In the flow

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"The Mission of the Detroit Water and Sewerage Department is to exceed our customers' expectations through the innovative treatment and transmission of water and wastewater, and the provision of services that promote healthy communities and economic growth."

Overflow facilities minimize backups; DWSD plans upgrades

The last thing that a customer wants to experience during a rainstorm is a sewer backup, and the Detroit Water and Sewerage Department's (DWSD) combined sewer overflow (CSO) facilities are designed to make such occurrences rare.

A combined sewer is the predominant type of sewer system in the metropolitan Detroit area, and all sewers within the city proper are combined sewers. Basically, a combined sewer is an older design, found in most large cities, that combines storm water runoff and sanitary sewage within a single system.

At the time that combined sewer systems were constructed (more than 100 years ago), such systems were less expensive than separate systems, and they weren't perceived as a public health threat. In those days, wastewater received little or no treatment and was allowed to run into rivers and lakes, because it was believed that dilution was the best solution to pollution.

Decades ago, combined sewer systems were typically sized to handle storm flows that were three to five times the size of flows in dry weather. As cities added treatment plants — Detroit's Wastewater Treatment Plant was completed in 1940 — relief features were added to the wastewater collection system so that excess storm flow could be discharged into a stream or river when the amount of water in the sewer pipe was too much for a treatment plant to handle. By using these relief devices — called regulators — to discharge wastewater, sewer backups in homes, businesses, and streets were avoided; yet, the overflow still had to go somewhere, and that "somewhere" was usually the river.

Each discharge from the system is an incidence of combined sewer overflow. Today, in Detroit's system, untreated discharges are minimized, because DWSD now has eight Combined Sewer Overflow screening, disinfection, and retention facilities. And a ninth CSO facility, the Oakwood CSO Retention Basin, is under construction and should be operational by early 2012.

There is also in-system storage for combined sewer overflow, where wastewater can be held within the pipe behind large weirs or dams until the storm passes. After the storm, the retained water can be sent to the Wastewater Treatment Plant.

All wastewater from the 76 suburban communities that purchase DWSD sewage service ends up in Detroit's sewer interceptor pipes, said Terrance Moore, head sewage plant operator.

Moore explained that water builds up and moves quickly through the system during a rainstorm. Water that goes to a CSO facility is either retained by the facility (if the facility has a retention basin), or screened and disinfected and sent to the river. "The waste solids would be removed at the CSO facility, screening would be done to remove floatable debris, and the water would be disinfected with sodium hypochloride," said Moore. Retained water in a CSO facility's reservoir is sent on to the Wastewater Treatment Plant after rains subside.

"When it stops raining, there's less hydraulic pressure in the sewer system and retained wastewater can proceed to the WWTP," Moore said.

The six CSO facilities with screening and disinfection, as well as retention basins, are:

- Seven Mile CSO Retention Basin
- Puritan-Fenkell CSO Retention Basin
- Hubbell-Southfield CSO Retention Basin
- Conner Creek CSO Retention Basin
- Belle Isle Pump Station and CSO Facility
- Oakwood CSO Retention Basin (under construction, operational 2012)

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In This Issue

Booster stations ensure that you'll get a gush, not a trickle

Pressure. That's what it's all about when you turn on your water tap. You expect the water to surge out of the faucet at an appropriate pressure, and if it doesn't, you know something's wrong in your water system. But how, you might ask, is that pressure maintained in the Detroit Water and Sewerage Department's (DWSD) far-flung water transmission system?

Pressure is added at each of the five DWSD water treatment plants, which serve 126 communities. Sometimes, however, that pressure diminishes as water travels farther out in the network. That's where booster stations come in. Booster stations, using pumps driven by electric motors, add more pressure in the water mains.

"The role of a booster station in the distribution of water is to increase the pressure in the system, and maintain reliability of service, so that water will reach the customers at a satisfactory pressure," said Sanjeev Mungarwadi, general manager, water and sewerage at DWSD. Mungarwadi oversees the Systems Control Center, which monitors and controls the entire DWSD system — 24 hours a day, seven days a week — from a secure location within the Central Services Facility on Huber Road in Detroit.

There are 20 booster stations, 15 of which include reservoirs. They are relatively small, unobtrusive buildings on fenced lots with the motors and pumps inside — scattered throughout the Detroit metro area. If you drove by one of the booster stations, chances are that you wouldn't even notice it. Two stations are in the city of Detroit and 18 are located in the suburbs.

Pressure in the network is increased or decreased as dictated by customers' demands. "Pressures in the DWSD network vary greatly from treatment plant to community," Mungarwadi said. He said that pressure can be as low as 35 psi (pounds-per-square-inch) at various locations in the water transmission system to as high as 200 psi coming out of the Lake Huron Water Treatment Plant.

"Pressures are monitored at the Systems Control Center through a control system called Ovation. The Ovation system

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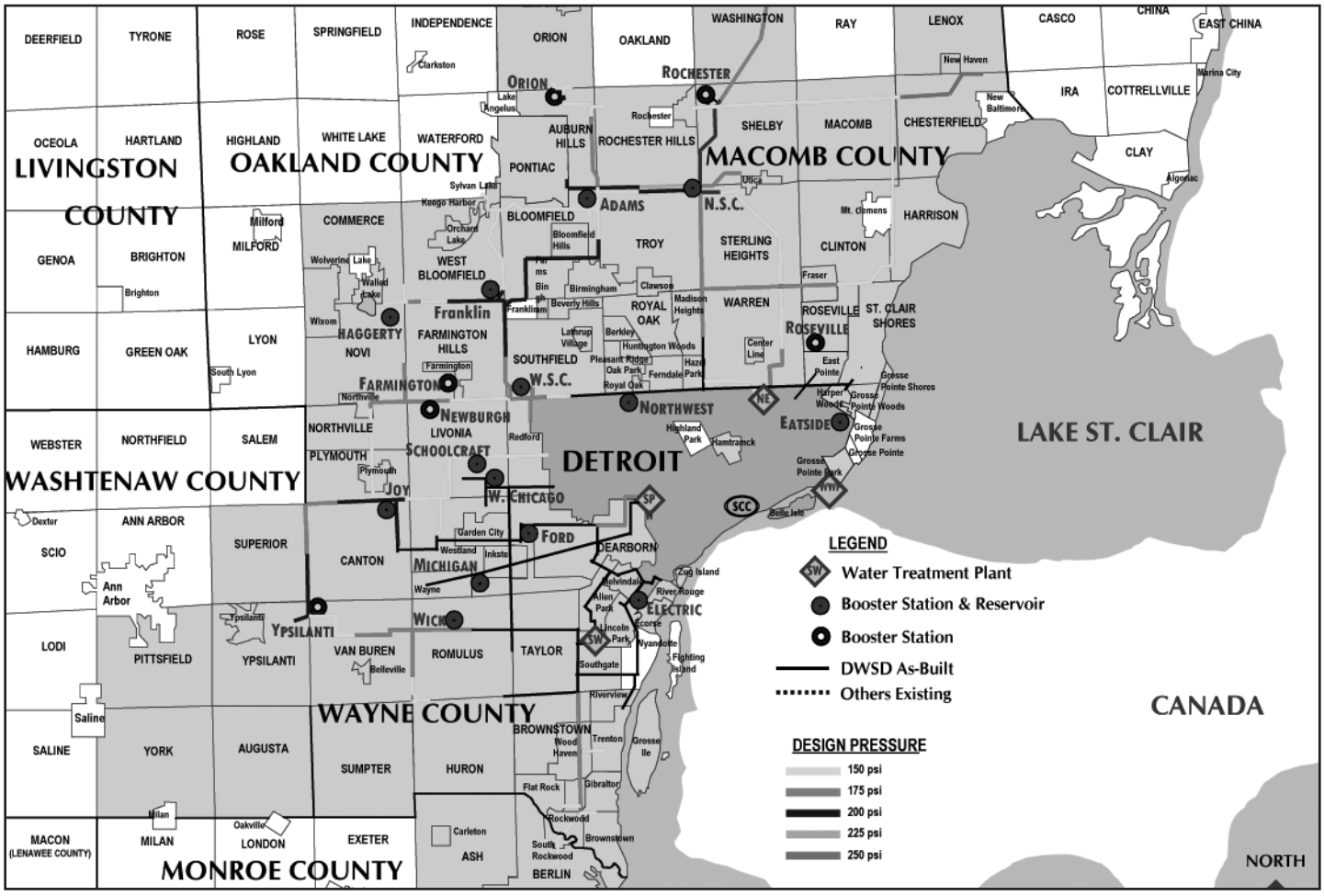

Booster stations of Southeast Michigan

Overflow facilities minimize backups

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The three CSO facilities with screening and disinfection, but no retention basin, are:

- Baby Creek CSO Fine Screening and Disinfection Facility
- Leib Screening and Disinfection CSO Facility
- St. Aubin Screening and Disinfection CSO Facility

In addition, Moore said there are in-system inflatable dams, used as storage devices, at 13 locations; and in-system storage gates at five locations.

"The gates are movable from six feet to eight feet high inside the 10-foot pipe," Moore said. "There are sensors that measure upstream and downstream levels in the sewer interceptor pipe, and the gates move up or down based on conditions."

Sometimes, if wastewater levels in the system drastically increase, a limited discharge into the river may still be necessary to prevent sewer backups. "Everything is regulated by law," Moore said, "by the Clean Water Act and the Michigan Department of Natural Resources and Environment (MDNRE), which recently changed its name from the Michigan Department of Environmental Quality (MDEQ). There are minimum standards we have to meet." State effluent limits of bacteria for discharges are set at 400 counts per 100 milliliters (ml); DWSD's typical bacteria levels of discharges during storms are 20 to 50 counts per ml.

Moore said that DWSD constantly monitors levels of pH, dissolved oxygen, phosphorus, ammonia, and fecal matter in the wastewater system.

The goal for many years was to expand the system's infrastructure to contain all combined sewer overflow and avoid any discharges into the river. Up until recently, the Upper Rouge Tunnel project, a $700 million affair that would have meant building a seven-mile-long, 30-foot-wide culvert under the Rouge River bed, was thought to be the best solution to contain overflow. Last year, however, the project was canceled due to cost considerations. Since then, another idea has emerged as a cost-effective alternative to the Upper Rouge Tunnel: first-flush capture basins.

"These basins would capture the 'first flush' of water at the beginning of each storm - the time when the pollutants in the system are most concentrated," Moore said. The "first flush" water would be stored until it could safely be sent to the WWTP.

The capture basins would be built at locations along the Rouge River. Moore added that although the first-flush capture basin program would necessitate upgrades to the WWTP so that it could receive greater volume, the cost of the program is estimated at a fraction of the Upper Rouge Tunnel cost — about $300 million.

Moore said current plans call for a pilot facility to be built to test the first-flush capture program, and that the project could begin in the next few years. Completion of all first-flush capture basins would occur around 2025.

In the meantime, the CSO system as it stands is very effective. Regular scheduled maintenance is done at each CSO facility and throughout the entire sewer system to ensure that everything is operating properly. "We do preventive and corrective maintenance," said Moore, "which involves servicing pumps, valves, gates, bar screens, and other related equipment."

Booster stations

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connects to set-point pressure controllers throughout the transmission network. Pressures are also monitored at each booster station, at various pressure control points throughout the system, and at each of the water treatment plants," Mungarwadi added.

Mungarwadi said that most of the booster stations run automatically and are set up to adjust pressure as needed. Several booster station sites operate off of predetermined pressures, he said.

What if a customer turns on a faucet, only to have the water slowly trickle out? Mungarwadi noted that pressure can be adjusted to satisfy customer complaints if the system load conditions allow for it — in other words, if the system is not operating near peak demand. Mungarwadi added that even if maintenance is being performed in the system, pressure adjustments can still be made if permitted by the load conditions.

Booster stations are kept in efficient operating condition by DWSD's Asset Maintenance Group. "Pumps, motors, and support equipment are serviced by our maintenance crews on a monthly basis, and planned corrective maintenance is done annually," said Martin Craig, superintendent of plants, buildings, and mechanical maintenance for DWSD. "Periodic maintenance actually drives our annual repair schedule, because we're able to predict what will need to be done in the future. And of course, emergency maintenance is done immediately, when needed."

Pressure. At DWSD, that's a good thing. And booster stations keep the pressure on.

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Fluoridation

Water fluoridation is the controlled addition of a very small amount of fluoride to a public water supply to reduce tooth decay. The water-fluoridation movement picked up speed in the United States after World War II as it was found that between 60 and 90 percent of school children and adults were affected by the decay of tooth enamel. Fluoridation — which is colorless, odorless, and tasteless — was shown to prevent decay when added to public water in moderate levels.

The issue of fluoridation was controversial. Opponents of the practice argued that the benefit was negligible and that it amounted to adulteration. Proponents, of course, pointed to public health benefits and supporting statistics.

By 1951, the United States Public Health Service officially supported fluoridation. As the Sixties dawned, water fluoridation in America had already reached about 50 million people; yet, Detroit's water was still not fluoridated.

Finally, at the urging of the Detroit Health Department, the city's Common Council drafted an ordinance to add fluoride to the water supply. By that time, 12 of the 18 major U.S. cities were fluoridating their water. Detroit followed suit in the summer of 1967.

The Detroit Water and Sewerage Department maintains the level of fluoride at 1 part per million (ppm); the federally-regulated upper limit is 3 ppm.

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