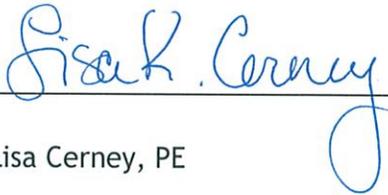




ANNUAL REPORT ON 2102 MINNEAPOLIS COMBINED SEWER OVERFLOW PROGRAM & 2011 ACTIVITIES

APRIL 16, 2012

I hereby certify that this plan, specification, or report, was prepared by me or under my direct Supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.



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NPDES/SDS Combined Sewer Overflow Permit

The 1972 amendments to the Federal Water Pollution Control Act (also known as the Clean Water Act) provided the statutory basis for the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program is designed to regulate the discharge of pollutants from point sources to waters of the United States. The Minnesota Pollution Control Agency (MPCA) has issued joint NPDES Combined Sewer Overflow (CSO) permits to the City of Minneapolis (City) and Metropolitan Council Environmental Services (MCES) since 1985.

These permits regulate CSOs by defining certain conditions that should be followed if an overflow event from the sanitary system occurs, including:

- Keeping detailed records of the number of CSO events
- Maintaining overflow volume data
- Maintaining operation and maintenance data for overflow events and elimination efforts
- Cooperation of both joint permittees is also maintained

A separate inter-agency agreement between the City and MCES details each permittee's responsibilities with respect to operation of the collection system, and notification in the event of a CSO from the sanitary sewer system.

The most recent CSO permit was issued on February 26, 1997 and expired on June 30, 2001 (Permit MN 0046744). The City and MCES applied to renew this permit in December of 2000, and began negotiating with the MPCA regarding the terms for a new permit. The City has continued to operate under the expired permit requirements, and has developed a plan to control CSOs, including an aggressive approach to eliminate connected areas and appropriate operation and maintenance of the system(s).

Sewer Separation History in Minneapolis

The oldest Minneapolis sewers were built in 1870, and were designed to carry both sewage and stormwater. In 1922, construction started for a separate storm drain system around Minneapolis lakes, as well as newly developing areas. Older areas continued to be served by combined sewers. Sewer separation began in earnest in the 1960s, in conjunction with a citywide paving program.

In 1986, the City began an accelerated sewer separation program called **Minneapolis Combined Sewer Overflow Program - Phase I**. CSOs were greatly reduced by Phase I efforts. Phase I was supported in part by federal and state funds and was responsible for disconnecting storm infrastructure that contributed more than 4,600 acres of surface area to Minneapolis sanitary sewers.

The Minneapolis Combined Sewer Overflow Program – Phase II was developed in 2002, based on a 1999/2000 comprehensive planning process and an April 2002 Brown & Caldwell study entitled **Combined Sewer Separation Evaluation**. The study identified inflow, rather than infiltration, as the major contributor to CSOs. The 2002 study recommended that Minneapolis:

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- Disconnect public sector inflow sources: isolated catch basins (storm drain inlets), alley drains, and storm drains
- Disconnect private sector inflow sources: rainleader connections, area drains, or other clean water discharges
- Study and implement storage and conveyance improvements

CSO Program - Current Status and Progress

The City of Minneapolis system is a combined system due to the known inflow at catch basin and roof leader connections, and unknown sources of Inflow and Infiltration (I & I). Progress has been made, but separation is not complete (see Figures 1 and 2).

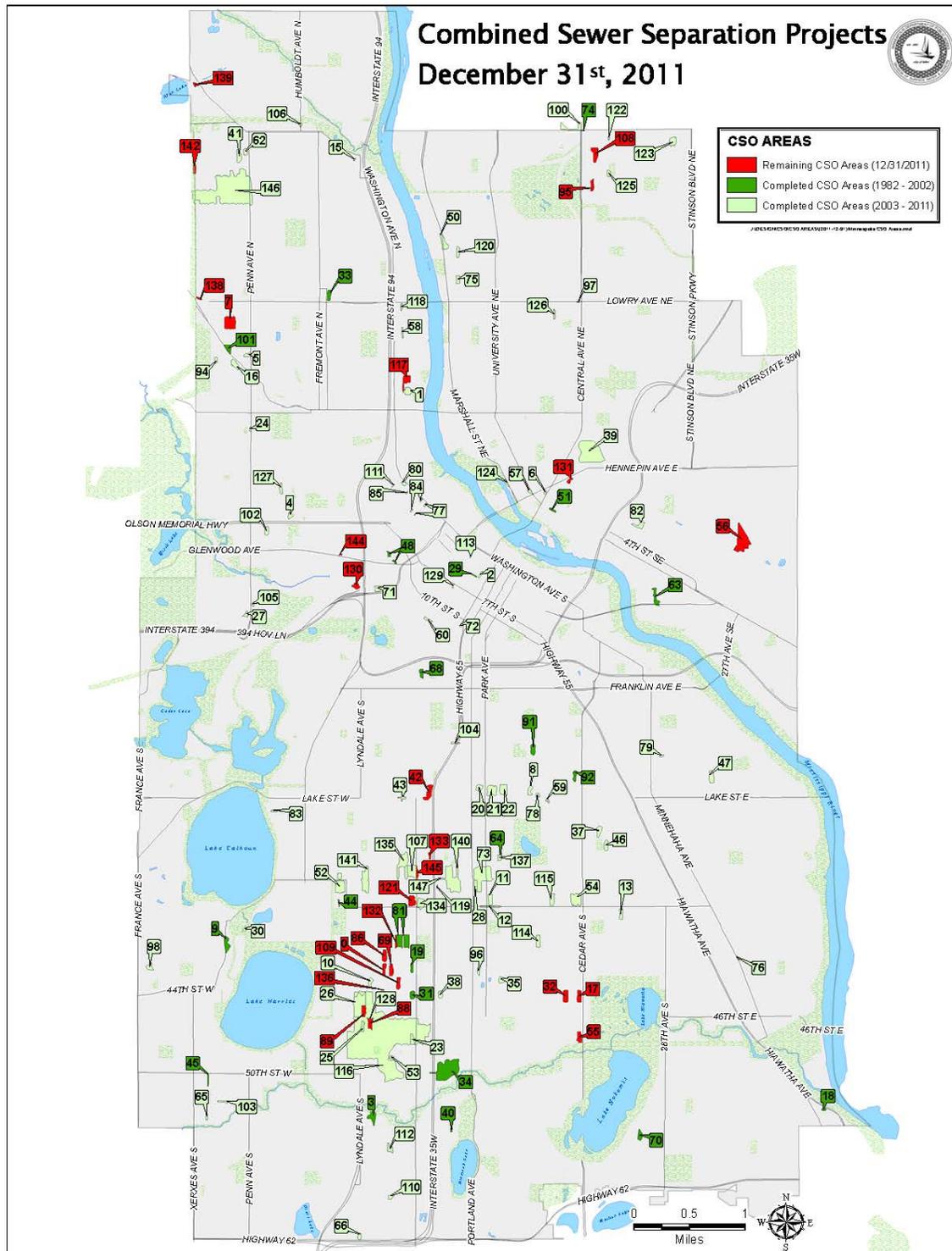


Figure 1

City of Minneapolis - Rainleader Disconnection Program Status as of 03/25/2012

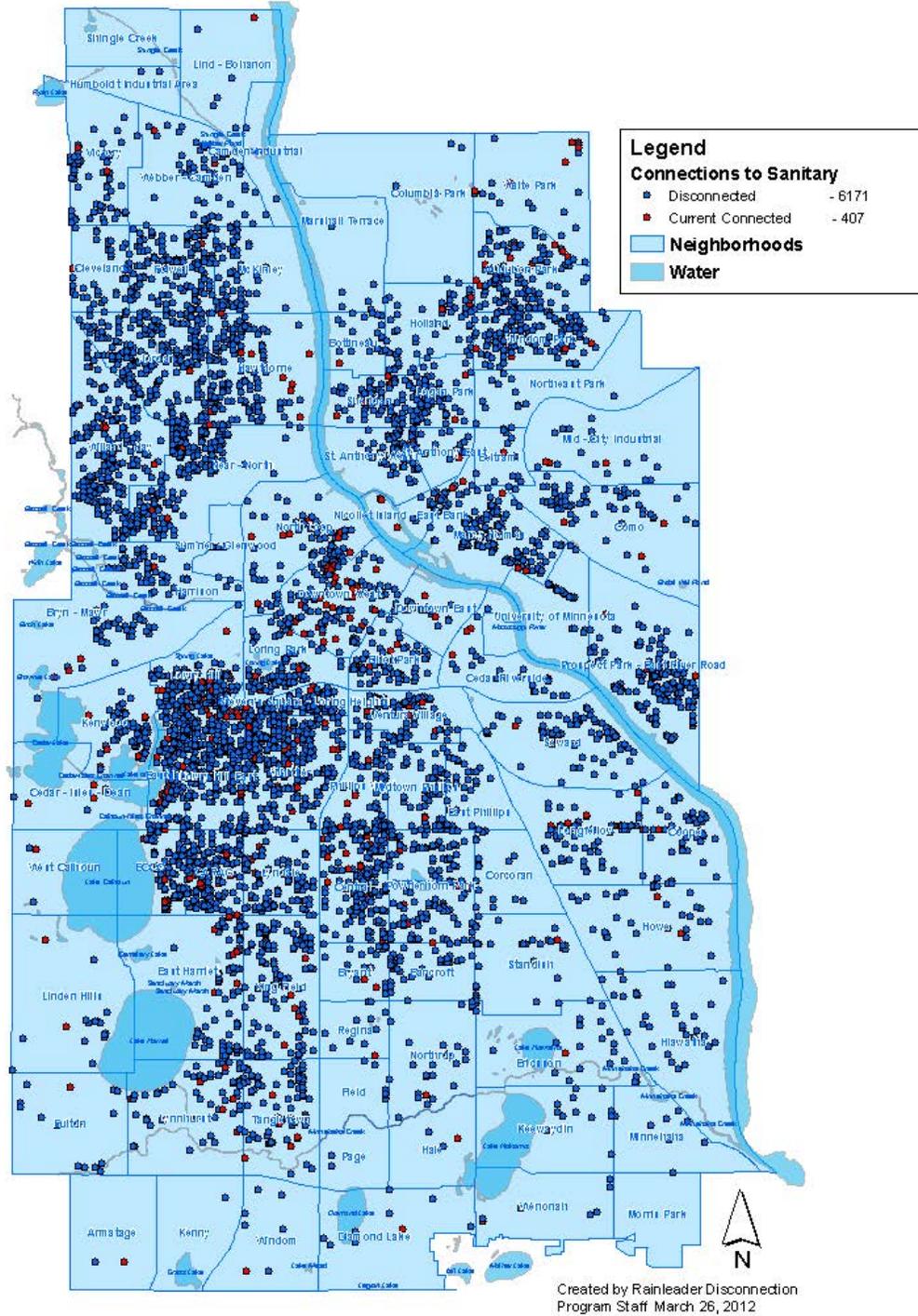


Figure 2

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Progress has been dramatic throughout both Phase I and Phase II as upgrades to the system have been carried out (see Figure 3). Figure 3 indicates a very high percent capture since 1984. Frequency and volume of untreated sewage overflowing into the stormwater system during intense rainstorms and discharging into the Mississippi River have steadily diminished.

Minneapolis has had zero CSO events to the Mississippi River in four of the past five years (two very small events occurred in 2010). Although combined sewer overflows can still occur, many years of dedicated efforts by Minneapolis Public Works staff have resulted in fewer CSO events. The remaining separations are the most difficult and complex to resolve.

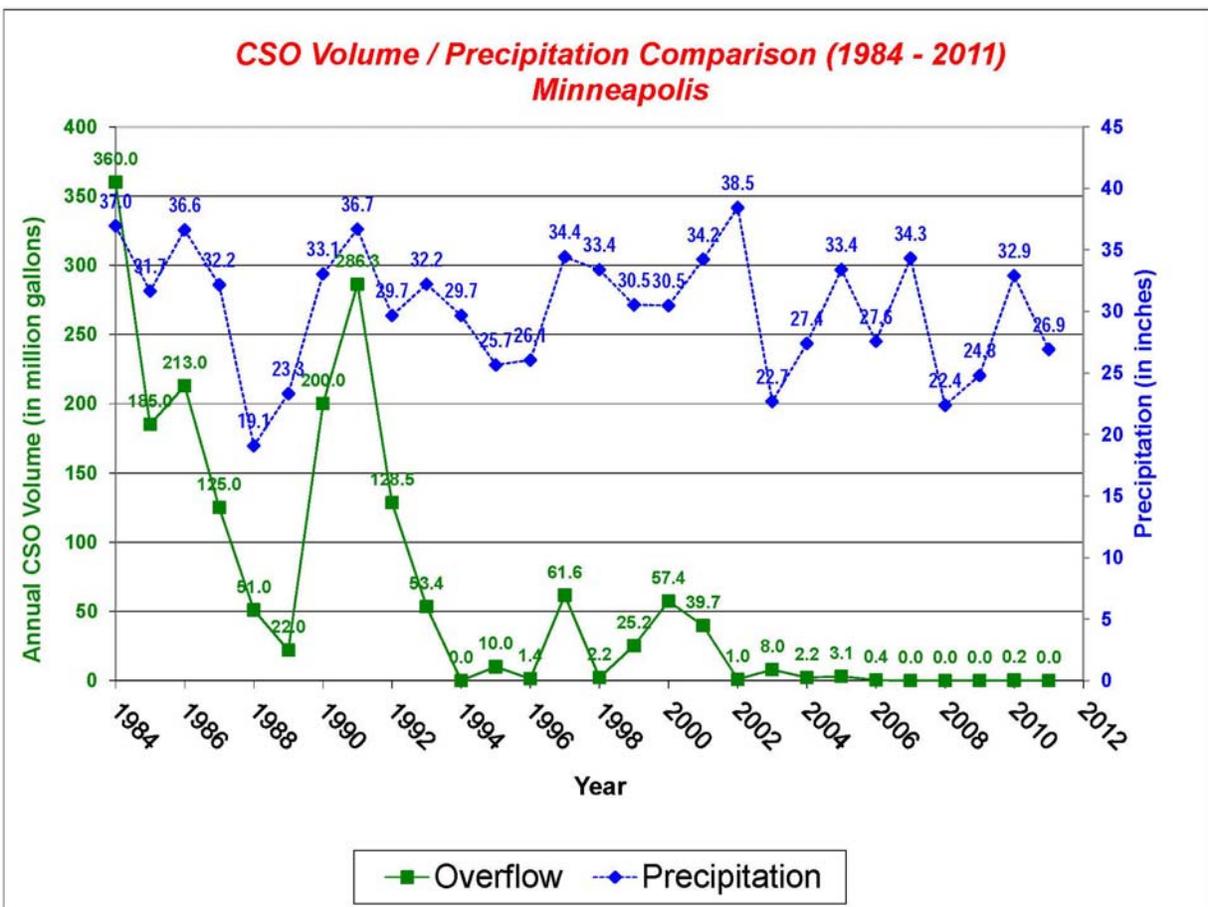


Figure 3

The following table shows information about the eight regulators remaining in Minneapolis:

Regulator Site Location	Regulator Number	Responsible Party
39 th Av S & Minnehaha Parkway	M001	MCES
38 th St E & 26 th Av S	M002	MCES
Southwest Meters	M004	MCES
Northwest Meters	M005	MCES
East Meters	M006	MCES
26 th St E & Seabury Av	M007	MCES
Oak St SE & 5 th St SE	M012	MCES
Portland Av & Washington Av S	M020	MCES

The elimination of overflow structures may not be feasible in every case without causing a public health or safety hazard. Some overflow regulators may need to remain operational for emergency relief necessitated by extreme storm or flood events, or to minimize damage due to accidents or system failures.

Since its inception in 2002, Minneapolis Combined Sewer Overflow Program, Phase II, Surface Water & Sewers Division personnel have identified, categorized, and prioritized 147 "CSO areas", meaning areas in the right-of-way with a known connection of stormwater drainage to the sanitary sewer system. The CSO Program coordinates with the Capital Improvement Project schedule to address CSO areas within the construction limits of that capital project. Occasionally, new CSO areas are discovered by City staff. This information is a result of:

- Private sewer and water connection reviews (for possible combined connections) that are done prior to issuing any new/repair permits
- Utility and plumbing inspectors' identification of CSO areas as part of their current activities
- Continued education of City staff on the importance of identifying and disconnecting CSO areas
- Flow metering and smoke testing programs

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2011 Completed CSO Projects

PROJECT NAME	PROJECT LOCATION	ACRES
CSO #075	Grand St NE, 26th to 27th Av NE	1.43
CSO #097	Lowry St NE, between Jackson and Central Av NE	0.13
CSO #120	Grand St NE (sanitary), between 28th & 29th St NE	1.51
CSO #125	Fillmore St NE, 34th to 35th Av NE	1.01
CSO #134	38th St E, between Nicollet Av and 1st Av S	3.48
CSO #135	35th St W, Blaisdell Av S to Pillsbury Av S	8.76
CSO #146	Queen Av N & 42nd Av N (storm overflow connection)	69.48
CSO #147	36th St E and 3rd Ave S	0.40
Total Area Removed in 2011		86.2

Minneapolis initiated a targeted metering program in 2008. One of the goals of this investigation is to identify sources of unknown Inflow and Infiltration (I & I). The 2011 target metering program included the following components:

- 1) Flow metering installation – 48 sites
- 2) While metering, the metered area is smoke tested. 61.3 miles of smoke testing was completed. Since 2007, over 118 miles have been tested.
- 3) 29 manholes in the area tributary to the meters were inspected
- 4) For I & I inspections, 17 miles of pipe were televised using the Closed Circuit Television (CCTV) process

The goal of this investigation project is to isolate and identify enough inflow to achieve the goal of eliminating combined sewer overflows.

The unknown sources of inflow have an effect on the system demonstrated by the following meter data in Figure 4. This metering data reveals an immediate reaction of increased flow in the sanitary system after a rainfall event. This meter is located on the City's system in Minneapolis on 2nd St N and 18th Ave N. This is representative of inflow in the sewer shed north of downtown Minneapolis.

Additionally, work on a 2011-2012 tunnel project included the abandonment of 3 blocks of sanitary sewer line. This reduced the amount of known groundwater infiltration into the sanitary sewer system of Minneapolis.

1-MN-310 Site 310i3 – 2nd St N & 18th Ave N

July 16th, 2011 Rainfall Event

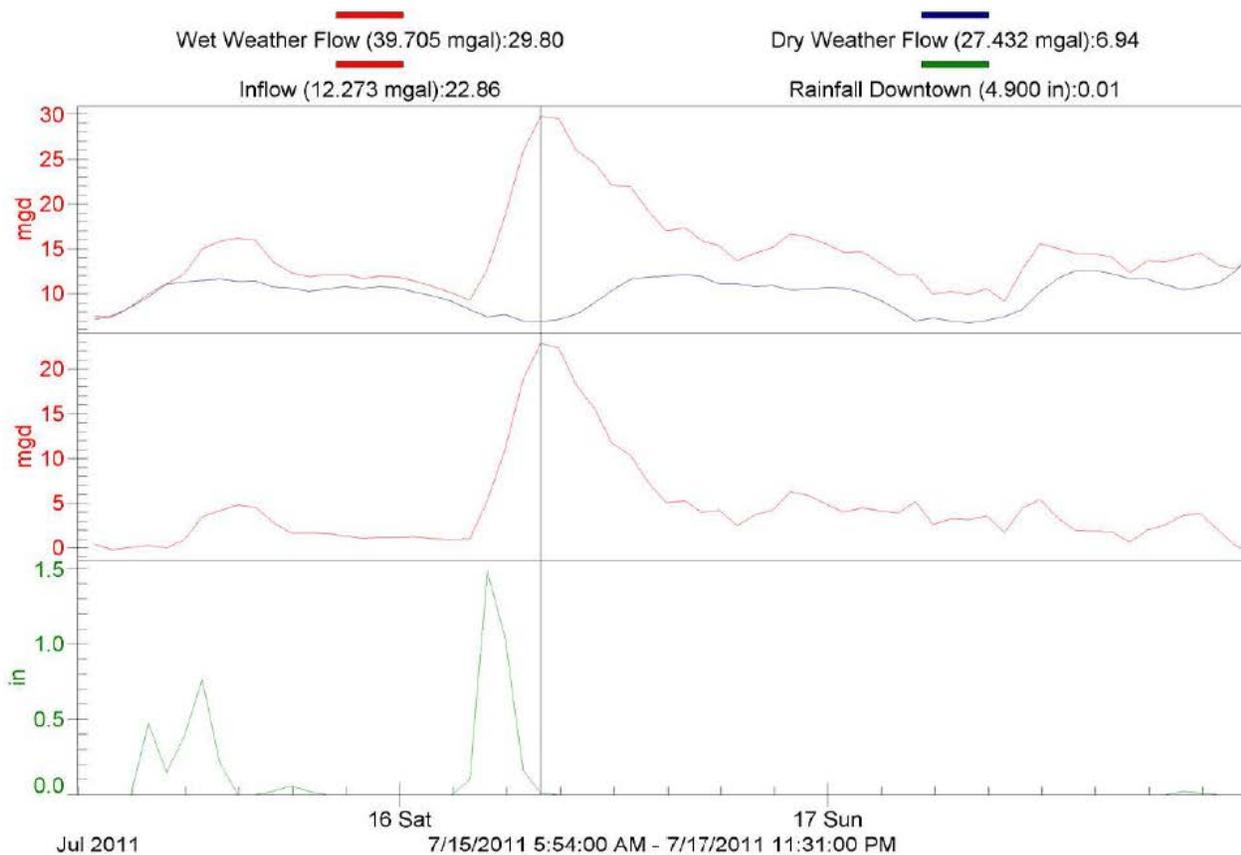


Figure 4: Meter Data

Additional CSO Program Activities

These activities directly or indirectly benefit the elimination of CSOs:

Minneapolis Flood Mitigation Program

Construction of projects from the Flood Mitigation Program has the benefit of reducing inflow and infiltration to the sanitary system.

- Construction for a 45-acre section of Flood Area 5 (Phase 1) began in December 2009. All work, including new underground storage chambers and surface bioretention cells, was completed in the fall of 2011.

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Sanitary Sewer Collection System

The sanitary sewer system within the City of Minneapolis is 852 miles in length. Of those, 777.2 miles of sewers are owned and maintained by the City, while 74.8 miles are owned and maintained by MCES.

Minneapolis Public Works has a sanitary manhole cover replacement program that switches out the older seven-hole manhole covers with one-hole manhole covers. The older manhole covers allow standing water to discharge into the sanitary system during storm events. Approximately 2,417 covers have been replaced thus far, including 1,083 in 2011.

The Sewer Operations section of MPW–SWS routinely inspects sanitary infrastructure, and performs needed maintenance to ensure proper operation. Staff has divided the City into 100 areas for their sewer main cleaning program. This program is significant to the CSO program because it uncovers and reveals inflow and infiltration (I & I). Sewer mains are cleaned by many different methods, which include jetting, discing and rodding. Annual records are kept that describe the condition, as well as the cleaning that was done for that year. City staff also utilizes GIS to create maps to better track progress.

Each year, sanitary sewers are selected for cleaning on the basis of past experience, pipe size and location in relation to flood-prone areas and poor soil conditions. Some mains are cleaned annually, but occasionally additional cleanings are needed.

The 10 sanitary lift stations in the City are cleaned each spring, and then checked on a regular basis to determine if additional cleaning is needed. In addition to cleaning, maintenance in 2011 also included:

- 4 major sanitary sewer repairs
- A total of 28,387 feet (5.38 miles) of sanitary sewer lined with a cured-in-place liner
- 312 (requested by residents) possible sanitary backups were inspected. Of those 242 possible backups, 25 were found to be plugged & were repaired.
- 5441 problematic sanitary locations were inspected
- 0 sanitary cave-ins were addressed
- 90 minor sanitary repairs were addressed
- 367.23 miles of sanitary sewer were jetted with high pressure forced water
- 26.19 miles of sanitary sewer were rodded (cleaned)
- 42.08 miles of sanitary sewer were televised

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Storm Drain Collection System

Minneapolis Sewer Operations section routinely inspects storm drain infrastructure, and performs needed maintenance to ensure proper operation. Inspection and maintenance frequency are event-driven, based on experience and inspection results history.

There are currently 145 grit chambers in Minneapolis that are inspected, cleaned and maintained by Minneapolis Sewer Operations. These grit chambers help to prevent sediment, debris and oil from entering area lakes, rivers and streams. Grit chamber inspection is based on a schedule by Minneapolis Sewer Operation personnel, and cleaned if necessary. Sediment is removed, the presence of floatables is noted, and the grit chamber cleaning dates are logged. This information is then compiled into a database and maintained by the Sewer Operations section of the Surface Water & Sewers Division.

Storm drain outfalls are inspected on a five-year schedule, generating information on:

- Condition of structures
- Significant erosion
- Any necessary repairs

Grit chamber maintenance and repairs are planned within the constraints of resources and budget, as well as the schedules of other operations. Ponds and pump stations are inspected after significant rainfall events; however, other events might require a maintenance response.

Catch basins are cleaned, removing accumulated sediment, trash and debris. This prevents pollution of receiving waters and minimizes flooding problems. The MPW - Street Maintenance section performs annual inspections, during which they clean catch basin grates on summer street sweeping routes, removing debris and sediment from blocked structures.

Statistics from the 2011 Storm Drain Maintenance program include:

- Completed 1 major repair to the storm drain system
- Performed 239 minor repairs to storm drain lines, catch basins or manholes
- Televised and condition assessed 2.65 miles of storm drain pipe
- Inspected 122 and cleaned 88 grit chambers. A total of 263.5 cubic yards was removed from the grit chambers and another 200 cubic yards was removed from a storm tunnel, for a total of 463.5 cubic yards that was removed and properly disposed of.
- Maintained 11 stormwater holding ponds
- Inspected 77 of 387 storm drain outfalls. Of those 77 inspected, 5 needed maintenance or repair.
- Monitored and maintained 26 pump stations
- Inspected 15.94 miles of storm tunnels. Inspections will continue on a regular inspection cycle.
- 1.61 miles of storm drain were jetted with high pressure forced water
- 390 feet of storm drain was lined with cured-in-place-pipe (CIPP)

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System Challenges

The City of Minneapolis has separated a significant amount of clear water out of the sanitary sewer system and is moving it to the stormwater system. The remaining sources of inflow pose both technical and financial challenges. The receiving stormwater system is at or above capacity in many locations, creating structural and operational risks with the infrastructure. Much of the receiving storm system discharges into storm tunnels. During heavy rain events, pressurization occurs, creating various problems that affect the integrity of the storm tunnels. These problems include fracturing of the tunnel liner, which in turn creates voids in the sandstone surrounding the tunnel. The storm tunnel system needs a significant amount of maintenance and rehabilitation prior to adding additional stormwater. The City has identified priority needs in the storm tunnel system and is working actively to address structural deficiencies. In addition, there are discussions to identify funding sources to assist with the design and construction of a parallel I-35W South tunnel to provide the necessary capacity in that tunnel system.

There are also known areas with localized flooding. Moving additional clear water to a system that is causing the flooding exacerbates the problem. In these situations, we cannot just separate the clear water, but must also respond to the risk of property damage.

In some instances, removing additional clear water and routing instead to the storm drain system is met by additional challenges from watershed organization rules or impaired water status.

Operating and maintenance costs are also increasing as a result of sedimentation occurring in the pipes due to inadequate velocities in the combined pipe system. The sedimentation is also causing methane gas build up and increased corrosiveness in the system.

Future Improvements

The City of Minneapolis will continue to make further reasonable progress maintaining and rehabilitating the combined sewer system and the storm sewer system, and increase the performance of those systems keeping in mind the goal of being the highest performing CSO system.