

**Performance Audit:
Combined Sewer Overflow
Consent Decree Impact**

January 2014

City Auditor's Office

City of Atlanta



CITY OF ATLANTA

City Auditor's Office
Leslie Ward, City Auditor
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January 2014

Why We Did This Audit

We undertook this audit to assess the Department of Watershed Management's efforts to comply with the 1998 combined sewer overflow consent decree, aimed at eliminating water quality violations caused by combined sewer overflows.

What We Recommended

To manage remaining risks to the combined sewer overflow facilities and continue to reduce the number of water quality violations, the Commissioner of Watershed Management should:

- Develop an ongoing budget to cover future maintenance needs and help eliminate the current backlog.
- Measure the amount of catch basin debris removed, identify areas with basins that generate high amounts, and develop a schedule to clean those areas on a more frequent basis.
- Determine the best and most cost-effective mix of catch basin cleaning and street sweeping to maximize resources while reducing the amount of debris and pollutants entering the combined sewer system.
- Determine whether more frequent street sweeping would reduce the amount of catch basin cleaning needed. Once the department determines an ideal frequency, it should develop a service level agreement with the Department of Public Works and include those expectations.
- Continue community outreach, recycling, and other efforts to manage litter and debris within the city and consider whether to expand or hold these events more frequently.

For more information regarding this report, please contact Stephanie Jackson at 404.330.6678 or sjackson@atlantaga.gov.

Performance Audit:

Combined Sewer Overflow Consent Decree Impact

What We Found

Completion of the consent decree projects appears to have significantly improved water quality. Despite these improvements, deferred maintenance and street level debris pose ongoing compliance risks.

Since Watershed management completed the projects related to the combined sewer overflow projects in late 2008, average annual water quality violations have decreased by 65% through July 2013. The city averaged 8.3 water quality violations per year at combined sewer facilities between 1998 and 2008, and averaged 2.9 violations per year after the projects were completed. Also, the severity of violations decreased after the improvements were completed. While most violations were for exceeding fecal coliform bacteria standards in the water discharged to the Chattahoochee and South Rivers, these violations decreased from 74% to 43% of the total violations after the projects were completed. Department officials predicted that the improvements would reduce the number of overflows to less than an average of four per year. The system has experienced only two overflows since the projects were completed, both related to flooding in September 2009.

The department has accumulated \$25-\$36 million in deferred maintenance on the combined sewer facilities as it prioritized work on the sanitary sewer system in recent years. Some of these maintenance issues have caused water quality violations. Staff told us the department plans to resolve outstanding maintenance and repairs by the end of fiscal year 2015. The department should develop an ongoing budget to cover future maintenance needs and prevent another backlog.

Street level debris also poses risk as it can clog the sewer systems, damage filtering equipment, and introduce additional pollutants into the system. Watershed management periodically cleans catch basins and pays public works about \$800,000 per year for street sweeping. Public works reports that it sweeps streets three times per year. Increasing the frequency of street sweeping could be a cost-effective way to reduce debris entering the combined sewer system. The department should assess the impact of additional street sweeping and community education.

Management Responses to Audit Recommendations

Summary of Management Responses		
Recommendation #1:	The Commissioner of the Department of Watershed Management should develop an ongoing budget to cover future maintenance needs and help eliminate the current backlog.	
Response & Proposed Action:	Watershed management will implement a multifaceted CIP project to rehabilitate/replace equipment and improve the reliability and performance of the CSO facilities. It will also increase the facility O&M maintenance budget and continue to increase the level of proactive maintenance effort.	Agree
Timeframe:	FY 2015	
Recommendation #2:	The Commissioner of the Department of Watershed Management should measure the amount of catch basin debris removed, identify areas with basins that generate high amounts, and develop a schedule to clean those areas on a more frequent basis.	
Response & Proposed Action:	Watershed management will research and identify impacted areas within the combined sewer area. It will also develop an inspection and maintenance plan within the combined sewer basins, incorporating the requirements in the Maintenance, Operations, and Management plans (MOMs). It will also implement the inspection and maintenance plan.	Agree
Timeframe:	FY 2015	
Recommendation #3:	The Commissioner of the Department of Watershed Management should determine the best and most cost-effective mix of catch basin cleaning and street sweeping to maximize resources while reducing the amount of debris and pollutants entering the combined sewer system.	
Response & Proposed Action:	Watershed management will conduct research and is working with DPW for equipment sourcing. Implementation following acquisition of equipment and staff training (DPW/DWM).	Agree
Timeframe:	FY 2015	
Recommendation #4:	The Commissioner of the Department of Watershed Management should determine whether more frequent street sweeping would reduce the amount of catch basin cleaning needed. Once the department determines an ideal frequency, it should develop a service level agreement with the Department of Public Works and include those expectations.	
Response & Proposed Action:	Watershed management will develop and finalize a Service Level Agreement (SLA) between DPW and DWM and implement the SLA.	Agree
Timeframe:	FY 2015	
Recommendation #5:	The Commissioner of the Department of Watershed Management should continue community outreach, recycling, and other efforts to manage litter and debris within the city and consider whether to expand or hold these events more frequently.	
Response & Proposed Action:	Watershed management will assess highly impacted source areas. Expand and target existing Clean Water Atlanta activities. The department will also implement training for Code Enforcement officers.	Agree
Timeframe:	FY 2015	



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January 28, 2014

Honorable Mayor and Members of the City Council:

We included this audit of the impact of the Department of Watershed Management's efforts to comply with the 1998 combined sewer overflow consent decree in our audit plan for fiscal year 2014 based on risk assessment. The department completed the projects for the combined sewer system in October 2008 and is working with state and federal officials to terminate the consent decree. The projects were designed to control the discharge of untreated wastewater into the Chattahoochee and South Rivers.

Since the projects were completed, average annual water quality violations have decreased by 65%; however, deferred maintenance and street level debris pose ongoing compliance risks. The department has accumulated \$25-\$36 million in deferred maintenance on the combined sewer facilities while it prioritized work on the sanitary sewer system in recent years, resulting in broken equipment and leaking chemical tanks. Street level debris entering catch basins can damage filtering equipment, introduce additional pollutants into the system, and clog the sewer system. Watershed management periodically cleans catch basins and shares in the funding of street sweeping conducted by the public works department, but lacks guidelines and data on the frequency of both activities.

Watershed management should budget to eliminate the maintenance backlog and address ongoing maintenance needs at the combined sewer overflow facilities. We believe the recent extension of the city's court-ordered deadline for complying with its remaining consent decree allows the financial flexibility to do this. We also call for the department to analyze the cost effectiveness of catch basin cleaning and street sweeping to determine an optimal mix of the two activities and develop a service level agreement with public works for street sweeping frequency. Finally, we encourage watershed management to examine its community-based activities and consider increasing those aimed at reducing debris and pollutants entering catch basins.

The Department of Watershed Management agrees with our recommendations and proposes to implement them during fiscal year 2015. The commissioner's full response to our recommendations is appended to the report.

The Audit Committee has reviewed this report and is releasing it in accordance with Article 2, Chapter 6 of the City Charter. We appreciate the courtesy and cooperation of watershed management and other city staff throughout the audit. The team for this project was Kwasi Obeng, Jamie Amos, Brad Garvey and Stephanie Jackson.

A handwritten signature in black ink, appearing to read 'Leslie Ward', with a stylized, cursive script.

Leslie Ward
City Auditor

A handwritten signature in black ink, appearing to read 'Fred Williams', with a stylized, cursive script.

Fred Williams
Audit Committee Chair

Combined Sewer Overflow Consent Decree Impact

Table of Contents

Introduction.....	1
Background.....	1
How the Combined Sewer System Operates	5
Audit Objectives.....	9
Scope and Methodology.....	9
Findings and Analysis	11
Water Quality Violations Have Decreased; Risk Remains	11
Projects Improved Water Quality	12
Deferred Maintenance Poses Compliance Risk	15
Street Level Debris Stresses the System	19
Changing Weather Patterns Could Increase the Risk of Overflows	23
Recommendations	25
Appendices.....	27
Appendix A	
Management Review and Response to Audit Recommendations	29

List of Exhibits

Exhibit 1 Map of Atlanta's Combined Sewer Overflow Facilities	4
Exhibit 2 Water Flow and Treatment at the West Area CSO Facilities	7
Exhibit 3 Water Flow and Treatment at the East Area CSO Facilities	8
Exhibit 4 Water Quality Violations Before and After Improvements	12
Exhibit 5 Penalties Paid for Violations Before and After Improvements	13
Exhibit 6 Water Quality Violations by Type, July 1998 - July 2013	14
Exhibit 8 Operational and Maintenance Budgets for CSO Facilities - FY08 through FY14..	17
Exhibit 9 Capital Costs for CSO Facilities - FY08 through FY14.....	17

List of Figures

Figure 1 Combined Sewer System	2
Figure 2 Separated Sewer System	2
Figure 3 West Area Tunnel Shaft	5
Figure 4 Intrenchment Creek Tunnel Shaft	6
Figure 5 Broken Mechanical Rake at Clear Creek CSO Facility	18
Figure 6 Installed Mechanical Rakes at Clear Creek CSO Facility	18
Figure 7 Hole in Drum Screen at Tanyard Creek CSO Facility	18
Figure 8 Broken Clamshell on Crane at West Area CSO Facility	19
Figure 9 Tires at the North Avenue CSO	20
Figure 10 Broken Grate at Tanyard CSO	20
Figure 11 Debris Entering Boulevard CSO Regulator	20
Figure 12 Catch Basin	21
Figure 13 Cleaning Crew on James P. Brawley Drive and Carmen Alexander Street, 11/7/13	21
Figure 14 Catch Basin on James P. Brawley and Carmen Alexander Street, 11/7/13	22
Figure 15 Catch Basin on James P. Brawley Drive and Carmen Alexander Street, 11/8/13	22

Introduction

This audit assesses efforts of the Department of Watershed Management to comply with Atlanta's combined sewer overflow (CSO) consent decree. Combined sewers carry sanitary sewage and stormwater through a single pipe. The decree was aimed at controlling the discharge of untreated wastewater into the Chattahoochee and South Rivers.

Background

The consent decree, issued in 1998, required Atlanta to evaluate and implement short- and long-term plans to eliminate water quality violations caused by combined sewer overflows. The decree was ordered following a lawsuit, in which the city reached a settlement with the EPA (U.S. Environmental Protection Agency), the Georgia EPD (Department of Natural Resources, Environmental Protection Division), and three citizen plaintiffs. To comply with the decree, Atlanta developed a plan to separate combined sewers in select areas; build tunnels, which capture and store sewage and stormwater; and evaluate maintenance, operations, management programs, and capital improvement projects.

The department completed the projects for the combined sewer system in October 2008, and reported a total of about \$711 million in project costs. Watershed management financed the improvements by increasing water and sewer billing rates, using Municipal Option Sales Tax revenue and bond funds, and borrowing money from the Georgia Environmental Finance Authority.

The city is working with the EPA and the Georgia EPD to terminate the consent decree, which may require court approval. A second consent decree was issued in 1999 to address sanitary sewer problems in other parts of the city. These projects, which are under way, must be completed by July 1, 2027.

Combined sewers carry waste from residential and commercial buildings, but also transport storm runoff in the same pipe to a treatment plant, where it is typically treated and released to a body of water (see Figure 1). If there is heavy rain, excess stormwater can push the combined system above its capacity and cause overflows. In these cases, the combined system was historically designed to release the excess sewage into creeks that flow directly into tributaries of either the Chattahoochee or South Rivers. These discharges contained untreated

wastewater, which can carry high levels of bacteria and other pollutants that harm water quality and pose environmental and health risks.

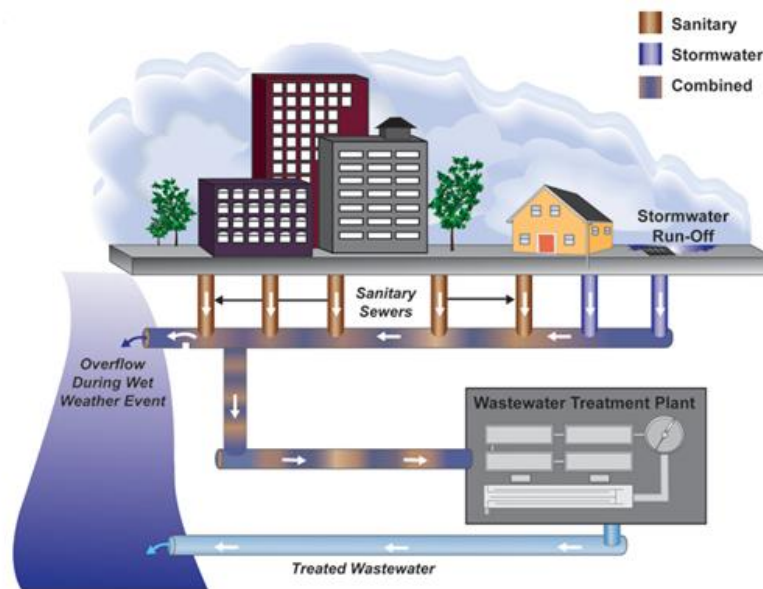


Figure 1 Combined Sewer System

Source: Buffalo Sewer Authority

Separated systems comprise two independent piping systems - one system for “sanitary” sewage from residences and businesses, and another for stormwater. Sanitary sewers can discharge raw waste if there are problems such as broken pipes, blockages, poor maintenance, power failures, and other defects that allow stormwater and groundwater to infiltrate the system. (Figure 2 illustrates a separated sewer system).



Figure 2 Separated Sewer System

Source: Cambridge Department of Public Works, Cambridge Massachusetts

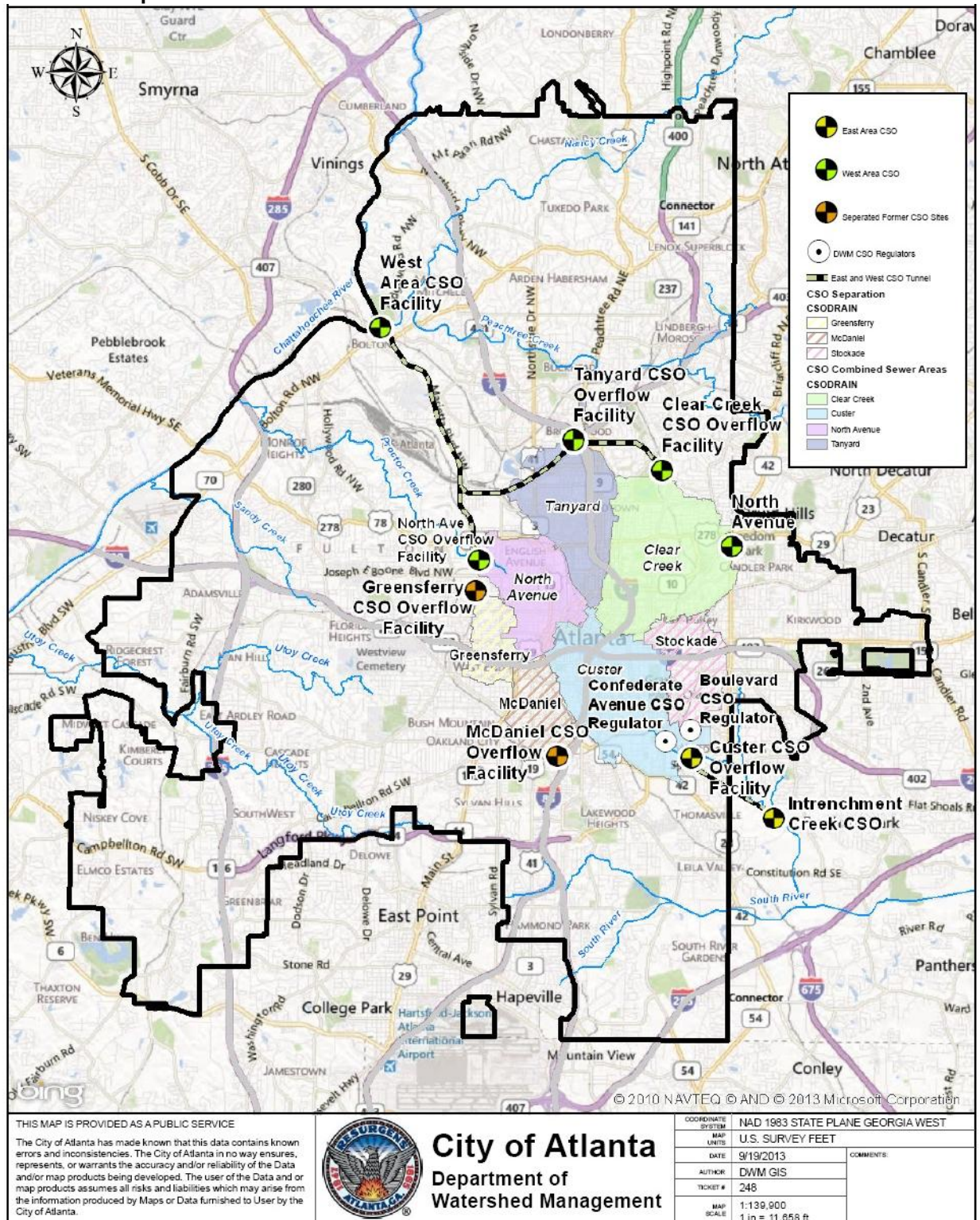
The city decided to separate select combined sewers and to construct tunnels. By separating more of its sewers, Atlanta achieved 90% separation of its total system. The city also eliminated two combined sewer overflow facilities and built two new facilities. The department used four criteria to consider its alternatives: (1) the ability to meet water quality standards, (2) affordability, (3) acceptance to the public and stakeholders, and (4) the ability to meet the consent decree deadline. The city ruled out the option to separate all sewers because the project could not be completed by the decree deadline, was the most expensive and disruptive, and would not offer the same water quality options.

The upgraded combined sewer overflow system has six sewer overflow facilities and two new tunnels (See Exhibit 1).

- West Area
- Tanyard
- Clear Creek
- North Avenue
- Custer Avenue
- Intrenchment Creek

The city's remaining combined sewers are located within an 11-square-mile area that includes the downtown city core, Midtown near Piedmont Park, Georgia Tech, the Georgia Dome locale, and parts of East Atlanta and Grant Park. The department separated the Greensferry and McDaniel combined sewer overflow (CSO) pipes, decommissioned the facilities, and separated the Stockade Sub-basin. The department built the West Area tunnel and expanded the East Area tunnel.

Exhibit 1 Map of Atlanta's Combined Sewer Overflow Facilities



Source: Department of Watershed Management, Engineering Division

How the Combined Sewer System Operates

The CSO system operates at its peak when volume exceeds capacity at the reclamation centers, which are the first treatment point in the system. During dry weather, wastewater is transported to one of the reclamation centers, where the sewage is treated and released to the Chattahoochee or South River. If rainfall amounts overwhelm the capacity of the reclamation centers, the combined sewage is diverted to one of the CSO facilities, where it is fully treated and released into a nearby creek.

When heavy rain causes an overflow at a CSO facility and its storage tunnel, the flow is discharged into a nearby creek with only minimal treatment. At this point, the combined flow has been disinfected with sodium hypochlorite (chlorine), which is treated with sodium bisulfite to neutralize the chemical. These overflows may contain residual amounts of chlorine, which could violate water quality standards. Watershed management employees monitor rainfall levels and treatment stages 24 hours a day, using a web-based computer system. During storms, plant managers dispatch additional employees to sample the treated water to ensure that it meets water quality standards before it is released into creeks.

Among the city's projects, the most significant improvements were construction of the West Area tunnel and expansion of the existing Intramural Creek tunnel, by adding the Custer Avenue storage facility. These changes expanded the overall capacity of the system. During



Figure 3 West Area Tunnel Shaft

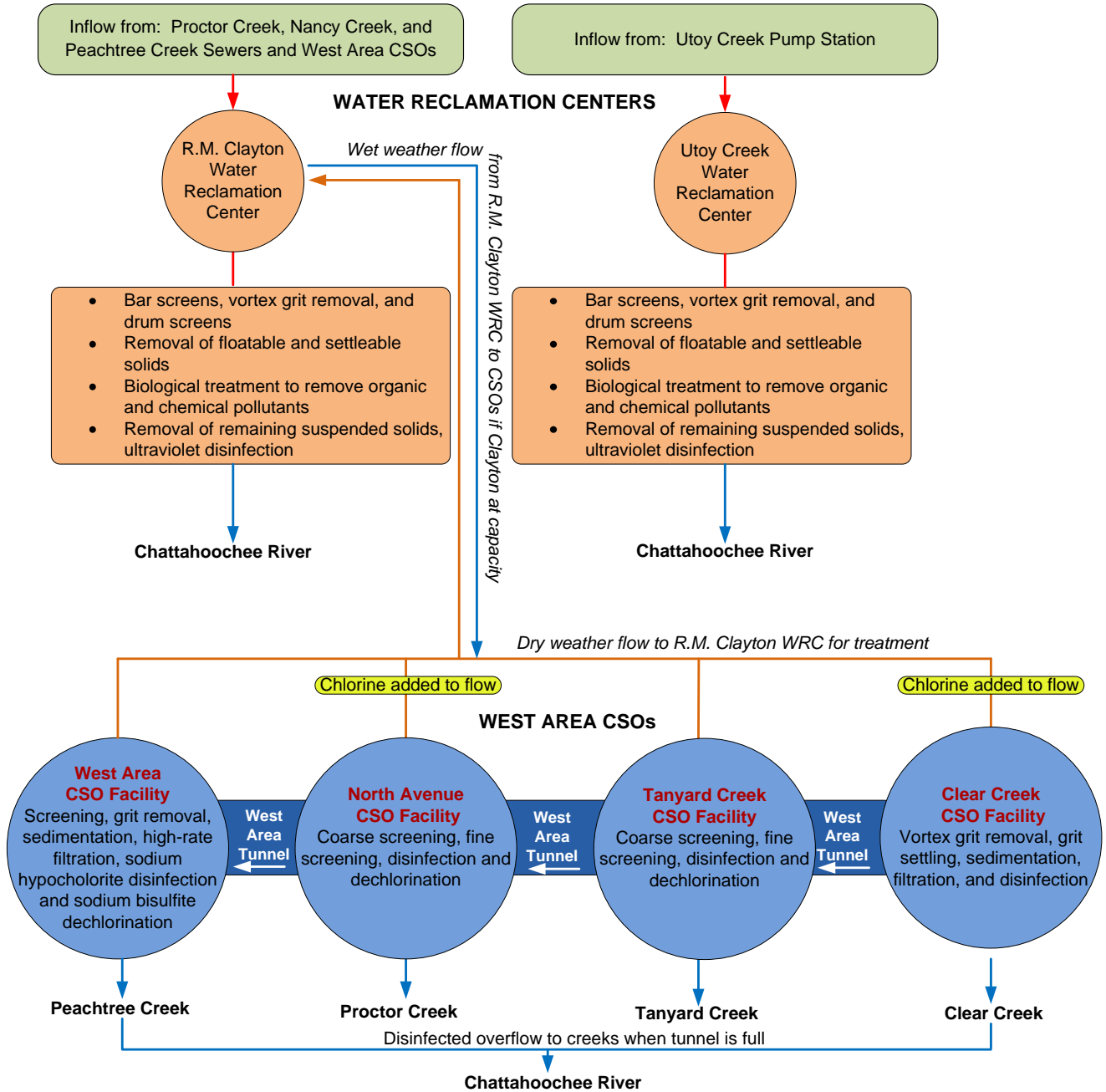
storms, the East and West Area tunnels capture and store sewage until it is transported to the reclamation centers and/or overflow facilities. The West tunnel (see shaft in Figure 3) is 8.5 miles long and 26 feet in diameter. The shaft is about 200 feet deep. Together, they store about 177 million gallons of overflow from the Clear Creek, Tanyard, and North Avenue overflow facilities.

The Intrenchment Creek tunnel (See shaft in Figure 4) is 1.8 miles long and 25 feet in diameter, with a shaft that is 115 feet deep. This tunnel and shaft can store 44 million gallons. The tunnel captures and stores overflows from the Custer Avenue facility and the Boulevard CSO regulator. The Boulevard facility is a chemical treatment facility where sodium hypochlorite (chlorine) is added to the flow before it is routed to the Intrenchment Creek reclamation center during dry weather or to the Custer plant when the sewer interceptor (48-inch diameter pipe) is at capacity. Exhibits 2 and 3 illustrate the storage and treatment that occurs at the city's East and West facilities, and identifies the creeks into which the water is released.



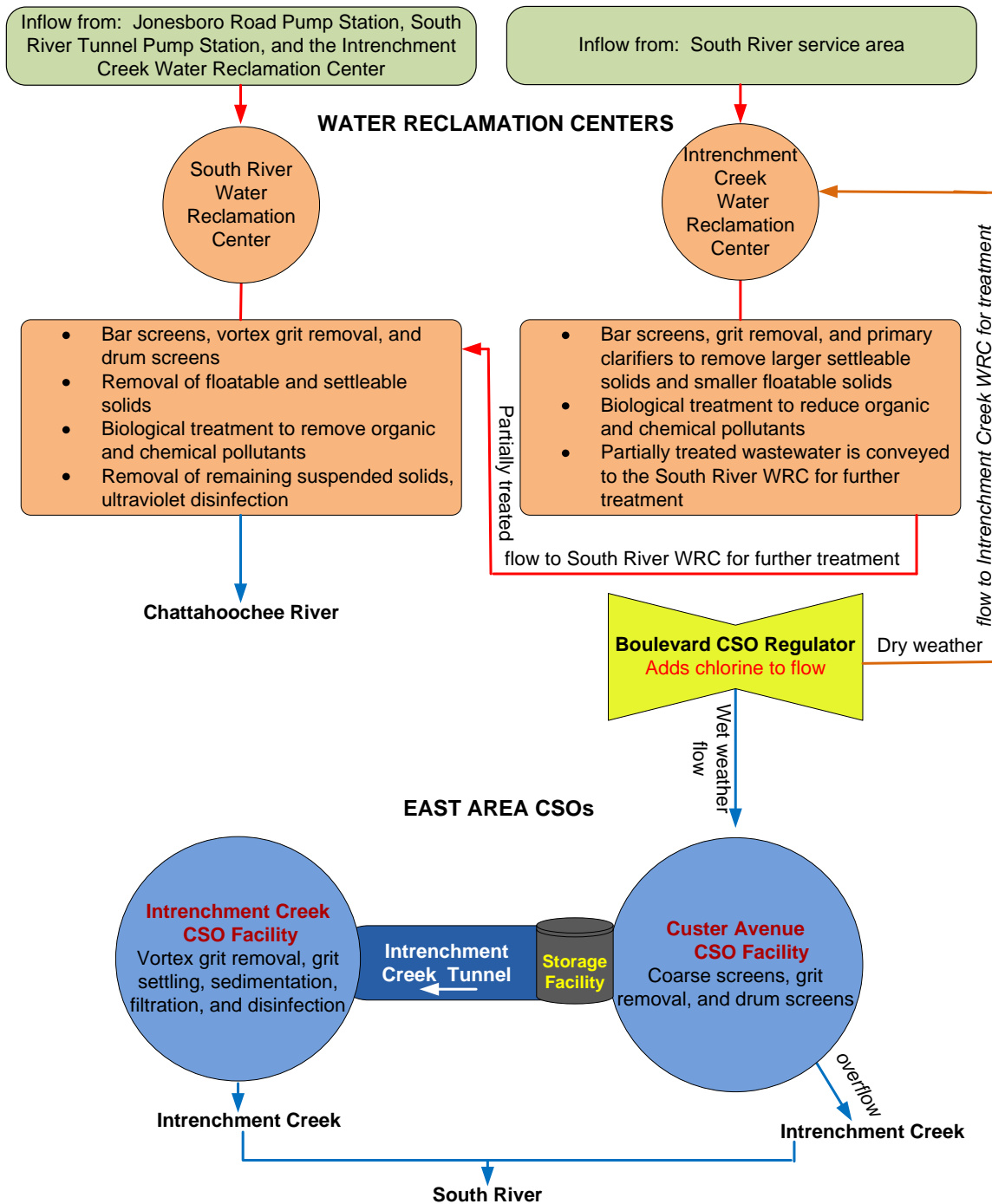
Figure 4 Intrenchment Creek Tunnel Shaft

Exhibit 2 Water Flow and Treatment at the West Area CSO Facilities



Source: Prepared by city auditor's staff using information from the Department of Watershed Management

Exhibit 3 Water Flow and Treatment at the East Area CSO Facilities



Source: Prepared by city auditor's staff using information from the Department of Watershed Management

Audit Objectives

This report addresses the following questions:

- Did the combined sewer overflow improvements result in a decrease in overflows and water quality violations?
- What are ongoing risks associated with the combined sewer overflow facilities, and how is the department managing them?

Scope and Methodology

We conducted this audit in accordance with generally accepted government auditing standards. We focused on information related to the city's combined sewer overflow facilities.

Our audit methods included:

- Reviewing and understanding the consent decree and National Pollutant Discharge Elimination System (NPDES) requirements
- Reviewing documents required by the consent decree to understand the Department of Watershed Management's remediation and operational plans to address consent decree requirements
- Interviewing department staff to understand how the agency tracks, monitors, and reports overflows and water quality violations
- Visiting the combined sewer facilities to observe and understand monitoring and treatment capabilities
- Analyzing water quality violations and associated penalties
- Reviewing amounts budgeted and spent for combined sewer overflow facility construction, upgrades, and maintenance
- Researching best practices for combined sewer operation and management

Generally accepted government auditing standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Findings and Analysis

Water Quality Violations Have Decreased; Risk Remains

The number and severity of water quality violations have decreased significantly since the Department of Watershed Management completed upgrading the combined sewer system in late 2008. Average annual water quality violations have decreased by 65% and the percentage of overall violations that were for exceeding fecal coliform standards has also decreased. The system has experienced two discharges of untreated wastewater since system improvements were completed, both related to flooding in September 2009. While the upgrades have met their intent of reducing overflows and improving water quality, deferred maintenance and street level debris pose ongoing compliance risks.

The department has accumulated \$25-\$36 million in deferred maintenance on the combined sewer facilities as it prioritized work on the sanitary sewer system in recent years. Consultants assessing the facilities in December 2011 and January 2012 identified broken equipment and leaking chemical tanks. We observed similar conditions in September 2013. Staff told us the department plans to resolve outstanding maintenance and repairs by the end of fiscal year 2015. We also recommend the Commissioner of Watershed Management budget annually for ongoing maintenance of the combined sewer facilities.

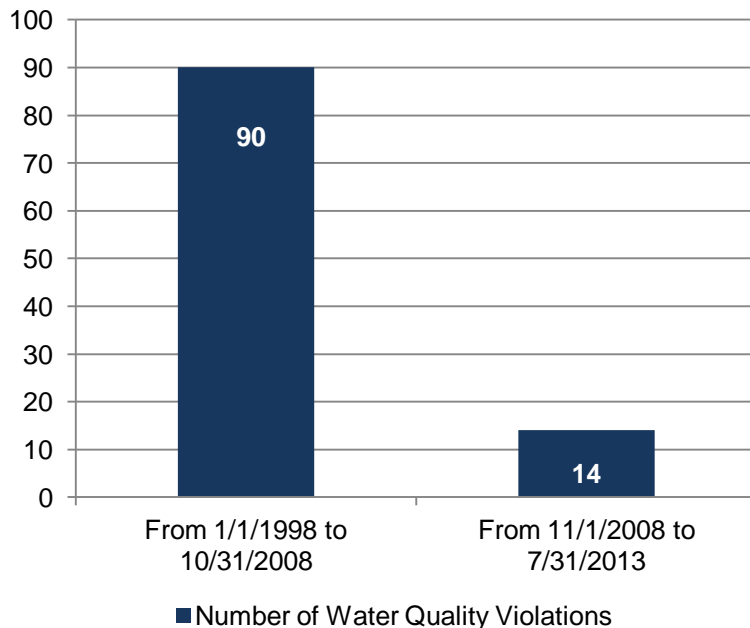
Street level debris also poses risk as it can clog the sewer systems, damage filtering equipment, and introduce additional pollutants into the system. Watershed management periodically cleans catch basins and pays public works about \$800,000 per year for street sweeping, amounting to about one-third of the street sweeping budget. Public works reports that it sweeps streets three times per year. Studies in some jurisdictions have modeled the effects of different levels of street sweeping and catch basin cleaning. Increasing the frequency of street sweeping could be a cost-effective way to reduce debris entering the combined sewer system. We recommend the Commissioner of Watershed Management determine the best and most cost-effective mix of catch basin cleaning and street sweeping and develop a service level agreement with the Department of Public Works. The department should also continue community outreach, recycling, and other efforts to manage litter and debris, and consider whether to expand or hold these events more frequently.

Projects Improved Water Quality

Completion of the consent decree projects appears to have significantly improved water quality. The city averaged 8.3 water quality violations per year within the combined sewer system between 1998 and 2008, and averaged 2.9 violations per year after the projects were completed. The percentage of violations for exceeding fecal coliform standards has dropped from 74% before the projects were completed to 43% after the projects were completed. Department officials predicted that the facility improvements and new construction would reduce the number of overflows to less than an average of four per year. The system has experienced only two overflows since the projects were completed, both related to flooding in September 2009.

Average annual violations decreased 65% since consent decree improvements were completed. The city's combined sewer facilities incurred 104 water quality violations from July 1998 to July 2013; 90 of the violations occurred before the consent decree construction was completed in October 2008 (see Exhibit 4). The facilities incurred 14 water quality violations after the projects were completed.

Exhibit 4 Water Quality Violations Before and After Improvements

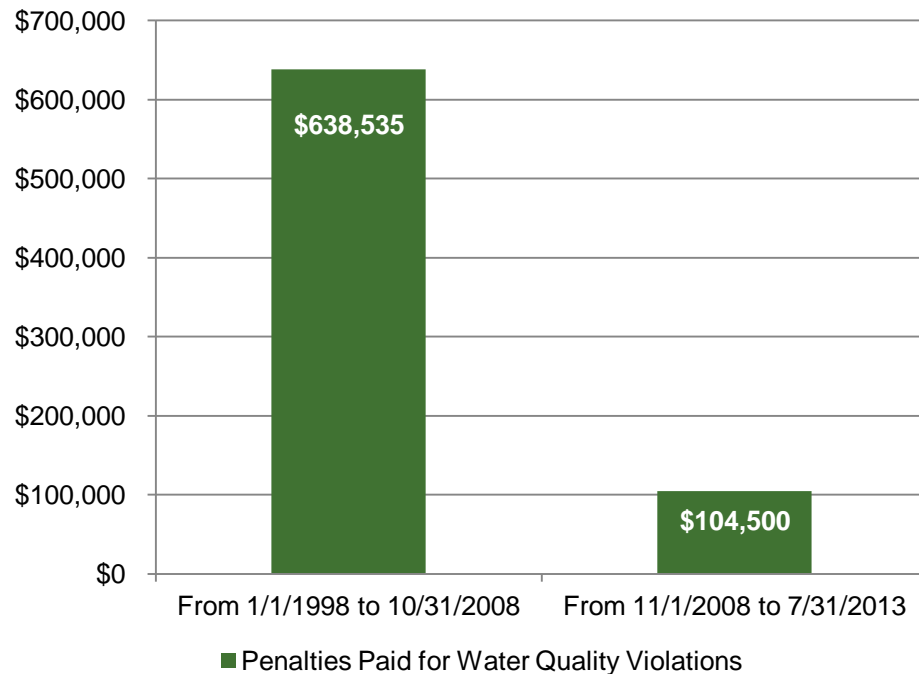


Source: Department of Watershed Management

Watershed management paid \$743,035 in penalties to the Georgia EPD and the EPA for the 104 water quality violations. The department paid

\$638,535 for violations occurring before the construction was complete and \$104,500 for violations occurring after, as shown in Exhibit 5. The department also paid an additional \$3 million in penalties and administrative fines as part of an agreement to settle previous violations.

Exhibit 5 Penalties Paid for Violations Before and After Improvements



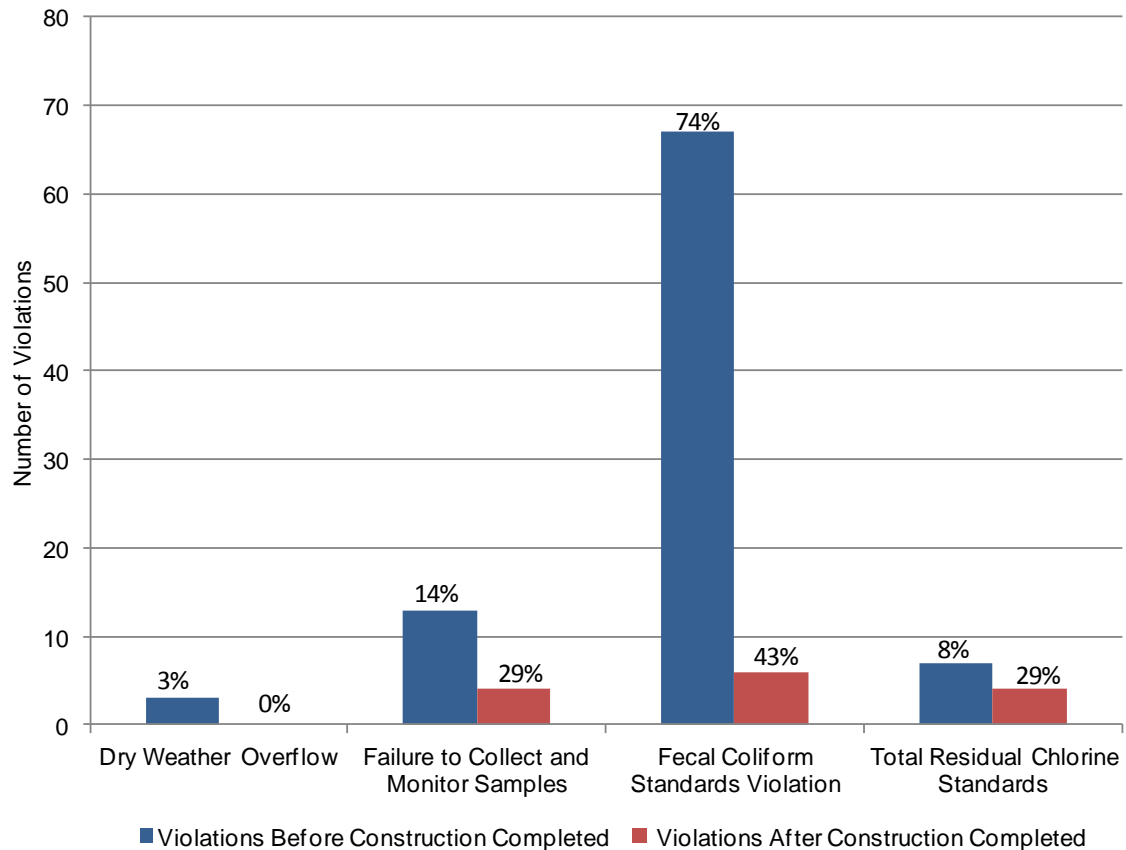
Source: Department of Watershed Management

Watershed management completed some of the combined sewer improvements as early as December 2000; however, the West Area tunnel, the last and most significant of the improvements, was finished in October 2008.

The severity of violations decreased after consent decree improvements were completed. While most violations were for exceeding fecal coliform bacteria standards in the water discharged to the Chattahoochee and South Rivers, these violations decreased from 74% to 43% of the total violations after the consent decree projects were completed (See Exhibit 6). Fecal coliform bacteria typically enter the combined sewers from sanitary sewage released from homes and businesses or from animal waste on the ground that washes into stormwater runoff. The department treats the combined storm and wastewater to remove bacteria before the water is released into the

rivers. Besides discharges of minimally treated water during heavy rain, these violations can occur because of human or equipment error.

Exhibit 6 Water Quality Violations by Type, July 1998 - July 2013



Source: Department of Watershed Management staff

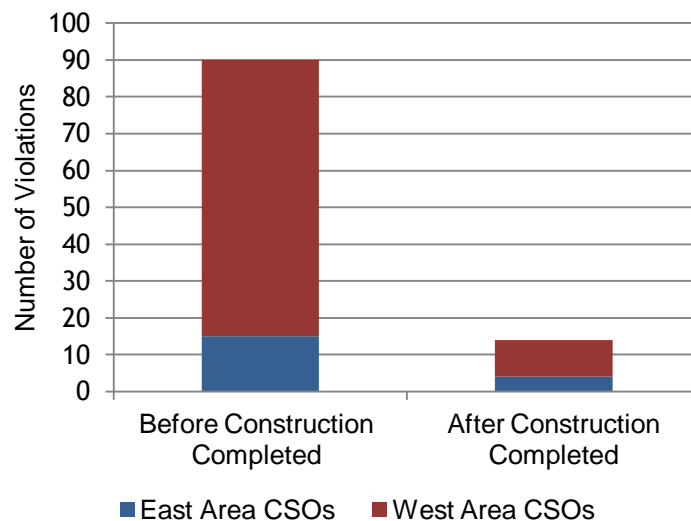
The second highest number of violations was for failing to collect and/or analyze monitor water samples in accordance with permit requirements. The operational permits require the department to take water samples at specific frequencies, depending on the regulated substance.

Violations for exceeding residual chlorine standards can occur when system capacity is exceeded during heavy rain. Watershed plant operators disinfect the sewage with chlorine before it reaches the overflow channels; however, the water may contain residual amounts of chlorine if it is discharged before de-chlorination can take place.

Dry weather overflows consist of residential sewage, groundwater infiltration, or industrial waste with no stormwater present.

The West Area facilities incurred the highest number of violations both before and after construction was completed. The Tanyard Creek, North Avenue, and Clear Creek combined sewer overflow facilities had the largest number of violations from 1988 through 2013 (see Exhibit 7). The West Area facilities cover the largest geographical area of the city compared to the East Area facilities.

Exhibit 7 Water Quality Violations Before and After Construction, by East and West Facilities



Source: Department of Watershed Management

Improvements to the combined sewer system have reduced overflows. According to watershed management staff, the facilities have experienced two overflows since 2008, with both occurring in September 2009 at the West Area facilities during heaving flooding. The city predicted that the sewer separation upgrades and other construction and improvements that it chose to implement to satisfy the conditions of the consent decree would limit the overflows “to an average of four times per year over a long-term period” at the combined sewer overflow facilities. Watershed staff said that the new facilities and upgrades are operating as designed and are more effective at preventing overflows than originally anticipated.

Deferred Maintenance Poses Compliance Risk

The department has accumulated \$25-\$36 million in deferred maintenance on the combined sewer facilities, while spending an average of about \$2.3 million per year for maintenance of the facilities from fiscal year 2010 through fiscal year 2014. A consultant assessment of the facilities conducted in December 2011 and January 2012 identified

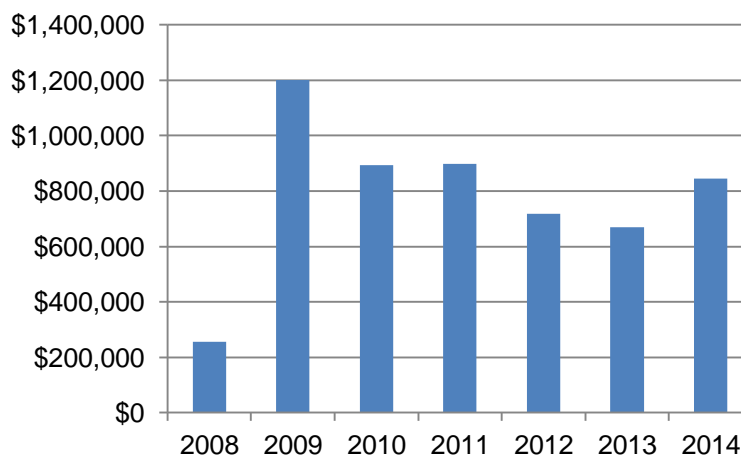
numerous problems including leaking chemical tanks and broken equipment. We observed similar conditions in September 2013. Two of three violations of the fecal coliform bacteria standard in 2012 resulted from broken equipment.

Staff told us the department had prioritized spending on capital improvements related to the sanitary sewer overflow consent decree projects over the past few years. According to staff, the department has developed a plan to resolve outstanding maintenance and repairs by the end of fiscal year 2015. The Commissioner of Watershed Management should ensure the department adequately budgets to eliminate the backlog of deferred maintenance and budget annually for ongoing maintenance of the CSO facilities.

The accumulated backlog of deferred maintenance at combined sewer facilities is \$25-\$36 million. The department estimates that it will cost approximately \$25 million to repair or replace broken equipment at the combined sewer facilities, which employees have said may increase by about \$11 million, depending on the maintenance options available (e.g., retrofitting v. replacing current equipment). The department budgets for maintenance from both its operating and capital funds, using operating funds to complete routine repairs using in-house staff and capital funds to pay for major repairs, replacement, and rehabilitation projects. The department has set the dollar threshold at \$5,000 to define a capital project, which is consistent with city policy. The city's policy on capital budgeting defines a capital expenditure as any item or group of items that cost more than \$5,000 and has a useful life of two or more years. Between fiscal years 2010 and 2014, the amounts spent for maintenance averaged about \$2.1 million per year from capital funds and \$218,700 per year from operating funds, totaling roughly \$2.3 million per year.

The department's operating maintenance budget was essentially flat after fiscal year 2009, as shown in Exhibit 8; the average annual budget from fiscal year 2010 to 2014 was just over \$800,000.

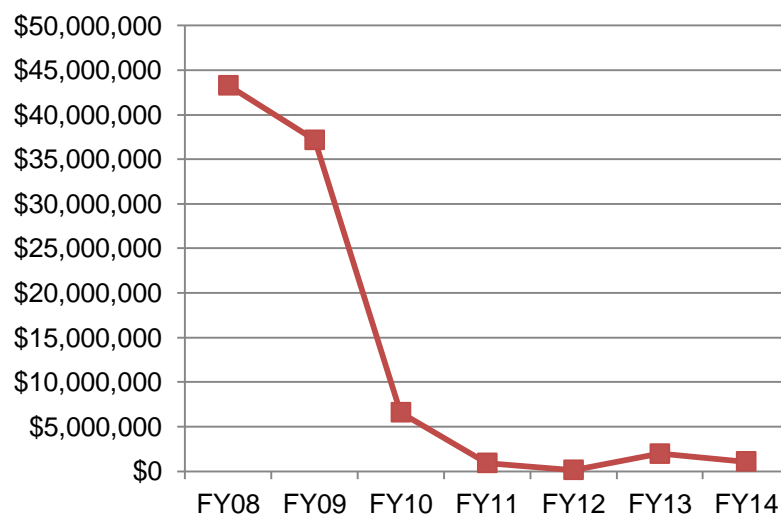
Exhibit 8 Operational and Maintenance Budgets for CSO Facilities - FY08 through FY14



Source: Department of Watershed Management staff

The capital improvement costs for the combined sewer overflow facilities decreased after fiscal year 2009, as shown in Exhibit 9, when the final combined sewer overflow consent decree project was completed. The average annual amount spent from fiscal year 2010 to 2014 was \$2.1 million.

Exhibit 9 Capital Costs for CSO Facilities - FY08 through FY14



Source: Department of Watershed Management staff

Consultant assessment identified numerous maintenance problems at combined sewer facilities. Watershed management officials hired a contractor to assess the conditions of its facilities, including the combined sewer overflow facilities. The contractors, who conducted site visits to the facilities during December 2011 and January 2012,

stated that preventative maintenance at the facilities was “essentially non-existent” and identified 500 open work orders. The contractors identified inoperable equipment and odor control systems, and out of service and leaking chemical tanks, some of which could cause water quality violations.

We toured the facilities during September 2013 and observed some of the same equipment in disrepair. For example, we saw a broken mechanical rake at the Clear Creek facility (see figure 5) that had been removed for repair; the consultant’s study found that two of six of the rakes were out-of-service. The mechanical rakes remove large debris from water flow. Figure 6 shows installed mechanical rakes.



Figure 5 Broken Mechanical Rake at Clear Creek CSO Facility

We also saw broken drum screens (see Figure 7) at Clear Creek. The consultant’s study identified multiple broken drum screens at Clear Creek as items in need of repair. Drum screens remove small particles from water flow. These particles are routed to dumpsters and plant employees haul the removed solids to a landfill.



Figure 6 Installed Mechanical Rakes at Clear Creek CSO Facility



Figure 7 Hole in Drum Screen at Tanyard Creek CSO Facility

We also saw a broken “clamshell” portion of a crane at the West Area combined sewer overflow facility (see Figure 8). Watershed maintenance employees use the equipment to remove debris from the West Area tunnel. The consultant’s study noted “repeated clamshell issues” at the facility.

To comply with consent decree and operating permit requirements, the department must keep the facilities in working order. Broken or malfunctioning equipment has caused water quality violations at the facilities. For example, at the Clear Creek facility in July 2012, a damaged chemical pipe that feeds chlorine into the combined water flow before it reaches the facility failed, resulting in fecal coliform levels in the water that exceeded the limit allowed by the operating permits. The EPA and Georgia EPD fined the department \$8,500 for the violation. The facility experienced another fecal coliform violation in October 2012 resulting from the same failed equipment, and the department was again fined \$8,500.



Figure 8 Broken Clamshell on Crane at West Area CSO Facility

Watershed employees told us that while completing combined sewer overflow construction for the consent decree, other watershed facilities accumulated a maintenance backlog. Once the construction was completed, Watershed management began to address the backlog in the SSO consent decree projects and then deferred maintenance at the combined sewer overflow facilities. Because the SSO project deadline was extended from 2014 to 2027, the department has shifted its focus to include the combined sewer overflow facility maintenance needs. Watershed management employees have developed a budget to fund all outstanding maintenance and repairs that they project will be completed by the end of fiscal year 2015. We recommend that the department develop an ongoing budget to cover future maintenance needs and help eliminate the current backlog.

Street Level Debris Stresses the System

Street level debris poses compliance risk to the combined sewer system because it can introduce pollutants, clog pipes and inlets, and damage filtering equipment. Industry sources recommend catch basin cleaning and street sweeping to manage debris. The Department of Watershed Management periodically cleans catch basins and funds about one-third of the city's street sweeping budget. The Department of Public Works is responsible for street sweeping and reports that it sweeps each quadrant of the city streets three times per year. Studies in some jurisdictions have modeled the effects of different levels of street sweeping and catch basin cleaning. Increasing the frequency of street sweeping could

be a cost-effective way to reduce debris entering the combined sewer system.

We recommend the Commissioner of Watershed Management determine the best and most cost-effective mix of catch basin cleaning and street sweeping and develop a service level agreement with the Department of Public Works. The department should also continue community outreach, recycling, and other efforts to manage litter and debris, and consider whether to expand or hold these events more frequently.

Debris can clog or damage equipment. During our tours of the combined sewer overflow facilities, we saw how small and large debris can damage the filtering equipment. The facilities assessment study found two tunnel grit pumps were inoperable due to compacted grit and six of nine sedimentation basin sludge pumps were out-of-service. Although employees told us that damage from large debris occurs infrequently, large items, such as tires and other debris can enter the system through uncovered catch basins or manholes (see Figure 9) and can damage the equipment (Figure 10). Typically, small trash, sediment and debris enter the facilities (Figure 11).

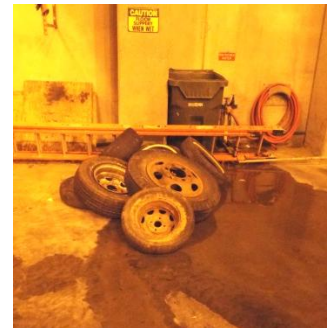


Figure 9 Tires at the North Avenue CSO



Figure 10 Broken Grate at Tanyard CSO



Figure 11 Debris Entering Boulevard CSO Regulator

Catch basins should be cleaned periodically to be effective; the frequency depends on the amount of debris they accumulate. Catch basins are drains that collect and filter stormwater into the city's combined sewer system. They also help to prevent street flooding and reduce the amount of debris that enters the combined overflow facilities, as shown in Figure 12. EPA guidance recommends cleaning catch basins when the depth of deposits is greater than or equal to one-

third the depth from the basin to the invert of the lowest pipe or opening into or out of the basin. Accumulation of debris beyond this point reduces the catch basin's effectiveness in trapping sediment and preventing street flooding. The EPA guidance also recommends that the basins be inspected at least annually to determine whether they need to be cleaned.

Watershed management lacks a formal process to identify and address catch basins that require more frequent cleaning. Watershed management staff told us that the department cleans all catch basins that flow into the combined sewer facilities every two months and cleans remaining catch basins only when customers complain about blockages or flooding. Employees plan and track catch basin cleaning using work orders in the Hansen work order management system. The system captures street names and a description of the location without identifying the number of individual catch basins on the segment. As a result, the department cannot identify the number of catch basins in the city or how often they are cleaned.

Although staff said the department cleans catch basins in certain parts of the city more frequently than others because those areas accumulate more debris, staff was unable to tell us how frequently they clean particular areas. Further, the department collects no data to show specifically where those areas are in the city, which they refer to as "hot spots."

We observed a watershed management crew cleaning a catch basin at the corner of Brawley and Carmen Alexander Street on November 7, 2013 (Figure 13). The catch basin was filled with debris nearly to the top before cleaning (see Figure 14). The catch basin was again filled with debris by the next day (see Figure 15). The cleaning crew told us that this location is one of the "hot spots" and they clean it more frequently; however, they were unable to say how frequently they cleaned the location. Hansen data showed that this intersection had only been cleaned once during fiscal year 2013.

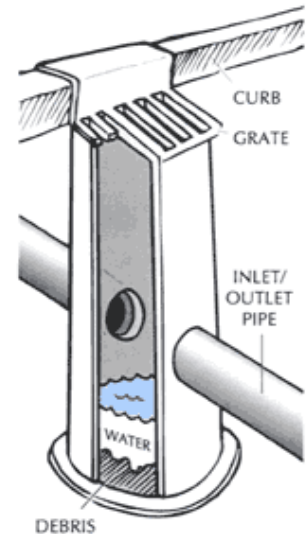


Figure 12 Catch Basin

Source: Southeast Michigan Council of Governments



Figure 13 Cleaning Crew on James P. Brawley Drive and Carmen Alexander Street, 11/7/13

Watershed should identify and develop a cleaning schedule for “hot spots.”



Figure 14 Catch Basin on James P. Brawley and Carmen Alexander Street, 11/7/13



Figure 15 Catch Basin on James P. Brawley Drive and Carmen Alexander Street, 11/8/13

Street sweeping is a cost-effective way to manage debris before it enters the combined sewer system. Multiple industry sources, including the EPA, have recommended street sweeping at least once or twice per year; however, the cleaning frequency depends on the area, traffic volume, average time between rainfall, and amount of litter and debris that accumulates in the area. Street sweeping reduces the amount of pollutants, including sediment, debris, trash, road salt, and trace metals that enter the sewer system. Some sources recommend sweeping streets weekly or every other week. Studies in some jurisdictions have modeled the effects of different levels of street sweeping and catch basin cleaning. Cities in Michigan, Florida, and Washington state have piloted studies that measured the amount of pollutants removed by the two methods and found that more frequent street sweeping is more effective than more frequent catch basin cleaning. Street sweeping is also less expensive than catch basin cleaning and provides additional benefits to the community.

The Department of Public Works is responsible for street sweeping. Employees told us they sweep all city streets three times per fiscal year by quadrant and record the number of miles swept and amount of debris removed. Watershed management pays public works approximately \$800,000 annually, which is about one-third of public works' total street sweeping budget.

We recommend that to maximize its resources while reducing the amount of debris and pollutants entering the combined sewer system,

watershed management should determine the best and most cost-effective mix of catch basin cleaning and street sweeping. Watershed management staff should measure the amount of catch basin debris removed, identify areas with basins that generate high amounts, and develop a schedule to clean those areas on a more frequent basis. Watershed management could also reduce the need for more intensive catch basin cleanings by coordinating street sweeping and catch basin cleaning activity in an optimal combination. Watershed management should also determine whether more frequent street sweeping would reduce the amount of catch basin cleaning needed. Once it determines an ideal frequency, it should develop a service level agreement with public works and include those expectations.

Watershed management reports efforts to manage litter and debris within the city in its annual report to the EPD in compliance with the consent decree. In addition to cleaning catch basins and street sweeping, the department also coordinates community education and outreach. These activities include tire and equipment recycling events and working with youth groups to stencil “no littering” signs on catch basins. **We recommend** that Watershed management continue these activities and consider whether to expand them and hold these events more frequently.

Changing Weather Patterns Could Increase the Risk of Overflows

Changing weather can result in increased rainfall which could exceed the capacity of the combined sewer overflow facilities. Although watershed management’s consent decree and operating permits would likely preclude the department from being fined for water quality violations due to extraordinary weather conditions, the department agrees that extreme weather conditions present a risk to the system. Watershed management employees stated that water infiltration into the sewer pipes introduces additional volume, which decreases available capacity for the combined flow; to maintain capacity they have begun coating the sewer pipes with fiberglass resin.

A 2008 EPA report states that climate change has altered rainfall patterns and created more extreme weather events, yielding more sewer overflows in some regions.¹ The report states that in the United States, climate change during the last century varied regionally but generally

¹ *A Screening Assessment of the Potential Impacts of Climate Change on Combined Sewer Overflow Mitigation in the Great Lakes and New England Regions*, Global Change Research Program, National Center for Environmental Assessment Office of Research and Development, U.S. Environmental Protection Agency, 2008.

included warming temperatures and an increased frequency of heavy rainfall. Anticipated future changes also vary regionally, but throughout most of the United States changes include continued warming temperatures and increases in heavy rainfall. If realized, these changes could present a significant risk to the performance of combined sewer system infrastructure, including efforts to mitigate combined sewer overflows.

Recommendations

To manage remaining risks to the combined sewer overflow facilities and continue to reduce the number of water quality violations, the Commissioner of Watershed Management should:

1. Develop an ongoing budget to cover future maintenance needs and help eliminate the current backlog.
2. Measure the amount of catch basin debris removed, identify areas with basins that generate high amounts, and develop a schedule to clean those areas on a more frequent basis.
3. Determine the best and most cost-effective mix of catch basin cleaning and street sweeping to maximize resources while reducing the amount of debris and pollutants entering the combined sewer system.
4. Determine whether more frequent street sweeping would reduce the amount of catch basin cleaning needed. Once the department determines an ideal frequency, it should develop a service level agreement with the Department of Public Works and include those expectations.
5. Continue community outreach, recycling, and other efforts to manage litter and debris within the city and consider whether to expand or hold these events more frequently.

Appendices

Appendix A
Management Review and Response to Audit Recommendations

Report # 13.06	Report Title: Combined Sewer Overflow Consent Decree Impact	Date: 1/22/2014
Recommendation Responses		
Rec. # 1	The Commissioner of the Department of Watershed Management should develop an ongoing budget to cover future maintenance needs and help eliminate the current backlog.	Agree
<p><u>Proposed Action:</u></p> <p>a) Implement a multifaceted CIP project to rehabilitate / replace equipment and to improve the reliability and performance of the combined sewer facilities.</p> <p>b) Increase the facility O&M maintenance budget and continue to increase the level of proactive maintenance effort.</p> <p><u>Implementation Timeframe:</u> FY 2015</p> <p>a) Design to start in the first quarter of 2014; City Council approved on January 21, 2014. Expect multiple procurement packages with contract terms spanning the thirty months following design NTP.</p> <p>b) Additional funding for routine and preventive maintenance to be included in FY2015 budget request.</p> <p><u>Responsible Person:</u> Kim Parmer (DWM OES) for the CIP projects, supported by OWTR Frank Stephens and Alan Stillwell (DWM OWTR) for increased routine and preventive maintenance Ray Wilke for Asset Management (DWM OES)</p>		
Rec. # 2	The Commissioner of the Department of Watershed Management should measure the amount of catch basin debris removed, identify areas with basins that generate high amounts, and develop a schedule to clean those areas on a more frequent basis.	Agree
<p><u>Proposed Action:</u></p> <p>a) Research and identify impacted areas within the combined sewer area.</p> <p>b) Develop an inspection and maintenance plan within the combined sewer basins incorporating the requirements in the Maintenance, Operations, and Management (MOM) plans.</p> <p>c) Implement the inspection and maintenance plan.</p> <p><u>Implementation Timeframe:</u> FY 2015</p> <p><u>Responsible Person:</u> Ray Wilke for Asset Management (DWM OES) Margaret Tanner and Kris Garcia (DWM OWP) Reginald Wells for Maintenance (DWM OLIO)</p>		

Rec. # 3	The Commissioner of the Department of Watershed Management should determine the best and most cost-effective mix of catch basin cleaning and street sweeping to maximize resources while reducing the amount of debris and pollutants entering the combined sewer system.	Agree
<u>Proposed Action:</u>	a) Conduct research (DWM). b) Equipment sourcing in progress (DPW/DWM). c) Implementation following acquisition of equipment and staff training (DPW/DWM).	
<u>Implementation Timeframe:</u>	FY 2015	
<u>Responsible Person:</u>	Reginald Wells (DWM OLIO) Margaret Tanner (DWM OWP) Mohamed Balla (DWM Finance) Ray Wilke for Asset Management (DWM OES) DPW TBD	
Rec. # 4	The Commissioner of the Department of Watershed Management should determine whether more frequent street sweeping would reduce the amount of catch basin cleaning needed. Once the department determines an ideal frequency, it should develop a service level agreement with the Department of Public Works and include those expectations.	Agree
<u>Proposed Action:</u>	a) See response to Recommendation #3 above. b) Develop and finalize a Service Level Agreement (SLA) between DPW and DWM. c) Implement the SLA.	
<u>Implementation Timeframe:</u>	FY 2015	
<u>Responsible Person:</u>	Reginald Wells (DWM OLIO) Ray Wilke for Asset Management (DWM OES) DPW TBD	

Rec. # 5	The Commissioner of the Department of Watershed Management should continue community outreach, recycling, and other efforts to manage litter and debris within the city and consider whether to expand or hold these events more frequently.	Agree
<u>Proposed Action:</u>	a) Assess highly impacted source areas. b) Expand and target existing Clean Water Atlanta activities. c) Develop and implement training for Code Enforcement officers.	
<u>Implementation Timeframe:</u>	FY 2015	
<u>Responsible Person:</u>	Scheree Rawles (DWM Communications) Margaret Tanner (DWM OWP) Communications personnel (DPW TBD) Municipal Code Enforcement personnel (TBD)	