment basins are designed to capture, detain, and treat stormwater runoff for a specific design storm with no ability to

adapt to larger events. Designed to protect Ford's campus assets, the new system can limit the amount of stormwater that enters Dearborn's combined sewer system during large storm events. Stormwater can be held back or released as needed, cutting the campus' overall stormwater runoff rate from 3 cfs/acre (cubic feet per second, per acre) to 0.55 cfs/acre.

The new network combines CMAC with repurposed City of Dearborn combined sewer, detention ponds, pipes, storage chambers, green infrastructure, a 21,000-GPM (gallons per minute) pump station with water level sensors, and a 950,000-cft pond named P-1. The P-1 pond is actually two ponds connected by an equalization pipe, a gate valve at the City discharge point, and the cloud-based weather monitoring system. When a storm is forecasted, the pond's gate valve can be actuated to either open and drain water into Dearborn's combined sewer system up to 48 hours in advance or retain water in the pond until the storm's peak has passed. As monitored water levels increase in the sewer pipe, one to three of the pump station's submersible pumps can be switched on to convey more stormwater from the pipe to the pond.

"Our new system lets us get ahead of large storms," said Chris Small, Global Real Estate Development Manager for Ford's land development group. "The ability to actively manage our stormwater system based on weather forecasts has a positive outward effect that is already being recognized by our neighbors and supports the City's broader initiatives to reduce CSO into the Rouge River and residential flooding."



Before the incorporation of CMAC technology, the Research & Innovation Center, which has the lowest flood elevation on site, stayed above flood lines in models. Now, CMAC provides 240,000 cft of capacity, adding even more flood risk protection during storm events.



CMAC optimizes the utilization of the available capacity at the P-1 Pond. An actuated gate valve on the outlet control structure of the pond uses weather forecasting to control the water volume in the pond to increase storage capacity.

Ford operators use a web-based dashboard with CMAC for monitoring and gaining insight into current and historic performance of their stormwater system. Dashboard results show that from December 1, 2023 through December 1, 2024, the P-1 pond retained 82% of flow during wet weather events, compared to 42% if the system were passive.

A Greener, More Resilient Campus

Combined with CMAC, the repurposing of Dearborn combined sewer has enabled

creation of more green spaces and natural stormwater treatment to improve water quality. Ford's new 22-acre Commons Park in the center of campus incorporates stormwater controls such as naturalized channels that convey stormwater to three central ponds within the park to treat up to 151,000 cubic feet of stormwater before it is discharged to the City's stormwater system.

Green infrastructure woven throughout the campus supports both environmental and operational goals. Bioswales and

rain gardens slow and treat runoff, while permeable pavements reduce the volume of water entering the system. This, combined with designing two parking structures with multiple decks on campus, helped reduce hardscape and protect a large grove of mature trees.

A Model for the Future

The Ford Dearborn Campus Stormwater Management project underscores the transformative potential of integrating smart technologies and public partnership into stormwater management. By leveraging innovative design and adaptive controls, Ford's P-1 Pond system not only protects campus facilities but also benefits the surrounding community. Repurposing the City of Dearborn's combined sewers exemplifies effective public-private collaboration, advancing municipal goals while protecting water resources. The project demonstrates an effective approach for other organizations or communities to optimize stormwater management, enhance environmental stewardship, and foster resilience. 💧