# **2010 Annual Report**

Clean water is vital to the health of southeast Michigan. Rivers and lakes serve as the source of much of our drinking water and provide an abundance of recreational opportunities. Michigan's waterways are closely monitored by the Michigan Department of Natural Resources and Environment (MDNRE) and subject to some of the toughest water quality standards in the nation. Throughout 2010, wastewater professionals skillfully operated and maintained the area's wastewater and storm water infrastructure to collect and treat flows generated by homes, businesses and rain storms to meet the state's requirements. The result - our waterways were protected from millions of gallons of combined sewage that previously would have been discharged without treatment.

The region is making significant progress reducing surface water pollution. The Detroit Water and Sewerage Department (DWSD) Wholesale Customer Outreach Public Education Work Group, comprised of wholesale customers (Macomb, Oakland and Wayne Counties), DWSD staff and consultants, has focused on the protection of our waterways through the Operation Clean Water series of articles and this Annual Report. Performance of the wastewater and storm water infrastructure system tributary to the Detroit Wastewater Treatment Plant (WWTP) during 2010 is highlighted in this report along with the steps being taken to further reduce pollution triggered by rain storms.

### Retention Treatment Basin Operational Statistics for 2010

The Detroit wastewater service area is supported by 15 combined sewer overflow (CSO) retention treatment basins (RTBs) that operate when heavy rain storms overload the sewer system. The oldest RTB was constructed in 1959 (Milk River RTB) and the most recent in 2008 (Belle Isle RTB). During 2010, these 15 RTBs prevented 6.4 billion gallons of CSO from reaching our waterways. Of this 6.4 billion gallons, 3.9 billion gallons were captured, transported to and treated at the Detroit WWTP after the storm subsided, and 2.5 billion gallons were treated and discharged from RTBs.

**Operation Clean** Water

Heavy storms forced RTBs to go into operation on 57 days to store and treat wet weather flows. On 29 days during 2010, over the course of 12 storm events, the storage capacity was exceeded and RTBs discharged treated flows. Because 28% of discharges started between the hours of 6:00 PM and midnight, it was not uncommon for a discharge event to span two calendar days. Southeast Michigan also experienced two long storm events that resulted in some facilities discharging for four consecutive days. Figure 1 shows operational days for area RTBs during 2010 and Figure 2 shows treated and captured volumes by month.

### Figure 1 RTB Days of Operation



Figure 2 RTB Volumes in Million Gallons



During 2010, RTBs stored and sent a greater volume of flow to the wastewater treatment plant than the volume treated and discharged to waterways. Of the total RTB volume generated by storms, 61% was treated at the Detroit WWTP and 39% was treated in RTBs and discharged. The largest percentage of volume was captured during summer months when recreational activity is highest.

The winter of 2010 started out with normal precipitation and snowfall. In February, snowfall increased and the Detroit area recorded 27 inches of snow, the tenth snowiest month on record. However, because the temperatures did not fluctuate greatly, snow melt occurred slowly, at a rate the sewer system and the Detroit WWTP could handle. RTBs that have historically operated during February and March saw very little activity during this time. In fact, the first major rain event of the season occurred on April 7 and 8, and only required three RTBs to discharge: Hubbell-Southfield, Conner Creek, and Milk River.

"Preventive maintenance is important all of the time, but it is critical in years like 2010 when the equipment isn't operated as frequently," stated Ancell Noel, CSO Supervisor, Wayne County Department of Public Services. "We normally have several discharge events in January through March but most of our RTBs didn't have their first discharge until May or June of this year. Our newest RTBs have been in operation for more than a decade so exercising the equipment during dry weather is critical for reliability when it is needed during storms."

Large rain storms hit the area on May 11-14 and June 4-7. The May storm delivered a steady flow of rain that required RTB staff to work continuously for four days at the Hubbell-Southfield and Milk River RTBs; three days at the GWK RTB; and two days at the Chapaton RTB. These, and other RTBs, successfully captured and treated 674 million gallons of storm water combined with sewage to meet their discharge permit requirements. During the June storm, the rain came much more quickly - 1,343 million gallons of flow was treated and discharged from area RTBs with an additional 384 million gallons fully captured in the RTBs and dewatered back into the sewer system for treatment at the Detroit WWTP. While the Hubbell-Southfield RTB discharged for more than 72 hours during this event, the other RTBs discharged for about one day or less through the heavy downpours. Figure 3 shows the average million gallons of discharge per hour for these two storms at the area's five largest RTBs providing a sense of how differently each storm behaved. Operator judgment managing





Ancell Noel CSO Supervisor for the Wayne County Department of Public Services

Terry Moore CSO Supervisor for the Detroit Water and Sewerage Department



Figure 3 Average MG/hour discharged for two largest storms

Each storm behaves differently as shown in the average million gallons discharged per hour for these two large storms. While the June storm generated twice as much treated discharge in total, the rate at which flow moved through each RTB differed.

the treatment process plays a key role in successfully maximizing capture and treatment of flows associated with different storm events.

According to Terry Moore, DWSD CSO Supervisor, "Hubbell-Southfield is our most active RTB and during the June event it took on the largest storm in its 10-year history. We discharged 425 million gallons of treated flow over a 72-hour period. We hit our maximum flow rate of 3,200 cubic feet per second. The Conner Creek RTB was busy too, but not for as long. We treated and discharged 397 million gallons of flow over a 31-hour period there."

"The early June storm was really a challenge," added Ancell Noel. "We had five RTBs in operation at once and all of the facilities had





John Stange Supervisor of RTBs for the Oakland County Water Resources Commissioner Brent Avery Operations Manager for Macomb County Public Works their highest 2010 volume of discharge during that event. Our operators worked around the clock to keep equipment running – this multiday storm event was the only discharge of the year at the Dearborn Heights and Redford RTBs."

July brought five storms into the area. The July 15 storm was the most intense storm in John Stange's 11-year history of operating the GWK RTB. "The storm delivered 1.45 inches of rain in the first 20 minutes. The collection system filled sending more than 124 million gallons of flow into the facility in 65 minutes requiring a discharge of treated flow. To put that in perspective, it took an average of 3 1/2 hours for this to happen during the other three events requiring a discharge this year," stated John. "We went from zero flow to an influent of 7,800 cubic feet per second and back to zero again in little more than five hours. The equipment really got a workout."

The Chapaton RTB in Macomb County had to contend with a lightning strike in the collection system during that storm. "Our system control and data acquisition (SCADA) was knocked out by lightning during the initial intense rain," stated Brent Avery, Operations Manager for Macomb County Public Works. "Through perseverance and hard work, our operations staff was able to troubleshoot and bring the system back on line in less than an hour. No flooding occurred during that time." November 23, 2010, brought an event that demonstrated how differently a storm can move through different areas on the same day. The Chapaton RTB had its largest event of the year discharging 41 million gallons of treated flow. The GWK RTB received flow, but not enough to require a discharge. The Milk River, Hubbell-Southfield and Conner Creek RTBs had smaller discharge events.

During 2010, precipitation fell across the Detroit Service Area from a low of 21 inches, measured at one gage in Macomb County, to 32 inches measured at a gage in the City of Detroit. Overall, precipitation totaled roughly 28 inches in the Service Area as compared to the long term average of 33 inches as calculated from the National Oceanic and Atmospheric Administration's gage at Detroit Metropolitan Airport.

Numerous storms required RTBs to operate throughout the year without discharging. For example, Oakland County's GWK RTB operated during 28 storms but did not discharge to the river during 24 of the storms so these events do not appear in MDNRE's discharge reports. May was a very busy month prompting the facility to operate for 7 different storms over 8 days with only 2 of the storms large enough to require a discharge. There were also numerous storms that looked threatening on the radar screen and then dissipated. Overall, Mother Nature delivered precipitation at a rate the sewer system could handle fairly well most of the time during 2010. Total discharges from area RTBs were about one third of the volume that was reported in 2009. From an RTB operational perspective, 2010 was a year with fewer discharge events but frequent mobilizations were required for storms that passed over without delivering anticipated rainfall or for events that did not have a discharge. So while the number of events was low, the manhours expended preparing for storms were significant. A summary of discharge activity at the five largest RTBs is shown in Figure 4.

Working Together to Improve RTB Performance and Wet Weather Pollution Control Managing the excess flows generated by storms is a coordinated effort that involves many different governmental units in the Detroit Wastewater Service Area. Because all RTBs feed into the same collection system, their flows impact one another. Maximizing storage capacity in the sewers during a rain and/or snowmelt event and dewatering RTBs after the event, must be coordinated to avoid overflows and basement flooding. Since 2007, RTB operators have been refining operational

Facility Name, Owner	Maximum storage volume	# of storms with a discharge in CY 2010	# hrs of treated discharge in CY 2010	Volume of treated discharge in CY 2010
George W. Kuhn RTB, Oakland County Water Resources Commissioner	124 MG	4	26 hours	555 MG
Conner Creek RTB, Detroit Water & Sewerage Department	63 MG <sup>1</sup>	7	247 hours	820 MG
Chapaton RTB, Macomb County Public Works	28 MG	5	36 hours	114 MG
Hubbell-Southfield RTB, Detroit Water & Sewerage Department	22 MG	9	220 hours	741 MG
Milk River RTB, Wayne County Department of Public Services	19 MG	12	18 hours	165 MG
<sup>1</sup> The Conner Creek RTB has a storage volume of 31.5 MG (million gallons). There is additional upstream storage volume in the Triple Barrels that feed the RTB bringing the total wet weather storage capacity to 63 MG.				

### Figure 4 Performance of Area's Five Largest RTBs in Calendar Year 2010

The five largest RTBs in the Detroit wastewater service area discharged 2.4 billion gallons of treated flows, or 96% of the total volume of treated discharges in the area.



Area RTB operators worked together to identify the best testing procedures for NaOCI strength (stored in tanks like the ones shown here) as part of the Best Practices Work Group activities.

protocols, sharing event debriefings and lessons learned, and improving testing procedures through the DWSD Wholesale Wastewater Best Practices Work Group. The work group meets six times a year and includes staff from the MDNRE, DWSD and Macomb, Oakland and Wayne Counties.

In 2010, the Best Practices Work Group focused on two aspects of RTB treatment – managing disinfectant chemical concentration and improving real time testing of suspended solids during events. Sodium hypochlorite (NaOCI) is the chemical used across the region to disinfect combined sewage. However, the strength of the chemical dissipates over time and the rate of decline is impacted by temperature. RTB operators have to monitor the concentrations on hand so the proper disinfection dosage can be calculated and utilized when a storm hits. The work group analyzed the different tank concentration





Wastewater utility staff from as far away as Halifax, Nova Scotia, visited area RTBs to gain knowledge that will assist in decision-making for their own facilities.

measurement practices used at RTBs and recommended best testing procedures to follow for determining NaOCI strength. Meter calibration for equipment that measures suspended solids is another test critical to disinfectant dosage decision-making. The work group evaluated calibration techniques to determine the most reliable way to perform this testing during wet weather events.

Another effort where area sewage utilities worked together was on formulating comments to the USEPA on sanitary sewer overflows. The RTB operators collaborated with SEMCOG to provide feedback to USEPA on proposed new rules affecting treatment and reporting requirements for wet weather discharges.

### Serving as a Resource for Other Communities

Southeast Michigan's RTBs continued to serve as a learning resource for communities throughout the country ready to embark upon CSO facility design. Visiting these facilities is an excellent way for other utilities to learn about different treatment options when evaluating the best treatment technologies to use in their own facilities.

In January, representatives from the Louisville/Jefferson County Metropolitan Sewer District in Kentucky visited DWSD's Conner Creek RTB and Leib Screening and Disinfection Facility as well as Oakland County's GWK RTB in Madison Heights and the Acacia Park RTB in Beverly Hills.

"They were really interested in learning how we staff our facilities and respond to wet weather events. We stepped through our sampling procedures and process control exercises during a wet weather event. We also discussed fecal coliform and total residual chlorine limits," stated Terry Moore, DWSD's CSO Supervisor. "The size of the facilities really made an impression on them as well. The facilities they are planning are not as large as ours."

In April, staff from Halifax Water in Nova Scotia, Canada, came to visit DWSD's Belle Isle RTB and Baby Creek Screening and Disinfection Facility to learn more about the fine screens used at these facilities. In October, the Regional Water Resource Agency from Owensboro, Kentucky, visited the Conner Creek RTB and St. Aubin Screening and Disinfection Facility to learn more about CSO facilities as they address three CSO outfalls in their community.

The Chapaton RTB in Macomb County was the site for the fall meeting of the Southeast Michigan District of the Michigan Association of County Drain Commissioners attended by 22 members. Chapaton was selected as the site to show off the \$7 million in improvements that have been made in the last few years at the 42-year-old facility. Ironically, Mother Nature delivered a storm that prompted the



Updated reporting by the MDNRE now distinguishes the volume of RTB treated discharges that meet permit requirements from untreated CSO.

pumps to start filling the basin shortly after the meeting began providing an opportunity for participants to see the facility in action.

The GWK RTB in Oakland County hosted a tour in November for staff from the City of Berkley. Berkley is one of 14 communities that sends flows to the facility.

## More Specific Discharge Reporting by MDNRE Easier to Understand

In addition to posting discharge information online, the MDNRE develops an annual report of CSO, SSO and RTB Discharges. The 2009 Annual Report, released in 2010, provides more detailed discharge information than in years past. The change is significant because it allows the reader to distinguish between the volume of discharges that meet the state's permit requirements as RTB discharges (treated) and the volume of untreated discharges.

The updated reporting recognizes that treatment provided by the RTBs meets permit requirements and state Water Quality Standards that have been established by MDNRE to protect public health. This is one more step in educating the public on the types of discharges that are actually occurring and providing a data source to measure improvement.

"By differentiating RTB treated volume from untreated CSO volume, it is easier to see the trend of declining volume of untreated CSO," stated Peter Ostlund, Field Operations Section Chief of the Water Resources Division for MDNRE. "We need to educate the public that treated flow from a CSO RTB is a final outcome - the discharges have received acceptable treatment. RTB facilities are working as planned, helping to improve water guality in our lakes and rivers. It is important to show this trend because vast public resources have been directed toward addressing these discharges. Historically, untreated CSOs were among the major sources of beach closings and other water quality impairments."

### Wet Weather Projects in the Works

Tough economic times and a changing landscape prompted DWSD to reassess planned CSO control projects for the Rouge River. The declining population has actually resulted in more green space from vacant parcels, many without structures. This demographic change impacts the amount of storm water generated by the area and ultimately the size of required facilities. A detailed re-evaluation resulted in the decision to reduce capital costs and increase green infrastructure within the expanded green space by constructing first flush capture basins instead of a previously planned tunnel. DWSD is proceeding with a combination of downsized conventional CSO control facilities plus a new "green infrastructure" component that reduces the amount of stormwater that enters the combined sewer system.

The new CSO control program, which was approved by MDNRE in May 2010, carries an estimated capital cost of \$850 million. To minimize the financial impact on Detroit residents who will bear 83% of the cost pursuant to a Federal Court Order, the program will be phased in over more than 30 years. The specific timetable for completing the projects will depend on the City's financial capability as determined by an evaluation of economic conditions to be conducted every 5 years.

The conventional CSO control facilities that have been proposed include storage tanks to



Green infrastructure such as tree planting, rain gardens and vegetative filter strips are being evaluated as a means to reduce storm water runoff and ultimately the size of additional facilities to control remaining untreated CSO to the Rouge River.

capture the most heavily polluted "first flush" that occurs at the start of a rain event, in conjunction with an innovative, low cost screening and disinfection system. The screening is to be accomplished using disposable mesh nets which are to be installed at the CSO outfalls, and disinfection will be achieved by injecting sodium hypochlorite into the combined sewers upstream of the outfall.

SEMCOG received a \$308,000 grant through MDNRE to work with DWSD to identify, prioritize and select green infrastructure projects across the Upper Rouge Tributary Combined Sewer area. Targeted green infrastructure opportunities include demolition of abandoned buildings and greening of those respective properties, disconnection of downspouts, implementation of green infrastructure techniques on municipal properties, targeted techniques along roadways and parking areas, and tree planting along roadways and open spaces. DWSD has committed to spending \$50 million to implement the Green Infrastructure program over the next 20 years, in addition to the \$850 million conventional CSO control facility expenditure.

Improvements were also undertaken at existing RTBs. Macomb County undertook a major pump rehabilitation program at the Chapaton RTB. Two of the 86,000-pound pumps capable of pumping 231,000 gallons per minute each were removed and completely rehabilitated. Construction is also continuing on Detroit's \$155 million RTB for the Oakwood Sewer District in southwest Detroit. The new facility consists of a 9 MG retention basin plus a new 1,660 cfs pump station to convey peak wet weather flows from the District.

Utilizing a grant obtained by the Oakland County Water Resources Commissioner's office, the US Army Corps of Engineers has designed and bid the Red Run Inter-County Drain E.coli Reduction Project that will benefit Oakland and Macomb Counties. In addition to repairing storm water outfalls and stabilizing the slopes along 9 miles of open-ditch drain in Macomb County, the project will also eliminate an existing cross-connection between a 60-inch combined sewer and a 48-inch storm drain in the City of Madison Heights. The project will reduce the levels of E.coli within the Red Run Drain and reduce the amount of sediment in the existing drain to improve the drain's flow characteristics. The Red Run Drain is the wet weather outlet for the George W. Kuhn RTB. Construction is expected to begin in the Winter of 2010-2011.

SEMCOG is also assisting area governments with two other grants to reduce pollution from storm water runoff. The "Restoring the Lake Erie Corridor through Green Streets" funded through the EPA provides direct implementation funding to Macomb, Monroe, Oakland and Wayne Counties to design and construct green infrastructure along identified roadways. The "Tree Enhancements on Publicly-Owned Priority Urban Areas" grant from the US Forest Service provides direct implementation funding to the City of Detroit, Oakland County, and Wayne County to design and plant trees along municipal properties and respective roadways. SEMCOG's funding through this grant will be utilized to model long-term storm water runoff reduction benefits from the trees.

#### **Continued Progress in 2010**

- RTBs managed flows from rain storms preventing 6.4 billion gallons of untreated CSOs from entering our waterways
- Macomb, Oakland and Wayne Counties continued to implement aggressive IDEPs (Illicit Discharge Elimination Program) to investigate and correct the discharge of untreated wastewater in our waterways. Macomb County completed more than 800 investigations, Oakland County completed 249 and Wayne County completed 230.
- The beaver first spotted near the Conner Creek RTB remained active and additional nearby habitat improvements were undertaken by DTE Energy. DWSD stopped mowing part of the Conner property to extend the wildlife area beyond DTE Energy's border. Skilled operation of the facility by DWSD enables it to successfully operate without impacting or disturbing wildlife.
- Caddisflies were discovered in Johnson Creek, the westernmost section of the Rouge Watershed. The moth-like insects are rare in this area and they are particularly sensitive to environmental stress.

### **Continued Outreach and Cooperation in 2010**

- DWSD and its wholesale customers worked together in a series of work groups to address RTB operational challenges and share strategies; reach out to the public, the media and local officials on wet weather pollution control issues; and address rate issues.
- The MDNRE began tracking RTB discharges separately from CSO discharges for their annual report enabling the public to distinguish between treated discharges that meet regulatory permit requirements and untreated discharges.
- Staff from four utilities throughout the US and Canada and Drain Commissioners came to visit RTBs in southeast Michigan to learn more about how we successfully manage the storms that overload our sewer system.

Operation Clean Water documents highlight how combined sewer overflow (CSO) treatment facilities are helping to improve southeast Michigan's waterways. They are published on the DWSD Customer Outreach Portal at www.dwsdoutreach.org by the Public Education Work Group composed of DWSD and wholesale customers.

