

**NPDES MS4 Phase I Permit Annual Report
for 2010 Activities
City of Minneapolis and the Minneapolis Park & Recreation Board**



NPDES MS4 Phase I Permit No. MN0061018 Annual Report

Prepared by:

Minneapolis Public Works Department in conjunction with the Minneapolis Park & Recreation Board

Submitted:

September 28, 2011



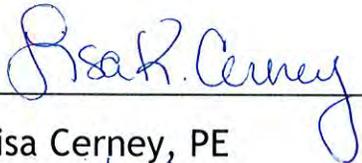
ANNUAL NPDES MS4 REPORT
ANNUAL REPORT FOR 2010 ACTIVITIES



**NPDES MS4 Phase I Permit Annual Report
for 2010 Activities**

September 28, 2011

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.



Lisa Cerney, PE

Date 9/28/2011 Registration No. 42688

NPDES PERMIT NO. MN0061018

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ANNUAL NPDES REPORT
ANNUAL REPORT FOR 2010 ACTIVITIES

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NPDES MS4 PHASE I ANNUAL NPDES REPORT FOR 2010 ACTIVITIES

Table of Contents

Cover Page.....	
Signature Page	i
Acknowledgements	ii
Table of Contents	iii-viii
Acronyms	ix
I. Executive Summary	1
II. Storm Drain System Operational Management and Maintenance.....	3
III. Structural Controls Operational Management and Maintenance	6
IV. Disposal of Removed Substances	10
V. Stormwater Management for New Developments and Construction	12
VI. Roadways.....	17
VII. Flood Control.....	21
VIII. Pesticides and Fertilizer Control	24
IX. Illicit Discharges and Improper Disposal to Storm Sewer System	28
X. Storm Sewer Design for New Construction	34
XI. Public Education	37
XII. Public Participation Process.....	45
XIII. Coordination with Other Governmental Entities.....	47
XIV. Stormwater Monitoring	51
XV. Storm Drain System and Drainage Areas Inventory	56

NPDES MS4 PHASE I ANNUAL NPDES REPORT FOR 2010 ACTIVITIES

Table of Contents

Appendix A – Supplemental Documents

Storm Drainage Areas by Receiving Water Body	A1
Storm Drainage Areas Characterization by Outfall.....	A2
Sources of Pollutants in Stormwater Runoff.....	A3
NPDES Summary Monitoring Results and Data Analysis.....	A4
Heritage Park BMP Monitoring.....	A5
Minnehaha Creek Monitoring at Xerxes	A6
Annual Pollutant Loadings By Receiving Water	A7, Part A
Estimates of Annual and Seasonal Pollutant Loads	A7, Part B
Annual Pollutant Loadings By Outfall.....	A7, Part C
Winter/Snowmelt Pollutant Loadings By Outfall.....	A7, Part D
Spring Pollutant Loadings By Outfall	A7, Part E
Summer Pollutant Loadings By Outfall	A7, Part F
Fall Pollutant Loadings By Outfall.....	A7, Part G
Comparison of Seasonal & Annual-based Outfall Loadings	A7, Part H
Stormwater Management Ordinance Summary	A15
Erosion Control Site Inspection Form	A16
Impacts of Erosion and Sediment from Construction Sites	A17
Erosion and Sediment Control Plan and Notes	A19
Erosion Control Inlet Protection Products	A22
Minneapolis Erosion and Sediment Control Reference Guide.....	A23
Chapter 54 Stormwater Management Plan Submittal Checklist.....	A24
Site Plan Review Checklist.....	A25
Minneapolis Development Review Process	A26
2010 Sewer Stormwater Rates Resolution	A27
Stormwater Utility Ordinance.....	A28
Stormwater Utility Fee FAQ.....	A29

NPDES MS4 PHASE I ANNUAL NPDES REPORT FOR 2010 ACTIVITIES

Table of Contents

Spill Response Protocol	A31
Standard Operating Procedure for Vehicle Related Spills.....	A32
Oil and Hazardous Material Spill Data form.....	A33
Specification For Disposal Of Spill Debris from Vehicle Related Spills	A34
2010 Grit Chamber Inspection and Cleaning Report.....	A35
2010 Outfall Inspection and Cleaning Report.....	A36
Street Maintenance NPDES Activities Costs and Budget.....	A41
Activities & Responsible Departments, by section of report	A45
Appendix B - Maps	
FEMA Designated Flood Zones	B1
Watershed Management Boundaries in Minneapolis	B2
Minneapolis Stormwater Runoff Drainage Sub-Area Boundaries.....	B3
Minneapolis Grit Chambers & Stormwater Ponds.....	B4
Appendix C – Public Comments [will appear in Final Report]	

ANNUAL NPDES REPORT
ANNUAL REPORT FOR 2010 ACTIVITIES

Acronyms

BCWMC	Bassett Creek Water Management Commission
BMP	Best Management Practices
CB	Catch Basin
CSO	Combined Sewer Overflow
CWA	Clean Water Act
DNR	Department of Natural Resources
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
FWMC	Flow Weighted Mean Concentration
LAURI	Lake Aesthetic and User Recreation Index
I & I	Inflow & Infiltration
LID	Low Impact Design
MCES	Metropolitan Council Environmental Services
MCWD	Minnehaha Creek Watershed District
MECA	Minnesota Erosion Control Association
MH	Manhole
MDR	Minneapolis Development Review
MnDOT	Minnesota Department of Transportation
MOU	Memorandum Of Understanding
MPCA	Minnesota Pollution Control Agency
MPRB	Minneapolis Park & Recreation Board
MPW	Minneapolis Public Works
MWMO	Mississippi Watershed Management Organization
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NURP	Nationwide Urban Runoff Program
RDP	Rainleader Disconnect Program
SCWMC	Shingle Creek Watershed Management Commission
SOP	Standard Operating Procedure
SSO	Sanitary Sewer Overflow
SW	Stormwater
SWPPP	Storm Water Pollution Prevention Plan
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
XP-SWMM	Stormwater Modeling design software
WMO	Watershed Management Organization

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Executive Summary

I. Executive Summary

Report Objective

This report is prepared in compliance with the requirements of NPDES (National Pollutant Discharge Elimination System) Permit No. MN0061018 issued on December 1, 2000. (The Permit was reissued in January 2011, however this Annual Report is in compliance with the 2000 Permit. Concurrently with this Annual Report, a new Stormwater Management Program is being submitted which is in compliance with the 2011 Permit.)

Background

The National Pollutant Discharge Elimination System (NPDES) program was created in 1990 by the United States Environmental Protection Agency (EPA) to safeguard public waters through the regulation of the discharge of pollutants to surface waters including lakes, streams, wetlands, and rivers. The Minnesota Pollution Control Agency (MPCA) is the local authority responsible for administering this program. Under this program, specific permits are issued to regulate different types of municipal and industrial activities.

This report is prepared in compliance with the requirements of the MPCA NPDES and State Disposal System (SDS) Permit MN0061018 which is a Municipal Separate Storm Sewer System (MS4) Phase I permit issued to City of Minneapolis and the Minneapolis Park & Recreation Board (MPRB) as co-permittees on December 1, 2000. In January 2011, the MPCA re-issued Municipal Separate Storm Sewer System (MS4) NPDES Permit No. MN0061018 to the City of Minneapolis and the Minneapolis Park & Recreation Board (MPRB) as co-permittees in January 2011. The Permit requires the implementation of approved stormwater management activities, referred to as Best Management Practices (BMPs). A new Stormwater Management Program (SWMP), documenting the BMPs the City and the MPRB have or will put in place for the re-issued 2011 permit, is being submitted to the MPCA for approval at the same time as submission of this Annual Report, September 28, 2011. Typically the Annual Report is due in June of each year, however the due date was changed for 2011, to September 28, because of the additional preparation of the SWMP in accordance with the re-issued permit.

The Minneapolis NPDES Stormwater Management program is developed and administered by the City and MPRB departments/agencies that are responsible for permit activities. Primarily included are the City's Public Works and Regulatory Services Departments and the MPRB. These stakeholders are

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Executive Summary

jointly responsible for the completion of the required Permit submittals. Public Works provides program management and completes each Annual Report.

This Report provides documentation and analysis of the activities conducted during the previous year, 2010. Public input into the development of the priorities and programs is required, as is adoption by City Resolution of the Annual Report. The draft Annual Report was distributed to neighborhood organizations, watershed organizations, the Citizens Environmental Advisory Committee (CEAC) and numerous other interested parties for their review and comment. A public hearing was held on Tuesday, September 13 at 9:30 AM in Council Chambers of City Hall, 350 South Fifth Street, at the meeting of the Transportation & Public Works Committee of the City Council.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Storm Drain System Operational Management and Maintenance

II. Storm Drain System Operational Management and Maintenance

Program Objective

The objective of the NPDES stormwater management program is to minimize the discharge of pollutants through the proper operational management and maintenance of the City's storm drain system. Targeted pollutants include:

- Sediment
- Nutrients
- Floatable Garbage

Program Overview

The City's storm drain system is operationally managed and maintained by the Operations section of the Public Works Department Surface Water and Sewers Division. Design engineering and regulatory issues are managed by the division's Capital and Regulatory sections.

The current authorized staffing level of the Operations section is approximately 70 full-time employees. Of these, there are currently 50 permanent, full-time and 9 seasonal employee(s) working directly within the operations and maintenance area, and the remainder work within the construction area. General operations and maintenance efforts include pump station and pipeline inspections, pipeline cleaning, system repairs, rehabilitation or reconstruction, inspection and operation of control structures, operation of pump stations, cleaning of water quality structures, and operational management of stormwater detention ponds.

The table below shows the base operational functions along with the corresponding staffing:

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Storm Drain System Operational Management and Maintenance

Crews	Staff/crew	Type	Tasks
4	2	Route Truck	Daily pipe line system inspections, complaint response, and resolution to minor system operational problems
6	2	Jet Truck	"As-requested" cleaning of storm system components, routine cleaning of sanitary system pipes, and "as-requested" cleaning of pump/lift stations. Hydro jet-wash technique.
2	2	TV Truck	Televise and inspect storm drain and sanitary sewer system components. Log and assess condition of televised lines to determine and prioritize rehabilitation and/or repair needs to storm drain and sanitary sewer system components.
2	2	Repair Truck	Perform medium-sized repairs, requiring minimum excavation, to storm drain and sanitary sewer system pipeline components. May assist in the repair or reconstruction of larger repair/ reconstruction jobs.
2	2	Vacuum Truck	Vacuum-cleaning of water quality structures, manholes, and catch basins within the storm drain system. Assist in sanitary sewer cleaning by vacuum removal of sludge and debris build-up. Assist in repair/ construction activities using vacuum excavation process. Assist in erosion control compliance using vacuum cleanup of eroded soils and/or cleaning of erosion control structures.
1	2	Rod Truck	Remove roots and foreign objects from sanitary sewer system. Remove large debris from storm drain pipes and free ice from frozen catch basin leads.
1	3	Pond & Pump	Operate, maintain, and repair sanitary lift station and stormwater pump stations. Operate and maintain stormwater detention basins.
1	1	Shop	Perform general maintenance and repair to specialty use vehicles and emergency response equipment. Fabricate, as needed, custom metal and wood objects for sewer and storm drain operations. Provide field deliveries of materials, tools, and equipment. Maintain material inventory and fleet management data.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Storm Drain System Operational Management and Maintenance

Previous Year Activities

Some of the noteworthy 2010 cleaning and repair statistics are summarized in the following list:

- Responded to 492 complaints of plugged or backed-up catch basins
- Responded to 56 complaints of cave-ins around catch basins and manholes
- Performed 211 minor repairs to storm drain lines, catch basins or manholes
- Completed 2 major repairs to the storm drain system
- Cleaned 3.66 miles of storm drain utilizing hydro-jet washing
- Televised and condition assessed 1.56 miles of storm drain pipe line
- Performed baseline inspection of 65,142 feet of deep stormwater drainage tunnels
- Reconstructed 593 feet of storm tunnel
- Repaired 200 feet of storm tunnel

In December 2010, the City Council approved an additional \$5.2 million for tunnel repair and construction. This work on the 10th Avenue SE tunnel will improve the condition of the structure and reduce the sandstone outside of the tunnel from eroding, which will decrease transport of solids the Mississippi River.

Performance Measures

- Miles of storm drain televised in 2010: 1.56 miles
- Miles of storm drain cleaned in 2010 utilizing hydro-jet washing: 3.66 miles

III. Structural Controls Operational Management and Maintenance

Program Objective

The objective of this NPDES MS4 stormwater management program is to minimize the discharge of pollutants through the proper operational management and maintenance of the City's storm drain system. Within the City's storm drain system are structural controls that affect system flow rates and water quality discharges.

Structural controls include:

- Grit Removal Chambers
- Outfall Structures
- Pump Stations and Level Control Weirs
- Stormwater Ponds, Stormwater Wetlands and Bio-(in)filtration (Rain Gardens)
- Catch Basins

Targeted pollutants include:

- Sediment
- Nutrients
- Floatable Garbage

Program Overview

Structural controls that are part of the City's overall storm drainage system are operationally managed and maintained by the Operations section of the Public Works Surface Water & Sewers Division. These components are routinely inspected and maintained to ensure proper operation and reliability. Frequency of inspections and assigned maintenance efforts are based on both operational experience and incurred environmental events. Structural controls are separated into five separate categories:

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Structural Controls Operational Management and Maintenance

1. Grit Removal Structures

These are devices that have been installed for sediment, debris, and oil collection. The City continues with its effort to increase the number of grit chambers installed. The devices are inspected in the spring and fall of each year, and then cleaned, if required. The amount of sediment removed, the presence of floatables, and the dates that devices were cleaned are recorded on log sheets, and then added to a database. Appendix A35 contains a list of these devices, and maintenance dates.

2. Storm Drain Outfalls

These are the structural ends of system pipelines where conveyance of stormwater runoff is discharged into receiving water bodies. Outfalls are inspected on a 5-year schedule where 20% of the outfalls are inspected each year. Site inspections evaluate the general condition of structures, determine if any significant erosion has occurred and observe any contaminant discharges. When indications of illicit or otherwise contaminated discharges are observed, they are immediately reported to Minneapolis Regulatory Services for reporting to the Minnesota Duty Officer and for further investigation and resolution. Any identified structural repair or maintenance work is prioritized and scheduled within the constraints of available personnel, budget funding, and coordination with other essential operations. Appendix A36 contains maintenance information for these devices.

3. Pumps & Weirs

These are structural devices that mechanically affect the flow of stormwater runoff through the storm drain system. Pump stations are inspected on a regular basis for routine operational checks and are inspected annually for detailed condition assessment. Maintenance and/or repairs are performed with routine items being completed as needed and larger items being coordinated into a budgeted pump station operation program. Weirs and outlet structures are inspected and repaired as needed to facilitate their proper operational working order.

4. Ponds and Bio-(in)filtration (Rain Gardens)

These are structural devices that detain stormwater runoff, and in some cases improve the water quality. They are regularly maintained for volume and functionality, and also for their park-like amenities including native plantings, turf grass, pathways, benches, and lighting. Based on current level of experience, the need for dredging of sediment buildup appears to be in a 15- to 20-year cycle. At present, only a few of the City's holding ponds are at or near this age such that the need for sediment removal from them is considerable.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Structural Controls Operational Management and Maintenance

5. Catch Basins

These are structural devices located along the City's street system that provide entrance of stormwater runoff into the storm drainage system. There is no formalized inspection schedule, however Surface Water & Sewers crews and Street maintenance crews both routinely look for plugged or damaged structures. Reported damages and/ or plugs are given a priority for repair and/or cleaning. Cleaning catch basins, while ensuring proper runoff conveyance from City streets, also removes accumulated sediments, trash, and debris. Augmenting this effort is the street sweeping program carried out by the Street maintenance section that targets the pick-up of street sands, leaves, and debris prior to their reaching catch basins. Repair of damaged catch basins is also a priority, given their location in city streets and ultimate impact to the traveling public.

Previous Year Activities

- Monitored and maintained 25 pump stations.
- Performed 186 grit chamber inspections on 120 individual structures (some were inspected more than once). Performed 136 cleanings on 96 of the structures (some were cleaned more than once, some did not need cleaning). A total of 468.25 cubic yards of material was removed from grit chambers. Another 149 cubic yards was removed from storm drains storm drain tunnels for a total of 617.25 cubic yards. The majority of the grit chambers are both maintained and owned/operated by Public Works, however some are owned and operated by others, but cleaned by Public Works under contract.
- Maintained 11 stormwater holding ponds
- Inspected 86 of 387 storm drain outfalls in 2010 inspection program. Of the 86 outfalls inspected, 3 were found to be in need of repair or maintenance. Of those, 1 of the issue was taken care of. We also did repairs to 1 outfall from the previous year's inspections, leaving 11 outfalls that are in need of repair or maintenance that we will address as soon as time and access allow.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Structural Controls Operational Management and Maintenance

Performance Measures

Structures operated and maintained annually:

- 25 pump stations
- 11 stormwater holding ponds
- 136 grit chamber cleanings

IV. Disposal of Removed Substances

Program Objective

The objective of this NPDES MS4 stormwater management program is to minimize the discharge of pollutants through the proper operational management and maintenance of the City's storm drain system. A key component is the collection and disposal of targeted pollutants in a manner that will prevent pollution and that will comply with applicable regulations. Targeted pollutants include:

- Sediment
- Nutrients
- Floatable Garbage

Program Overview

Targeted pollutants are collected from grit removal structures, catch basins, system piping, detention ponds, and deep drainage tunnels. Removed substances are screened for visual or olfactory indications of contamination. If contamination of the material is suspected, the Engineering Laboratory will select representative samples for an environmental analysis. Contaminated substances are disposed of in a landfill or another site that is approved by the Minnesota Pollution Control Agency (MPCA). Non-contaminated targeted pollutants are disposed of the same way as street sweepings, as reported in **Section VI. Roadways**. During cleaning and disposing operations, erosion control measures are applied when needed to prevent removed material from re-entering the storm drain system.

Previous Year Activities

Approximately 617 cubic yards of sediment and debris were removed from storm drain system facilities by Minneapolis Public Works crews in 2010. Minneapolis Public Works maintains the city's system and also facilities for other agencies, such as Hennepin County and the Minnesota Department of Transportation. The removed material consisted primarily of sand and vegetative matter collected from grit removal chambers. See **Section III. Structural Control Operational Management and Maintenance** for operation and maintenance details.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Disposal of Removed Substances

Work Plan

Disposal of removed substances will continue as in years past.

Performance Measures

- Quantity of materials removed: 617 cubic yards
- Surface Water & Sewers Operations responded to, and subsequently mitigated, 2 contaminated substance/ hazardous waste spills in 2010.

V. Stormwater Management for New Developments and Construction

Program Objective

The objective of this stormwater management program is to minimize the discharge of pollutants through the regulation of construction projects and new developments. Regulation includes erosion and sediment control, and approval of stormwater management including ongoing operation and maintenance commitments. Targeted pollutants include:

- Phosphorus
- TSS¹

Program Overview

Minneapolis Code of Ordinances, Title 3, Air Pollution and Environmental Protection, Chapter 52 (Erosion and Sediment Control and Drainage) and Chapter 54 (Stormwater Management), contain erosion and sediment control requirements and stormwater management instructions for new developments and other land-disturbing construction activities.

Site Plan Review

Construction activities and new development projects are reviewed through the City's site plan review process. The Minneapolis Development Review (MDR) section of the Regulatory Services Department facilitates this process where a Development Coordinator directs a preliminary, multi-disciplinary review of the submitted plans. This review provides comments that are integrated into a final plan submittal that is subsequently routed to the City's Licensing, Building Plan Review, Fire, and Community Crime Prevention units, and to the Public Works Department (Street, Traffic, Sidewalk, Water, Right of Way, and Surface Water & Sewers sections), for review of compliance issues. The Surface Water & Sewers Division reviews project plans for compliance with the Minneapolis Erosion & Sediment Control Ordinance (Minneapolis Code of Ordinances [MCO] Chapter 52), Stormwater Management Ordinance (MCO Chapter 54), and flooding and capacity issues.

¹ Total Suspended Solids

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Stormwater Management for New Developments and Construction

Erosion Control

Ordinance

In 1996 the Minneapolis City Council amended Title 3 of the Minneapolis Code of Ordinances relating to Air Pollution and Environmental Protection by adding Chapter 52, entitled *Erosion and Sediment Control for Land Disturbance Activities* (now *Erosion and Sediment Control and Drainage*). The ordinance was designed with the intent of regulating topsoil disturbances, thus limiting soil from entering the storm drain system.

Requirements

The ordinance addresses development sites, demolition projects, and other land disturbing activities. Sites disturbing more than five cubic yards, or 500 square feet, are required to have an erosion control permit. Erosion & Sedimentation Control (ESC) Permits must be acquired prior to commencement of work, and must be obtained before a building permit will be issued for the site. If there will be a disturbance of greater than 5,000 square feet, demolition and construction sites also require an approved erosion control plan before the ESC Permit can be issued.

Enforcement

Ongoing site inspections are performed by Regulatory Services inspectors. Inspectors may issue citations. Failure of the permittee to comply with the ordinance will constitute a violation (pursuant to Section 52.300). If there is a demonstrated failure to comply, the City reserves the right to terminate an ESC permit at any time. The City then has the option of proceeding with the necessary restoration of the site. This restoration would be done at the expense of the owner/permittee.

Ongoing Stormwater Management (following completion of construction projects)

Ordinance

In 1999 the Minneapolis City Council amended Title 3 of the Minneapolis Code of Ordinances (relating to Air Pollution and Environmental Protection) by adding Chapter 54, which is entitled *Stormwater Management*. The ordinance establishes requirements for permanent stormwater management for projects on sites that are greater than one acre.

Plan Review

Stormwater management plans are required for all construction projects on sites greater than 1 acre in size. These plans are reviewed through the Minneapolis Development Review (MDR) process and approved by the Minneapolis Public Works Surface Water & Sewers Division. Sites less than 1 acre are also encouraged to incorporate stormwater BMPs in their design as a means of satisfying other city codes such as green space requirements.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Stormwater Management for New Developments and Construction

Registration

Stormwater devices are registered with the City of Minneapolis Department of Regulatory Services, with an annual permit required for each stormwater device registered. An annual maintenance and inspection program is included in the permitting process.

Goals

The Minneapolis Stormwater Ordinance specifies that stormwater management standards be set according to the receiving water body. These standards include but are not limited to:

- Reductions of TSS for discharges to all receiving water bodies
- In addition to TSS, controlled rate of runoff for discharges to streams, areas prone to flooding, and areas with infrastructure limitations
- In addition to TSS, a reduction in nutrients for stormwater that discharges to lakes and wetlands
- Provision for on-site, off-site, or regional stormwater facilities
- Maximizing infiltration by minimizing the amount of impervious surface
- Employing natural drainage and vegetation

Previous Year Activities

Site Plan Review

During 2010, Minneapolis Public Works took part in the preliminary review of 145 site plans. Of those 145 site plans, 102 received final approval with the appropriate permits issued. Continued attention to erosion control plan submittals along with increased awareness in the industry provided for better compliance during site inspections.

During 2010, Minneapolis Public Works took part in reviewing the Central Corridor LRT project. Hennepin County and the University of Minnesota also took part. The parties worked closely and successfully with the project to include mitigation for pollutants in stormwater runoff. Improvements will include several several bio-filtration sites, installation of a large grit chamber, and probably most notably, re-routing of stormwater to allow elimination of seven outfalls to the Mississippi River that had been causing considerable riverbank erosion.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Stormwater Management for New Developments and Construction

Erosion Control

Increased awareness of the ordinance, improving plan submittals and a continued compliance-based inspection program resulted in a continued rise in compliance. A summary of the 2010 inspections is as follows:

- 1943 site inspections completed
- Successfully responded to all public complaints (number not tracked)
- 194 enforcement actions issued to gain site compliance
- 33 citations for non-compliance after enforcement action
- Coordinated inspections with Minnehaha Creek Watershed District (MCWD)

During 2010, Public Works Surface Water & Sewers staff continued to work with internal and county staff on erosion compliance providing site inspections for Street, Bridge, Traffic, Sewer and Water construction forces improving overall compliance.

Ongoing Stormwater Management

Redevelopment of existing sites provides an opportunity to lessen the impacts of urbanization on the Mississippi River and other Minneapolis water resources. During 2010, 138 Stormwater Best Management Practices (BMPs) were installed on sites reviewed through the Minneapolis Development Review process. BMP types included:

- Rain gardens
- Pervious pavement
- Infiltration areas
- Ponds
- Green roofs
- Underground infiltration chambers/pipe galleries
- Underground storage/detention chambers
- Proprietary filter chambers
- Vegetated swales

These BMPs will provide rate control and water quality for approximately 86 acres of land, including 62 acres of impervious area.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Stormwater Management for New Developments and Construction

Performance Measures

Current performance measures include:

1. Number of sites captured in 2010 under Stormwater Management Ordinance: 40
2. Number of erosion control inspections in 2010: 1943

VI. Roadways

Program Objective

The objective of this stormwater management program is to minimize the discharge of pollutants through the proper operation and maintenance of public streets, alleys, and municipal equipment yards.

Targeted pollutants include:

- TSS²
- BOD₅³
- COD⁴
- Phosphorus
- Chlorides

Program Overview

Street Sweeping

Minneapolis employs several street sweeping approaches in Minneapolis. Some are citywide, and some vary by area or land use. Curb-to-curb sweeping operations occur citywide every year in the spring and fall. At those times, all City streets and alleys are swept systematically, and temporary parking bans are enforced to aid with sweeping operations. Operational routines and special methods are employed to address seasonal conditions, and to optimize cleaning. Flusher trucks apply pressurized water to the streets in an effort to push sediment and debris to the gutters. Street sweepers follow behind the flusher trucks and clean the gutters. During the fall, leaves are first bunched into piles, and then the leaves are picked up before flushing and sweeping occurs. During the summer, between the spring and fall sweep events, sweepers are assigned to maintenance districts for periodic area sweeping. Downtown and other high traffic commercial areas are swept at night on a weekly basis. In addition, summer sweeping in the Chain of Lakes drainage areas has occurred since 1995 as part of the Clean

² Total Suspended Solids

³ Biochemical Oxygen Demand of wastewater during decomposition occurring over a 5-day period

⁴ Chemical Oxygen Demand

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Roadways

Water Partnership project. Two sweepers are dedicated to cleaning drainage areas around the Chain of Lakes, and one sweeper is devoted to the Minneapolis Parkway System.

The materials collected from Street Sweeping are received at two different locations, based on time of the year and nature of the material. The inorganic materials go to a construction demolition landfill site in Becker, Minnesota, to be used as daily cover. A five-year 2008 contract states that the organic materials, which are collected mostly in the fall of the year, go to Carver County Minnesota to be composted and converted to a retail mulch material that is then distributed by a company called RW Farms, LLC, Organic Technologies.

Snow and Ice Control

The Street Maintenance section applies salt and sand to City roadways every winter for snow and ice control. Efficient application of de-icing materials is sought to reduce costs, required maintenance, and environmental impact. The most obvious cost savings is realized in a reduction of the overall amount of materials used. Salt is harmful to groundwater and to most plant and tree species. Salt causes corrosive damage to bridges, reinforcement rods in concrete streets, metal structures and pipes in the street, and vehicles. Sand harms lakes and streams by disturbing the ecosystems, and in depositing pollutants that bind to sand particles in lake bottoms and streambeds. An accumulation of sand calls for more frequent cleaning of catch basins and grit chambers. In 2007, the EPA approved a Total Maximum Daily Load (TMDL) study that places limits on chlorides (salt) discharged to Shingle Creek which had been assessed as impaired for chlorides. Consequently, the City developed improved snow and ice control practices, and they are being implemented not only in the Shingle Creek drainage area but also citywide. Maintenance supervisors are trained in winter maintenance techniques through sessions that are sponsored by the Local Road Research Board (LRRB), a training partnership of Mn/DOT and the University of Minnesota. Specific topics covered include guidelines for sand and salt application rates that are based on weather conditions, application techniques, and spreader calibration. Plans for future training sessions will include those actual equipment operators. Material spreaders are calibrated annually before the winter season. Maintenance yard housekeeping practices are designed to minimize salt/sand runoff. The materials that are used are tallied on a daily basis.

Storage of De-icing Materials

Salt stockpiles are stored under cover to minimize potential groundwater contamination and runoff. Opened in Summer 2010, a new maintenance facility constructed at Hiawatha Avenue and E. 26th St. consolidated some stockpile activities. The storage shed at the 44th St. E. & Snelling Ave. maintenance yard is closed. For its permanent facilities, the new maintenance yard employs runoff

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Roadways

collection systems installed around salt and sand stockpiles. Two temporary storage locations are scheduled to be eliminated when funding is available from the sale of several city facilities.

Previous Year Activities

The 2010-2011 winter season was warmer at the start but colder at the end, with many large and minor snow events. There were 25 notable events with 91.5 inches for the season, as compared to an average of 48 inches. The most snowfall was observed in December, but significant snowfalls were also in each of the other winter months. There were eight declared snow emergencies, as compared to an average of 3.5, and there were 162 days of snow and/or temperatures below freezing. The quantities of salt and sand used in snow and ice control are tracked by recording amounts that are delivered by suppliers, and also by estimating the quantities that are on-hand on a daily basis. Street sweepings are counted by volume (truckload). These counts are converted to material weight by taking an average of a random weighting of trucks, and by then multiplying that number by the number of truckloads hauled. Leaves picked up are weighed at certified scales that are located at City facilities in Minneapolis. The statistics for last year's program are as follows:

- 13,976 tons of salt applied to roadways
- 9,503 tons of sand applied to roadways
- 19,250 tons of materials reclaimed during spring and summer street sweeping operations
- 4,930 tons of leaves collected for composting during the fall City-wide sweeping
- 22 staff members attended an eight-hour refresher for the 40-hour hazardous materials training class
- 5 Foremen and 2 Supervisors attended training on the use of salt at the annual salt symposium
- All division shift-staff attended the annual review of procedures. The review covers the recognition and response to hazardous materials or situations.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Roadways

Performance Measures

- Amount of materials recovered as a percentage of materials applied: 82%
- Amount of salt and sand applied relative to total snowfall: 257 tons/inch

VII. Flood Control

Program Objective

The objective of the Minneapolis stormwater management program is to design flood control systems that manage stormwater quantities so that the runoff does not exceed the capacity of the existing facilities while minimizing the impacts on the water quality of the receiving water body. Targeted pollutants include:

- Phosphorus
- Total Suspended Solids (TSS)

Program Overview

In July 1997, Minneapolis experienced torrential rainstorms that exceeded the capacity of the City's existing storm drain system and caused flooding throughout the City, causing physical damage to homes, businesses & vehicles. In response, Minneapolis Public Works established the Flood Mitigation Program to develop potential solutions and a plan for implementation for each of 39 areas that experienced flooding and/or property damage as a result of the 1997 storms.

The Flood Mitigation Program began in 1998 and was originally scheduled to run through 2009. However, due to the state of the City's available finances, this Program was temporarily suspended. New flooding areas continue to be identified by residents, or through continued analysis of the system. These additional project areas will be considered for future implementation. The design storm is unchanged. Storm drains are still designed to accommodate open channel flow during a 10-year, 24-hour design⁵ and provide protection to homes from the 100-year, 24-hour design event. However due to ever-increasing emphasis on water quality and Total Maximum Daily Load (TMDL) standards, flood mitigation strategies have changed. The mitigation techniques have a much different priority now. Anticipated TMDL standards require a new type of flood management project. The new type of project tries to achieve the three R's or the three **REDUCTIONS** of **VOLUME**, **LOAD** and **RATE**.

⁵ City of Minneapolis 10-year design based on 4.2" of rainfall in a 24-hour event and 100-year design based on 5.9" of rainfall in a 24-hour event.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Flood Control

With this current strategy, the designer first looks for **VOLUME REDUCTION**. This is a successful approach for responding to TMDL targets, because these volume reducing techniques do not concentrate the phosphorus or suspended solids, so there is a corresponding **LOAD REDUCTION**. Next the designer looks for **RATE REDUCTION**. This too is a successful approach for responding to TMDL targets, because the techniques slow the water down at its source, thereby reducing the initial amount of sediment that reaches the stormwater system. This is a dramatic change in design development and a departure from past strategies of enlarging pipes to drain more stormwater faster. New techniques focus on green initiatives that treat stormwater where it falls and this approach develops options that eliminate or at least minimize the need for new or larger pipes. Examples of the new **Three "R"** techniques include:

- A proposal to use street right-of-way for infiltration is a **Three "R"** project because phosphorus-laden suspended solids would be filtered by porous media and then infiltrate into the soil
- Another proposal to use street right-of-way in areas with heavy soil is a **Three "R"** project because, once again, phosphorus-laden suspended solids would be filtered by porous media to an underground reservoir that feeds tree roots for evapotranspiration
- When volume-reducing strategies are precluded by soil conditions, rate control systems such as underground storage are used

In many cases, adding catch basins or augmenting inlet capacity has the negative effect of increasing the runoff rate. New strategies would look for volume-reducing techniques upstream so the existing system would then have capacity for existing flows. Here are other strategies to help control flooding:

- Installation of backup generators for existing pump stations
- Increased inspection and maintenance of catch basin inlets and storm drains that are located within flood-sensitive areas
- Inclusion of various Best Management Practices (BMPs), including grit chambers, rain gardens, permeable pavers, etc.

Previous Year Activities

In December 2009, the city began construction on a new flood control project for Flood Area 5. This is the part of Minneapolis that drains to Crystal Lake in Robbinsdale. It is roughly bounded by Lowry

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Flood Control

Avenue N., Dowling Avenue N., Humboldt Avenue N., and Victory Memorial Drive. Overall, the Minneapolis portion of the drainage area is approximately 450 acres.

After a large event the city's stormwater conveyance system is backed up, causing water to overtop curbs, and in some cases rise to a level that allows flow to enter homes through window wells or across thresholds. The condition occurs primarily because this area is underlain by heavy clay soils that do not allow much water to soak into yards and other green spaces, but rather most of the water that falls on even the planted areas runs off into the street, due to the impermeability of the soils. The original concept for Flood Area 5 under the 1997 Flood Program was to enlarge the pipe system, so that the area could drain faster. Since that time, Crystal Lake has been classified as an impaired water, with an approved TMDL for nutrients. To drain the area faster by simply enlarging pipes would not be appropriate as it could negatively impact Crystal Lake. Therefore the City's project is using primarily underground storage, with some filtration basin (rain garden) storage, to detain the water until the system can convey it downstream. The storage is being designed to also remove pollutants, thus improving the water quality of the runoff before it is discharged to the lake.

The construction that commenced in December 2009 and finished in August 2010 was for the first phase (approximately 45 acres or 10%) of the total project, which is roughly bounded by 36th Avenue N., Dowling Avenue N., Knox Avenue N., and Penn Avenue N. The 2010 work modified some of the north-south storm drains, and added a grit chamber. The second part of this phase, scheduled to begin Summer 2011, will create the "37th Avenue Greenway" which is replacing an existing street with filtration rain gardens straddling a bike/pedestrian trail. Underneath the trail, underground storage vaults are being installed, approximately 20 feet wide and 10 feet deep, for a length of five city blocks.

The remaining mitigation for the balance of the 450 acre flood area is only tentatively scheduled at this time. It is envisioned as a continuation of the approach described above, using underground storage vaults, filtration rain gardens, grit chambers, and additional "greenway" work.

Performance Measures

While most citizens will measure success by whether there is reduced neighborhood flooding, the Flood Control work now also targets water quality. Many of the projects are intended to determine and demonstrate technology that works specifically for this City. Continuing the objectives of previous years, the goal is increased water quality of lakes, river and streams in Minneapolis. The Flood Mitigation Program Projects now focus more on treating stormwater where it falls and making **VOLUME REDUCTION** the common element of systems, because volume-reducing systems provide for reduction of TSS, nutrients, litter, and other pollutants, as well as providing some **RATE CONTROL**.

VIII. Pesticides and Fertilizer Control

Program Objective

The objective of this stormwater management program is to minimize the discharge of pollutants by controlling the application of pesticides and fertilizers. Targeted pollutants include:

- Pesticides (insecticides, herbicides, fungicides etc.)
- Nutrients (phosphorus, nitrogen etc.)

Program Overview

Integrated Pest Management (IPM) Policy and Procedures

The Minneapolis Park and Recreation Board's (MPRB) IPM policy, which is used for golf courses and general park areas, is included in the MPRB's General Operating Procedures. Specific areas where IPM is used include the Cowles Conservatory, the Minneapolis Sculpture Garden, and the major display gardens at Lyndale Park, Loring Park, and Minnehaha Falls Park. Plant Health Care/Integrated Pest Management Action Forms are filed when there are specific plant health problems for these garden areas. These forms document the specific problems and the recommended course of corrective action.

Each golf course foreman is responsible for the IPM decisions at his/her course. The golf course foremen, along with other select maintenance staff, attend the annual Minnesota Green Expo in January. There they receive updated information on the newest turf and other related research as it applies to fertilizers, pesticides, biocontrols, etc.

MPRB Staff Pesticide Applicator Licensing and Continuing Education

All recent hires for position of park keeper, Mobile Equipment Operator (MEO), gardener, golf course park keeper, and arborist are required to obtain their Minnesota Non-Commercial Pesticide Applicator license within one year of being hired. Every two years, as mandated by the Minnesota Department of Agriculture, staff attends re-certification training, offered and coordinated by the University of Minnesota. This effort is in conjunction with the Agronomy Services Division of the Minnesota Department of Agriculture.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Pesticides and Fertilizer Control

Use of Pesticides and Fertilizers on Park Lands

The MPRB manages 6,400 acres of park land in the City of Minneapolis (approximately 18% of the City's 35,244 total land acres).

Pesticide Use

Use of pesticides to control turf weeds is not a regular practice of park maintenance. Weed control pesticides may be used when a park is being renovated, or when athletic fields and surrounding areas are being sodded/seeded. It may also be used when weeds exceed 50% of the ground "turf" cover. These procedures for general grounds and athletic fields are included in the MPRB's General Operating Procedures.

The MPRB actively manages Eurasian watermilfoil and purple loosestrife, which are two non-native invasive plant species. Eurasian watermilfoil, an aquatic weed, is harvested mechanically on Lakes Harriet, Wirth, Cedar, Isles and Calhoun throughout the summer months. The MPRB has established (in its General Operating Procedures) that no chemical application will be used to control aquatic weeds. Eurasian watermilfoil harvesting is permitted through the Minnesota Department of Natural Resources, Division of Ecological Services. Coordination of control programs for Eurasian watermilfoil are determined, and supervised, by the Environmental Operations Section.

The MPRB does use biocontrols and herbicides to control certain problem invasive species in natural areas. Purple loosestrife, an invasive emergent plant in wetlands, is controlled using a leaf-feeding beetle. Purple loosestrife is the only invasive plant where a biocontrol agent has been successful at controlling the spread of the invasive species. In particular situations where the biocontrol agent is not as effective in controlling purple loosestrife, spot-spraying or hand-pulling is done by park maintenance staff. Common and glossy buckthorn are two woody invasive species controlled in woodlands through herbicide applications. Control of these species is done on a limited basis by Environmental Operations staff and by Forestry staff. Park Maintenance, Forestry and Environmental Operations staff document chemical applications made through our electronic database "PF Manager".

MPRB staff produce and maintain the necessary records of all pest management activities as required by the Minnesota Department of Agriculture. Annual records are kept by the District or Golf Course office.

Since the 1980s, golf course foremen and park maintenance staff have documented the type, amount, and locations of the chemicals that are stored at park storage facilities. These chemical inventories provide detailed information to the fire department as to how to deal with a possible fire at these sites. The plans identify how the fires are best extinguished, and how to protect surface water in

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Pesticides and Fertilizer Control

the surrounding area. The plans were put into place in the early 1980's, following a chemical company fire in north Minneapolis that resulted in the contamination of Shingle Creek.

Fertilizer Use

In September 2001, the Minneapolis City Council amended Title 3 of the Minneapolis Code of Ordinances (relating to Air Pollution and Environmental Protection) by adding Chapter 55, Lawn Fertilizer. Under the ordinance, since January 1, 2002 the use of fertilizer containing any amount of phosphorus or other compound containing phosphorus, such as phosphates, is prohibited in Minneapolis, except as allowed by Minnesota Statute 18C.60 Phosphorus Turf Fertilizer Use Restrictions. The Minnesota Statute allows the use of phosphorus turf fertilizer if:

- An approved and recent test indicates that the level of available phosphorus in the soil is insufficient
- The fertilizer is being applied to newly established turf, and only during the first growing season

The fertilizer is for use on a golf course under certain conditions specified in the Statute

Fertilization of turf on Minneapolis Park & Recreation Board Property is performed for golf courses, around athletic fields, and in areas of heavy traffic. Golf course managers and maintenance foremen are instructed that no phosphorus can be used for turf fertilization unless a current soil test has demonstrated the need for this nutrient. MPRB staff is required to complete a report for every turf fertilizer application. These records are maintained for a period of 5 years, per state law.

Previous Year Activities

Staff Pesticide Applicator Licensing and Continuing Education

Currently 179 MPRB employees hold pesticide applicator licenses, through the Minnesota Department of Agriculture (MDA).

Audubon Cooperative Sanctuary Program (ACSP) for Golf Courses

Audubon International provides comprehensive conservation and environmental education assistance, to golf course superintendents and industry professionals, through collaborative efforts with the United States Golf Association (USGA). The ACSP seeks to address environmental concerns while maximizing golf course opportunities thereby providing open space benefits. An important component of

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Pesticides and Fertilizer Control

this program is the implementation of IPM procedures, and the reduction of chemical and fertilizer use to protect water quality and provide a healthier habitat for wildlife.

Participation in the program requires that golf course staff address environmental concerns related to the potential impacts of water consumption, and chemical use on local water sources, wildlife species, and native habitats. Additionally, the program provides assistance in comprehensive environmental management, enhancement and protection of existing wildlife habitats, and recognition for those who are engaged in environmentally responsible projects.

Audubon International provides information to help golf courses with:

- Environmental Planning
- Wildlife and Habitat Management
- Water Conservation
- Water Quality Management
- Outreach and Education

By completing projects in each of the above, the golf course receives national recognition as a Certified Audubon Cooperative Sanctuary. MPRB Operations staff, working with Theodore Wirth and Meadowbrook Golf Course foremen, received the ACSP certification for both courses. MPRB staff conducts yearly water quality and aquatic vegetation monitoring at the courses.

Performance Measures

- Number of MPRB staff with pesticide applicator licenses: 179

IX. Illicit Discharges and Improper Disposal to Storm Sewer System

Program Objective

The objective of this stormwater management program is to minimize the discharge of pollutants by implementing a program to detect and mitigate illicit discharges, and to encourage that an NPDES General Industrial Stormwater Permit or other such permit be obtained for non-stormwater discharges, as well as an NPDES Industrial Stormwater Permit for non-stormwater discharges (process water or de-watering) if applicable. Targeted pollutants include:

- All pollutants

Program Overview

Hazardous Spills

Training for emergency spill procedures is coordinated among all of the following: the Operations section of the Public Works Surface Water & Sewers Division, the Street Maintenance section of the Public Works Transportation Maintenance & Repair Division, the Minneapolis Fire Department, and the Regulatory Services Department.

Typical Spill Response

Regulatory Services and Minneapolis Fire Department personnel typically serve as the first responders to an emergency spill event. The immediate goals of this response are safety, containment of the spill, recovery of hazardous materials, and collection of data for use in assessment of site impacts. Recovery efforts can take several forms, but typically fall into two broad categories:

- 1) Recovery for disposal
- 2) The use of absorbents or other media to collect hazardous waste for disposal

The life cycle of an event requires City personnel to work as a team, utilizing available resources to protect residents, the environment and property. Events are followed by a post-action debriefing to determine the cause of the event, to identify measures to improve the City's response, and to determine the means to limit future occurrences.

The protocol used by the Street Maintenance section for handling spills is documented in Appendix 32: Standard Operating Procedure for Vehicle Related Spills (VRS).

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Illicit Discharges and Improper Disposal to Storm Sewer System

Small Spills

Street Maintenance will dispatch personnel with appropriate equipment to apply sand. Once the sand has absorbed the spill, it is removed by a street sweeper. The contaminated sand is removed from the street sweeper, and then deposited in a leak-proof container.

Large or Hazardous Spills

For large or extremely hazardous spills, the small spill process is followed with the exception that additional resources are expended. The Fire Department's Hazardous Materials Response Team is mobilized in lieu of the local fire station. As the assessment of the event occurs, other City departments become involved; additionally, outside agencies and private emergency response contractors are incorporated as needed. Spills that fall within the minimum reporting requirements are reported to the Minnesota Pollution Control Agency (MPCA) Public Safety Duty Officer. For these spills, an Oil and Hazardous Materials Spill Data form must be completed within 24 hours, or by the next business day. The completed forms are used to document the type of spill, as well as the response to the spill. Emergency Preparedness is responsible for coordinating long-term recovery efforts with other regulatory agencies. Qualifying spills are also reported to the National Duty Officer as required by law.

Emergency Response Program

The Department of Regulatory Services operates a boat for use on the Mississippi River and other Minneapolis water bodies, to be able to respond to spills that could impact our valuable water resources. The presence of a properly equipped boat facilitates addressing these events on the Mississippi River as well as on City lakes. Regulatory Services and Public Works staff are trained in the river deployment of booms, have field experience in placement of both containment and absorbent types of booms, and have years of experience on the water. These skills, coupled with an extensive level of knowledge of the Mississippi River, City lakes, landings and outfalls, provide a high level of protection for our precious natural resources.

Additionally, Regulatory Services uses the boat for the placement of monitoring and sampling equipment used for tracking water quality, identifying points of illegal discharges, illegal sewer connections, infiltration from a sanitary sewers or water mains, assessment of outfalls, and investigation of complaints that are inaccessible from shore.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Illicit Discharges and Improper Disposal to Storm Sewer System

Unauthorized Discharges

Regulatory Services personnel are responsible for pollution prevention and control. Results are achieved through educational efforts, inspections, and coordinated community outreach events. These activities may include enforcement, pursuant to Chapter 48⁶ and other applicable City codes, and coordination with other regulatory agencies at the county, state and federal levels. Enforcement yields identification of the responsible party, documentation of clean-up activities, and also endeavors to reduce the flow of pollutants from illegal dumping and disposal. Response is made to reports of unauthorized discharges and illicit connections. Complaints are received from the public, City and private contractors, City staff and other government agencies, by the following means:

- [Environmental Management Complaint Form](#)
- Confidential calls to Minneapolis Information & Services. Within Minneapolis, the phone number is 311. Outside of Minneapolis, the phone number is 612-673-3000
- Reports from sewer maintenance crews, plumbing inspectors, and other City personnel
- Direct contact to Environmental Services staff at 612-673-3867

Non-Stormwater Discharges

Environmental Services reviews non-stormwater permits and renewals while working with the MPCA permitting authority to address local concerns. Environmental Services also reviews alleged violations to a permit or code. If permits are violated, or if conditions indicate that the permit should be revised, Environmental Services staff will assist MPCA permitting staff in updating or revoking the permit.

Additional control measures are implemented within the City of Minneapolis to minimize impacts on receiving waters due to the non-stormwater discharges listed below:

⁶ Minneapolis Code of Ordinances, Chapter 48 Minneapolis Watershed Management Authority.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Illicit Discharges and Improper Disposal to Storm Sewer System

a.	NPDES permitted non-stormwater discharges	Permits are reviewed and registration is required. Ordinances: Title 3, Chapter 50.
b.	Water line flushing and other discharges from a potable water distribution system	Minneapolis Department of Public Works, Water Distribution & Treatment Division implements procedures for de-chlorination prior to discharge to the storm drain system.
c.	Landscape irrigation and lawn watering	Pollutants are controlled through City ordinances: Title 11, Chapter 230 and Title 3, Chapters 48 and 55.
d.	Irrigation water	Same as above.
e.	Diverted stream flows	Regulated by state statute and adopted in the City Charter. Diversions require approval by the City and other regulatory agencies.
f.	Rising ground water	The Minneapolis Brownfield Program addresses relevant contamination issues through requirements in City Ordinance Title 3, Chapter 48.
g.	Foundation and footing drains	Contribute to I/I problems, and ultimately to Combined Sewer Overflows. Clear water connection requirements enforced by state plumbing code and through City ordinance Title 3, Chapter 56.
h.	Water from basement sump pumps	Not a significant source of pollution. Contribute to I/I problems, and potentially to Combined Sewer Overflows.
i.	Air conditioning condensation	Not a significant source of pollution.
j.	Springs	Not a significant source of pollution.
k.	Individual residential and fund-raising car washings	Not a significant source of pollution.
l.	Flows from riparian habitats and wetlands	Not a significant source of pollution.
m.	Swimming pool discharges	Regulated by City ordinances: Title 5, Chapter 111 and Title 11, Chapter 231.
n.	Flows from fire-fighting	Minneapolis Fire Department and Public Works Surface Water & Sewers Operations section cooperate to control fire-fighting flows. Emergency Preparedness gets involved if there are chemicals on site.
o.	Lawn fertilizer use, application and sale	Minneapolis Environmental Services provides education and enforcement of MCO 55 Lawn Fertilizer.

Detection and Removal Screening Program

The field screening program to detect and investigate contaminated flows in the storm drain system is an integral part of Sewer Operations and Regulatory Services daily operations. Sewer Maintenance crews routinely inspect and clean storm drain structures throughout the City. In addition,

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Illicit Discharges and Improper Disposal to Storm Sewer System

inspections of flows that generate unusual odors, stains, and deposits are included in the annual tunnel inspection, outfall inspection, and grit chamber inspection and cleaning programs. Any suspect flows are then reported to Regulatory Services inspectors for further investigation. Regulatory Services personnel also receive reports of alleged illicit discharges to the storm drain system from the public, other City departments, and various agencies. These combined efforts result in an annual screening of more than 20% of City drainage areas. The City partners with the Mississippi Watershed Management Organization to conduct a joint sampling program of the storm drainage system that drains to the Mississippi River. The intent of this partnership is to detect illegal discharges, and to establish a baseline of chemical, physical, and biological parameters. The best avenue for a continued effective screening program in the City of Minneapolis, without duplication of services, is to continue to use current practices, and to explore the development of certain aspects of the program to improve enforcement results.

Facility Inspection Program

Inspectors perform site visits of facilities that store large quantities of regulated and hazardous materials. In addition, site plan inspections yield the following information:

- Drainage patterns from the site to the nearest drain or water body
- Watershed destination and outlet location
- Handling, storage, and transfer procedures as they relate to the site

Previous Year Activities

- Addressed 91 calls for emergency response (containment of spills, chemical dumping, illegal disposal or handling of regulated or hazardous materials)
- 42 direct connections (registrations) to the storm drain (NPDES Permits)
- 220 permanent stormwater management devices at 153 sites were registered
- Investigated 589 water and land pollution complaints (illegal dumping, improper storage of material, and chemical storage)
- Inspected 21 contaminated soil complaints
- Approved installation of 6 contaminated soil and ground water remediation systems and temporary storage of contaminated soil, resulting in 23 active systems on 17 sites
- Approved 11 limited duration sanitary sewer and storm drain discharge permits
- Approved 73 storage tank permits: Above ground, 13 installed and 23 removed. Underground, 3 installed, 32 removed and 18 abandoned in place

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Illicit Discharges and Improper Disposal to Storm Sewer System

- Conducted 20 outfall sampling days on the Mississippi River

The Public Works Surface Water & Sewers Operations section also responded to x incidents of alleged illicit discharges to the storm drain system.

Performance Measures

- Resolution of all reported or discovered non-compliant activities in previous year: 955 of 1207 events
- Erosion control permit non-compliance incidents that were addressed: 194

X. Storm Sewer Design for New Construction

Program Objective

There is a continuing effort to minimize the discharge of pollutants to public waters. This section describes the current focus and outlines the design measures used to control the discharge of pollutants by controlling the volume, loading or rate of stormwater discharged.

Targeted pollutants include:

- Total Suspended Solids (TSS)
- Phosphorus
- Chloride
- Fertilizers

Program Overview

In 2010 the City of Minneapolis continued its program to reduce sanitary sewer inflow (stormwater and other clear water sources connected directly to the sanitary sewer) and infiltration (groundwater that enters the sanitary sewer usually through pipe and system defects). The program is continuing a focus that the city has had since the 1960s when the city began a 40-year residential paving program.

The principal work is elimination of known public and private stormwater inlets or rainleaders connected to the sanitary sewer. Additionally the City is using a targeted sanitary sewer flow metering program to identify other sources. The flow metering program includes follow-up smoke testing where a smoke-like vapor is blown into the sanitary sewer in order to expose openings where inflow is entering the sanitary sewer.

The City's success with reducing I & I is transferring a problem from the sanitary sewer system to the stormwater management system, because there is rarely storm sewer capacity for the inflow removed from the sanitary sewer. Management techniques are required for volume reduction or rate reduction, and the techniques vary with each project. Most projects range from the equivalent area of one lot to a 2.5-acre drainage area. By themselves, these inflow areas may not be serious problems but cumulatively, the runoff becomes significant.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Storm Sewer Design for New Construction

At this time, mitigation begins with an effort to reduce the volume of runoff. Options that reduce volume must have space within the right-of-way or must have an off-site area, with suitable soils for volume reduction in either case. Next, load reduction options are investigated, using recognized Best Management Practices (BMPs) such as prefabricated swirl-type grit chambers, bio-filtration or ponds. Space constraints in fully developed urban areas like Minneapolis limit many projects to use of compact prefabricated BMPs for load reduction.

For street renovation or reconstruction projects, whenever storm drain upgrades are required, installations of volume reduction systems are considered first, load-reducing facilities next, and finally rate reduction BMPs.

Previous Year Activities

The storm drain project areas for 2010, and associated water quality impacts, are referenced in the following table:

PROJECT AREA	PROJECT DESCRIPTION	STORMWATER RUNOFF BENEFITS
CSO Area RLD010 (16 6th Street N)	Provided a public storm sewer so that a rainleader could be disconnected	Eliminated CSO area of 0.10 acres
CSO Area 038 (Chicago Ave S, E 34th St to E 35th St)	Redirected catch basins from the sanitary sewer to the storm sewer	Eliminated CSO area of 1.26 acres
CSO Area 122 (Fillmore at RR south of 36-1/2 Av NE)	Redirected catch basins from the sanitary sewer to the storm sewer	Eliminated CSO area of 0.30 acres
CSO Area 126	Redirected catch basins from the sanitary sewer to the storm sewer	Eliminated CSO area of 2.98 acres
CSO Area RLD010 (16 6th Street N)	Redirected catch basins from the sanitary sewer to the storm sewer	Eliminated CSO area of 1.20 acres

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Storm Sewer Design for New Construction

Performance Measures

- At end of 2010, cumulative total of approximately 41 green infrastructure⁷ regional stormwater facilities⁸ on 22 sites
- At end of 2010, cumulative total of approximately 155 pre-treatment grit chambers
- At end of 2010, progress continued toward GIS system that will (among many other benefits) allow calculations of watershed acres in the City of Minneapolis that are receiving water quality treatment

⁷ "Green infrastructure" refers generally to stormwater ponds, stormwater wetlands, major bioretention facilities ("rain gardens"), mini-reservoirs for underground detention with water quality treatment, and the like. Not included in this figure are three major dry basins that were built for flood control. Although not designed for volume control or water quality, they do provide some infiltration..

⁸ "Regional stormwater facilities" refers to treatment of runoff from multiple areas including some portions of right-of-way

XI. Public Education

Program Objective

The objective of this stormwater management program is to educate the public regarding point and non-point source stormwater pollution. Targeted pollutants include:

- All pollutants

Program Overview

In addition to work done by watershed organizations and other entities, the City of Minneapolis and the Minneapolis Park & Recreation Board (MPRB) implement their Public Education Program to promote, publicize, and facilitate the proper management of stormwater discharges to the storm sewer system. The program's focus is to educate Minneapolis residents, business owners, employees and visitors about stormwater. The program's goals include showing how *everyone's* actions affect the quality of our lakes, wetlands, streams and the Mississippi River, and how to control pollutants at the sources to reduce the discharge of pollutants to our receiving waters. The desired result is to change behavior in ways that will improve water quality. Many of the components of the program can be found on the City of Minneapolis Stormwater web site: <http://www.ci.minneapolis.mn.us/stormwater/>.

Previous Year Activities

Metro Blooms Rain Garden Workshop Program

A. Ongoing Program: In 2010, the City and others again sponsored a multi-part stormwater education workshop program conducted by Metro Blooms, a non-profit organization that grew out of the City's Committee on the Urban Environment (CUE). The goals of the workshop program are to reduce stormwater runoff, prevent stormwater pollution that damages our watersheds and improve the environmental and visual quality of the urban landscape. The two-part workshops serve to inform, coach and offer consultation to Minneapolis residents protecting the upper Mississippi River watershed by installing properly designed bio-infiltration areas (rain gardens), redirecting downspouts and using native plants. The **Part A** workshop focuses on watershed education, various types of rain garden design, and native plant choices. Attendees can then attend a **Part B** workshop, which offers practical, hands-on design sessions where participants bring pictures, measurements and sketches of their sites and receive

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Public Education

plant and one-on-one design advice. One of the means of publicizing the workshops is a utility bill insert that reaches most of the approximately 100,000 households in Minneapolis. In 2010, 8 **Part A** and 6 **Part B** workshops were held within Minneapolis, attended by a total of 432 Minneapolis residents.

B. Powderhorn Lake “Neighborhood of Rain Gardens” Project: 2010 was the second year of a three-year project being carried out by Metro Blooms, in partnership with the City of Minneapolis, Minneapolis Park and Recreation Board, and the Minnehaha Creek Watershed District, and funded primarily by a grant from the Environment and Natural Resources Trust Fund of the Minnesota Legislative-Citizen Commission on Minnesota’s Resources (LCCMR). The project is to (a) work with residents in one of the subwatersheds that drains to Powderhorn Lake to install up to 150 residential rain gardens, and (b) before, during and after installation of the rain gardens, monitor both the quantity and quality of water being conveyed from the subwatershed to the lake through storm pipes, in order to study the impact of the project on water quality in Powderhorn Lake. The monitoring data from the “test” subwatershed will be compared with monitoring data from a “control” subwatershed (one without the rain garden initiative) of similar size and land use characteristics.

Minneapolis Park & Recreation Board Education Activities and Events

In 2010 Minneapolis Park & Recreation Board (MPRB) staff provided water quality education programs throughout the City. Environmental Operations naturalist staff participated in 62 Minneapolis community festivals,, neighborhood events⁹, and concerts at Lake Harriet, Father Hennepin Park (along the Mississippi River) and Minnehaha Park. Hands-on water quality educational displays focused on neighborhood watersheds and how human activities impact local water bodies. Printed materials, bookmarks, and water bottles with educational messages were distributed to adults and children.

To give people of all ages a better understanding of how stormwater negatively impacts local waterbodies, MPRB staff led guided canoe trips on local lakes and ponds. The MPRB provided canoes, paddles, lifejackets, and paddling instruction. Water quality education programs using canoes were held at 9 lakes¹⁰ in Minneapolis a total of 53 times. Participants paddled by stormwater outfalls and observed alluvial fans, floating debris, and adjacent erosion. Participants were also able to use secchi disks to determine lake and pond clarity. Depending on the location of the waterbody, some participants were also able to view Best Management Practices (BMPs) including stormwater holding ponds, grit chambers

⁹ Neighborhood event sites (several sites had multiple events): Parks: Armatage, Audubon, Beltrami, Bottineau, Bryant Square, Corcoran, Creekview, Diamond Lake/Pearl, Dowling School, Farview, Folwell, Harrison, Kenny, King, Lake Harriet, Lake Hiawatha, Lake of the Isles, Linden Hills, Loring, McRae, Minnehaha, Lake Nokomis, Northeast, Pershing, Powderhorn, Sibley, Van Cleve, and Victory Memorial Parkway

and vegetated swales. Direct observation of how Minneapolis residents' actions and inactions impact our lakes and ponds was very motivating for participants. Providing paddling experiences at neighborhood parks with smaller water bodies such as Powderhorn Lake and Webber Pond continued to attract a high percentage of minority participants.

Canines for Clean Water

More than 100,000 dogs reside in the City of Minneapolis and **each day** they generate an estimated 41,000 pounds of solid waste. This new water quality education program targeting dog owners was piloted in 2009.

Canines for Clean Water combined recreational activities with education to change the actions of dog owners to improve water quality. The project goals were to inform dog owners about the impacts that improperly disposed pet waste has on water bodies and on the people who swim, sail, and fish; and then to change the behavior of dog owners so they always pick up after their pooch. *Canines for Clean Water* offered a five-part series of dog-themed movies at Minneapolis parks including Father Hennepin Park (along the river), McRae and Luxton Parks. Dog owners and their pets were invited to attend and to commit to the "clean water pledge" – dog owners signed the pledge form and dogs left a paw print. The movie at McRae was part of a larger dog themed annual event, Paws in the Park.

A ripple effect of the 2009 Canines for Clean Water movie series and pledge form was the development of educational posters featuring dogs. Dog owners were asked to submit their top ten reasons for picking up after their dog. The over-riding theme was that "stepping in dog doo really stinks". This became the tag line for a series of posters. The message along the bottom states that dog poop contains millions of e.coli bacteria which directly affects water quality of lakes, creeks and the river when not disposed of properly.

The featured dogs are owned by the humans who submitted the best answers. The posters were printed in 2010 and distributed throughout the Minneapolis park system and at pet clinics and retail stores. A number of volunteers participated in the initiative.



¹⁰ **Canoe sites (multiple programs at all sites):** Diamond Lake, Lake Calhoun , Lake Harriet, Lake Hiawatha, Lake Nokomis, Lake of the Isles, Powderhorn Lake, Webber Pond, Wirth Lake.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Public Education

Teen Teamworks & the Mississippi River Green Team

MPRB Environmental Operations staff provided water quality education to all site supervisors of the Teen Teamworks summer youth employment program. The site supervisors were charged with sharing the information with their youth crews. Throughout the summer these 27 crews were responsible for removing debris from storm drains along the park perimeters. At park sites with a water amenity the crews also cleaned up around storm water outlets.

This was the third year of a youth employment program to involve teens in more intensive environmental work projects. Two crews of 10 youth known as the Mississippi River Green Team each spent the summer doing conservation and restoration work at Powderhorn Park, Heritage Park, North Mississippi Park, and Hennepin Island. The crews also worked at several stormwater holding ponds owned by the City of Minneapolis. The crews removed invasive species and planted native species that are required to support monarch butterflies and other native pollinators.

The Mississippi River Green Team continued to work with the City of Minneapolis and MetroBlooms to help improve water quality in the pond at Powderhorn Park. In June the youth crews learned about watersheds, stormwater runoff, and how rain gardens can help improve water quality. The crews then worked alongside a Minnesota Conservation Corps crew to install rain gardens at more than 100 homes within a subwatershed of Powderhorn Pond. Water quality staff from the Park Board are monitoring the stormwater outlet and pond for any changes.

The Mississippi River Green Team education days focused on gaining new skills and knowledge related to the environment. Teens learned about erosion and then planted bulrushes along the shoreline and island of Powderhorn Park, learned to use Newcomb's guide to key out native and invasive plant species, gained knowledge about watersheds and the Mississippi River, learned how aquatic insects are indicator of water quality, paddled the Mississippi River in voyageur canoes with Wilderness Inquiry and the National Park Service, and were active participants in President Obama's America's Great Outdoors Youth Listening Session.

The Mississippi River Green Team youth crews are made possible through the collaborative efforts of the Minneapolis Park and Recreation Board, the Mississippi Water Management Organization, and the Minneapolis Employment and Training Program.

Earth Day Watershed Clean-Up Event

Earth Day is a collaborative effort between the City of Minneapolis and the Minneapolis Park & Recreation Board. The 2010 Minneapolis Earth Day Watershed Clean Up was held Saturday April 17, at 38 locations throughout Minneapolis. More than 3,000 volunteers participated. Volunteers removed more than 15,000 pounds of trash during the two and a half hour event, compared to 30,000lbs in 2009.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Public Education

Staff surmises that because of an early snow melt in 2010, park maintenance staff had several weeks to pick up debris and trash prior to Earth Day. This resulted in fewer pounds being picked up by volunteers.

Multi-Cultural Watershed Education Video

Minneapolis Public Works partnered with the Mississippi Watershed Management Organization (MWMO) to create an educational water quality Digital Video (DVD) called ***The Nature of Water***. The DVD uses a spoken language approach, educating people about watersheds and water quality, and includes bonus features about drinking water and rain gardens. It includes five languages, with subtitles in English and Hmong, and audio tracks in Hmong, Vietnamese, Lao, Khmer (Cambodian) and English. The DVD was created in a way that will allow the content to be modified for use in other cultural communities such the Latino or African immigrant communities at a later date. The production for this DVD was completed late in 2009, followed in 2010 by duplication and distribution. Approximately 1,500 copies were distributed.

Storm Drain Inlet Stenciling

Stenciling of storm drain inlets, also called catch basins, educates the people painting stormwater messages on the storm drains, and also shares an environmentally friendly message for people passing by. A great team building exercise, it allows volunteer organizations to educate people about simple steps they can take to help improve the quality of Minnesota's lakes, rivers and streams.

In 2010, the City continued the program, maintain four self-contained stenciling kits, each containing everything needed to stencil storm drains: stencils, map with catch basin locations, stenciling paint, traffic cones, facemasks, a broom for prepping the site, gloves and trash bags, safety vests and glasses, and door hangers to explain the stenciling to nearby residents. By providing educational stormwater door hangers to distribute to residents, dialogue is encouraged between the stencilers and people who live nearby.

The stencils vary by the type of receiving waterbody, thus referring to "Mississippi River", "lake", or "creek" as the case may be. The City has three versions of the "Mississippi River" stencils: in English, Spanish and Somali languages. The "lake" and "creek" stencils are only in English.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

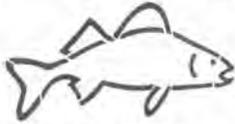
Public Education

PLEASE DON'T POLLUTE



DRAINS TO
MISSISSIPPI RIVER

**POR FAVOR, NO CONTAMINE!
EL AGUA DEL ALCANTARILLADO PLUVIAL**



**VA A PARAR
EN EL RIO MISSISSIPPI**

HA WASAKHEYN HALKAAN!



WAXAY KU SHUBTAA WEBIGA MISSISSIPPI

Safety is important, so we include traffic cones, and suggest to groups that they stencil on low volume streets to provide a safe environment. If children are part of the group, we request at least one adult be present to supervise. Trash bags and gloves are provided to pick up trash in the areas around the storm drain inlets, especially on the upstream side. Efforts of the organizations doing the stenciling are tracked, including the locations of the stenciled catch basins, the number of volunteers, and the number of door hangers distributed. In 2010, the City furnished the kits for 6 stenciling events, with 74 participants painting approximately 657 catch basins.

Web sites

STORM & SURFACE WATER MANAGEMENT – The City provides the following primary web site for information about Storm and Surface Water Management:

<http://www.ci.minneapolis.mn.us/stormwater/>

2010 statistics for the above web location (multiple pages and topics are included):

Total visits:	44,683
Number of pages:	405
Percentage of visitors who visited more than once:	51%
Average time per web page:	1:07

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Public Education

ENVIRONMENTAL MANAGEMENT – The Department of Regulatory Services maintains the following web site for additional information about the its initiatives and programs:

<http://www.ci.minneapolis.mn.us/environment>

ANNUAL NPDES REPORT – The City and MPRB work with local watershed organizations, internal agencies, and other government agencies to partner with these organizations as a requirement of the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit. The current and prior annual reports that can be reviewed at the following web site provide education to interested parties about the City's authorization to discharge stormwater via its NPDES MS4 Permit: <http://www.ci.minneapolis.mn.us/stormwater/NPDESAnnualReportDocuments.asp>

LOCAL SURFACE WATER MANAGEMENT PLAN – The City's comprehensive approach can be reviewed at the following web site: <http://www.ci.minneapolis.mn.us/stormwater/local-surface.asp>

REGULATORY CONTROLS OF SURFACE WATER MANAGEMENT – The City of Minneapolis provides information regarding pesticides, fertilizers, illicit discharges, improper disposal and other water quality issues via the following City web site: <http://www.ci.minneapolis.mn.us/stormwater/regulatory-controls.asp>

STORMWATER MONITORING PROGRAM – The MPRB provides the following web site to educate interested parties regarding their Stormwater Monitoring Program:

<http://www.minneapolisparcs.org/default.asp?PageID=833>

FLOOD CONTROL INFORMATION – The City web site provides educational information regarding flood control. For information on flooding and safety precautions, the following web site can be viewed by interested parties: <http://www.ci.minneapolis.mn.us/stormwater/flood-information/index.asp>

COMBINED SEWER OVERFLOW (CSO) PROGRAM – The City maintains a web site to educate Minneapolis residents and property owners about the City's CSO program to eliminate Combined Sewer Overflows: <http://www.ci.minneapolis.mn.us/cso/>

STORMWATER UTILITY FEE and BEST MANAGEMENT PRACTICES (BMPs) – As a component of the City's Stormwater Utility Fee, the City web site encourages the implementation of various Best Management Practices (BMPs) such as rain gardens, rain swales and pervious pavement that would reduce the overall amount of impervious surface area throughout the City. These practices would also filter and cleanse stormwater. The City also maintains a link to the following Metropolitan Council and MPCA BMP web sites, where numerous BMP suggestions are available for small scale implementation:

Urban Small Sites Best Management Practice Manual:

<http://www.metrocouncil.org/environment/watershed/bmp/manual.htm>

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Public Education

Minnesota Stormwater Manual:

<http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/stormwater-management/minnesota-s-stormwater-manual.html>

PUBLIC EDUCATION & OUTREACH – Additional information about how the City and MPRB advance stormwater education activities can be found at the following web sites:

City of Minneapolis – <http://www.ci.minneapolis.mn.us/stormwater/outreach.asp>

Minneapolis Park & Recreation Board – <http://www.minneapolisparcs.org/home.asp>

Erosion and Sediment Control Education for Contractors and Developers

During Minneapolis Development Review and the Site Plan Review processes, and during on-site inspections, Public Works and Regulatory Services personnel provided Erosion and Sediment Control (ESC) education and guidance to contractors and developers. This education included information regarding the City's ordinances, and local, state and federal regulations.

XII. Public Participation Process

Program Objective

The objective of this stormwater management program is to maximize the effectiveness of the City's NPDES program by seeking input from the public. Targeted pollutants include:

- All pollutants

Program Overview

The City of Minneapolis and the MPRB are the joint holders of the NPDES MS4 Permit, and the Annual Report is a coordinated effort by various City departments and the MPRB. The Permit requires an opportunity for public input in the development of the priorities and programs necessary for compliance. The MPCA re-issued Municipal Separate Storm Sewer System (MS4) NPDES Permit No. MN0061018 to the City of Minneapolis and the MPRB as co-permittees in January 2011. The Permit requires the implementation of approved stormwater management activities, referred to as Best Management Practices (BMPs). A new Stormwater Management Program (SWMP), documenting the BMPs the City and the MPRB have or will put in place for the re-issued 2011 permit, is being submitted to the MPCA for public comment and approval at the same time as submission of this Annual Report. This 2010 Annual Report is prepared in compliance with the previous version of Permit No. MN0061018, issued in December, 2000. Information in the Annual Report provides documentation and analysis of the activities conducted in the previous year. Typically the Annual Report is due in June of each year, however the due date was changed for 2011, to September 28, because of the additional preparation of the SWMP in accordance with the re-issued permit.

Each year, the City holds a public hearing at a meeting of the Transportation & Public Works Committee of the City Council. The hearing provides an opportunity for public testimony regarding the Program and Annual Report prior to report submittal to the Minnesota Pollution Control Agency. The hearing is officially noticed in the Finance and Commerce publication, and also publicized through public service announcements on the City cable television channel. This year's public hearing date was September 13, 2011 at 9:30 AM in Council Chambers, Room 317 City Hall, 350 S 5th Street, Minneapolis, MN.

A notice of the availability of the draft Report for review and public comment was sent to all 81 Minneapolis neighborhood organizations, to the governmental entities that have jurisdiction over activities

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Public Participation Process

relating to stormwater management, and to other interested parties. The notice was sent by e-mail on August 19, 2011, announcing the web site link to the draft Report, and informing that written comments [are being] accepted until September 15, 2011 for the SWMP and until September 21, 2011 for the Annual Report, or in person at the public hearing on September 13.

The notice explained that emails or faxes were the preferred methods for submitting written comments, rather than conventional mail due to the additional time involved. The contact information for written comments was listed as:

City of Minneapolis, Department of Public Works
Surface Water & Sewers Division c/o Lois Eberhart
NPDES MS4 REPORT COMMENTS
300 City of Lakes Building, 309 2nd Avenue S, Room 300
Minneapolis MN 55401-2268
Phone: 612-673-3260 Fax: 612-673-2048
E-mail: lois.eberhart@minneapolismn.gov

The draft Annual Report is made available for viewing or downloading from the City's [Storm and Surface Water Management web site](#) prior to finalization. Once finalized, the Annual Report is also made available on the web site for viewing or downloading. The City Clerk's office also keeps copies of the Annual Report on hand for examination by the public, prior to the public hearing date and for a period thereafter.

All testimony presented at the public hearing, and all written comments received, are recorded and given due consideration. A response to those public comments is then included with the Annual Report as Appendix C. A copy of the council resolution adopting the Stormwater Management Program and Annual Report Activities is included each year with the submission to the Minnesota Pollution Control Agency

Performance Measures

- Number of interested parties that were directly notified of public hearing and Annual Report availability: 97 (includes 81 neighborhood organizations)

XIII. Coordination with Other Governmental Entities

Program Objective

The objective of this Stormwater Management Program is to maximize stormwater management efforts through coordination and partnerships with other governmental entities.

Program Overview

Coordination and partnerships of the City and the MPRB with other governmental entities include the four watershed organizations in Minneapolis: Bassett Creek Water Management Commission, Mississippi Watershed Management Organization, Minnehaha Creek Watershed District, and Shingle Creek Watershed Management Commission. Coordination activities and partnerships with other governmental entities also include MnDOT, MPCA, neighboring cities, the Metropolitan Council and various other entities.

The coordination and partnership activities can include the joint review of projects, joint studies, joint water quality projects, stormwater monitoring, water quality education, and investigation or enforcement activities.

Coordination with the Bassett Creek Water Management Commission (BCWMC)

The BCWMC approved its Second Generation Watershed Management Plan in September 2004, and plans to commence its Third Generation planning efforts in 2011. Under the current plan, required are stormwater management, erosion control practices and floodplain management for redevelopment projects that are greater than 5 acres. Minneapolis provides yearly financial contributions to the BCWMC annual operations budget. The City and the MPRB are also stakeholders with other BCWMC joint power cities in development of several Total Maximum Daily Load (TMDL) studies and implementation plans.

Coordination with the Mississippi Watershed Management Organization (MWMO)

The MWMO adopted its Second Generation Watershed Management Plan in June 2000, and was near finalization of its Third Generation Plan at the end of 2010. The City and MPRB participated in its planning committees. The MWMO delegates stormwater management requirements for new developments to its member cities and does not provide separate project review and approval. The MWMO receives revenue through direct taxation against properties within its jurisdiction..

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Coordination with Other Governmental Entities

Coordination with the Minnehaha Creek Watershed District (MCWD)

The MCWD adopted its Third Generation Plan in 2006. The District administers state mandated wetland protection rules and Department of Natural Resources regulations, as well as District rules relating to erosion control (land disturbance of 5,000 square feet or greater), floodplain alteration, wetland protection, dredging, shoreline & stream bank improvements, stream and lake crossings and stormwater management. The MCWD receives revenue through direct taxation against properties within its jurisdiction. The City of Minneapolis and the MPRB are stakeholders in development of TMDL studies and implementation plans, in collaboration with the MCWD and other stakeholders.

Coordination with the Shingle Creek Watershed Management Commission (SCWMC)

The SCWMC adopted its Second Generation Watershed Management Plan in August 2004, and plans to commence its Third Generation planning efforts in 2011. SCWMC reviews plans of any land development adjacent to or within a lake, wetland, or a natural waterway, within the 100-year floodplain, 15 acres or larger (for single-family detached housing use) and 5 acres or larger for all other land uses. SCWMC requires these developments to provide erosion protection during construction, in addition to on-site detention and treatment. Developments also have the option of demonstrating that adequate detention and treatment is available via a regional facility. Minneapolis provides yearly financial contributions to the SCWMC annual operations budget. The City of Minneapolis and the MPRB are stakeholders with other SCWMC joint power cities in development of TMDL studies and implementation plans.

Coordination with the Minnesota Department of Transportation

The City of Minneapolis coordinates with the Minnesota Department of Transportation (MnDOT) in the following ways:

- Erosion control review, inspections, and enforcement
- Plan review of storm and water quality improvements associated with road projects
- Roadway and storm drain maintenance agreements (including deep storm tunnels)

Coordination with the Metropolitan Council Environmental Services

The City of Minneapolis coordinates with Metropolitan Council Environmental Services (MCES) in the following ways:

- Review of non-stormwater permit applications
- Inspection of existing infrastructure and regulators
- Joint permittees for Combined Sewer Overflow (CSO)

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Coordination with Other Governmental Entities

Previous Year Activities

Ongoing Coordination Efforts

The Minneapolis Park and Recreation Board (MPRB) and the City of Minneapolis coordinate stormwater management efforts, and coordinate with the watershed management organizations, the watershed district, and other governmental agencies on a number of water quality projects. Minneapolis Public Works maintains communications with all watershed management organizations and the watershed district within the City boundaries. Interactions take several forms to facilitate communication and provide support:

- Attend selected local board and special issues meetings
- Attend selected education and public outreach committee meetings
- Take part in Technical Advisory Committee (TAC) meetings
- Inform the organizations of upcoming City capital projects in an effort to identify projects that may benefit from partnerships
- Provide developers (who submit projects for site plan review) with information and contacts to meet watershed requirements
- Share information and data regarding storm drainage system infrastructure, watershed characteristics, flooding problems, modeling data, etc.

The Environmental Services Division of the Minneapolis Regulatory Services Department coordinates with the MPCA and the MCES regarding investigations and enforcement for incidents of illegal dumping or illicit discharges to the storm drain system.

The MPRB coordinates with the watershed organizations and the MCES on watershed outlet monitoring. The MPRB and the City coordinate and partner with the watershed organizations on capital projects and water quality programs. The MPRB also works with the DNR and surrounding suburbs on various capital projects and programs. The City and the MPRB coordinate with the MPCA, the watershed organizations and stakeholders for Total Maximum Daily Load (TMDL) studies and implementation plans.

Current Capital Project and Program Partnerships

Bassett Creek Water Management Commission (BCWMC)

Wirth Lake is impaired for phosphorus and a TMDL Study is underway. Wirth Lake is located in the City of Golden Valley, but owned by the MPRB. Stakeholders include the MPRB, the Cities of Golden Valley and Minneapolis, MnDOT, Hennepin County and the BCWMC. The TMDL study includes a public

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Coordination with Other Governmental Entities

outreach component. Within the BCWMC 10-year capital improvement program , there are identified Wirth Lake improvement projects with recommendations for implementation. The Capital Improvement Program (CIP) is funded through an *ad valorem* tax.

Shingle Creek Watershed Management Commission

TMDL studies for chloride impairment of Shingle Creek, nutrient impairment of Ryan Lake, and nutrient impairment for Crystal Lake, have been completed and approved by the MPCA and the EPA. A second TMDL study for Shingle Creek, for biota and dissolved oxygen, is underway. Minneapolis is partnering with the WMO and the other joint powers cities on these watershed-based initiatives.

Mississippi Watershed Management Organization

A TMDL study is underway for bacteria impairment of a portion of the Mississippi River. Additionally, a TMDL study is underway for turbidity impairment of the Mississippi River downstream of the junction with the Minnesota River (South Metro), and a TMDL study is underway for nutrient impairment of Lake Pepin, which is a portion of the Mississippi River. The geographic area for all of these studies is considerably larger than either the City of Minneapolis or the Mississippi Watershed Management Organization (MWMO). The City and the MPRB are engaged with the MWMO as well as numerous other stakeholders on both of these TMDL studies.

Minnehaha Creek Watershed District

The City and the MPRB were engaged with the MCWD and other stakeholders for a TMDL study that included Lake Nokomis in Minneapolis and has been submitted to the EPA for approval. The City and MPRB are engaged with the MCWD and other stakeholders for another TMDL study that includes Minnehaha Creek and one lake in Minneapolis: Lake Hiawatha.

XIV. Stormwater Monitoring - Results and Data Analysis

Stormwater Runoff Monitoring Results¹¹

Storm event samples were collected from May through November. One snowmelt grab sample was collected from each site, three sites in February and one site in March. The target frequency for sample collection was once a month. If a sample was not taken one month more than one sample was taken the next month to catch up. The required number of samples was met or exceeded for the year. The total volume sampled at each site, and the total recorded volume is given in **Table 23B of Appendix A** along with the percentage sampled per season. For detailed information on sampling events see **Table 23C of Appendix A**. The parameters listed in the Limits and Monitoring Requirements section of the permit were monitored and analyzed for the samples collected. Bacteria grab samples were taken throughout the season using standard protocols.

Sampled data for 2010 were similar to typical urban stormwater data (**Tables 23H and 23I of Appendix A**, respectively). **Table 23H** shows median values for residential sampled sites. Results were similar or less than reported NURP values with the exception of TP and TKN values. Most MPRB land use category values collectively were similar to NURP values. All metals monitored were well below NURP levels.

Most 2010 parameters were similar to MPRB 2001-2009 data. Exceptions in 2010 where the data were higher than previous years were the residential TSS and metals, and composite land use Cu and Zn. In 2010 all three land use categories saw a decrease in median TP, TKN and cBOD concentrations. Note that the sites monitored between 2005-2010 are located in different watersheds and have similar but not identical land uses to those monitored from 2001-2004.

Data from MPRB Sites 1–5a (2001–2004) and 6–9 (2005–2009) were generally similar to Sites 6–9 in 2010. All measured parameters decreased or were roughly equal or lower in 2010. All mean parameter concentrations decreased in 2010.

¹¹For tables referenced in this section, see Appendix A4 of this report. This section, as well as Appendix A4, are adapted from the 2010 Water Resources Report, which is produced by the Minneapolis Park & Recreation Board. These annual reports can be found at this [Minneapolis Park & Recreation website](#).

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Stormwater Monitoring – Results and Data Analysis

Best Management Practices Monitoring Results¹²

Best management practices (BMPs) include procedures and structures designed to help reduce pollutants in stormwater runoff. In 2010 the MPRB monitored two of the City of Minneapolis' stormwater ponds located at Heritage Park in north Minneapolis. Heritage Park is a 140 acre large redevelopment project which was formerly public housing and a public park. It is now a mix of public and private housing, a public park and an innovative collection of stormwater treatment systems designed to create high quality ponds as a neighborhood amenity.

The treatment-train approach using grit chambers, trench forebays or sedimentation ponds, infiltration or filtration galleries, and stormwater ponds was designed for hydraulic mitigation purposes, to help reduce pollutants discharged to the Mississippi River and to create high quality amenities in an amenity-poor area of the City. Level spreaders and flow splitters are engaged to distribute flows. The stormwater ponds which are located north of the intersection of Olson Memorial Highway and Van White Memorial Boulevard are referred to as Heritage Park Pond and to the south as Heritage Commons Pond. Following construction Heritage Park Pond outlet auto-monitoring dates were 7/30/07–11/7/07, 5/8/08–9/1/08, 5/18/09–11/13/09, and 5/20/10–11/17/10. Heritage Park Pond outlet samples were collected by flow weighted auto-monitoring. Heritage Commons outlet auto-monitoring was performed from 6/3/08 – 8/5/08, 9/7/08 – 9/27/08, and 5/19/09–11/17/09, and 4/27/10–11/17/10. The brief break was caused by equipment failure.

In 2007-2010 44 storm events were sampled at the Heritage Park Pond outlet.

In 2007-2010 at Heritage Commons Pond, 42 storm events were sampled, at the Heritage Commons Pond north outlet.

These data will be used to assess and give an indication of the baseline efficacy of the Heritage Park and Heritage Common BMPs and will be compared to data collected in later years. The dates and lab results are presented in **Table 24A of Appendix A**. Statistics were calculated and are presented in **Table 24B of Appendix A**. Lab values reported below detection were divided in half for statistical calculations. Mean outlet values in **Table 24B** show the results for many water quality parameters. The fact that these data were collected with construction ongoing should be interpreted as a baseline of these “disturbed” systems and not as how these systems will ultimately work.

At Heritage Park Pond outlet the mean TP, TDP, Pb, and Zn appears to be increasing over time. The mean TSS and TDS appear to be decreasing over time. This system was significantly changed with

¹² For tables referenced in this section, see Appendix A5. This section, along with Appendix A5, are adapted from the 2007 Water Resources Report, which is produced by the Minneapolis Park & Recreation Board. These annual reports

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Stormwater Monitoring – Results and Data Analysis

the removal of the weir 9/3/08 so the data must be interpreted cautiously. These data could indicate that the system is functioning to remove solids (TSS) but some of the solids fraction are possibly being digested in the pond and later released (e.g., TDP).

At Heritage Commons north outlet the mean TP, NH₃, and cBOD and appear to be decreasing over time. The TDP, NO₂NO₃, Cl, TSS, TDS, and Pb appear to be holding reasonably steady. This may be the result of the pond/wetland system having time to chemically and biologically stabilize or may simply be due to the variable nature of stormwater.

Complete inlet data are not available from either Heritage Park or Heritage Commons to perform a mass balance comparison and make definitive conclusions as to the pond/wetland systems effectiveness.

Both Heritage Commons and Heritage Park systems had some functionality issues. Some of the infiltration basins/trench forebays at Heritage Park appear to be silting in. The design engineer was made aware of these issues and is investigating and initiating repairs. Sediment also appears to be circumventing upstream treatment where silt is being deposited in front of the level spreaders.

In comparing the 2007-2010 data sets Heritage Commons north outlet had higher median values for TP, TDP, TKN NH₃, Cl, Sp. Cond, and TDS. The Heritage Park outlet had higher median values for NO₂NO₃, TSS, VSS, Cu, Pb and Zn. It is unknown why Heritage Commons outlet had higher values for many parameters since it is a much smaller watershed. The higher NH₃ and Cl values may be the result of large goose and seagull populations defecating in the final ponds.

It is difficult to draw solid conclusions from this limited data set which included grab samples, limited inlet data and a dynamic system under construction. Further comprehensive study will be needed to explore and answer some of the questions raised.

Other Monitoring

The monitoring site at Minnehaha Creek at Xerxes Avenue South was added in 2009. Xerxes Avenue South crosses Minnehaha Creek at the border of Minneapolis and Edina. The station should allow Minneapolis to determine what is coming into the City from the upstream areas and help determine the impact of Minneapolis's stormwater on Minnehaha Creek.

The watershed discharge at Xerxes and Minnehaha Creek results from 3 sources. The initial runoff source is from the immediate watershed. The second runoff source is the watershed between the station and Lake Minnetonka. The third runoff source is baseflow when the dam discharges at Gray's

can be found at this [Minneapolis Park & Recreation website](#).

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Stormwater Monitoring – Results and Data Analysis

Bay into Minnehaha Creek. The third source is intermittent because the outlet to Lake Minnetonka (at Gray's Bay) is adjustable so discharge rates vary.

2009 was the first year of comprehensive monitoring at the Xerxes Minnehaha Creek station. It will take a few years to develop an accurate rating curve over a variety of stage events. The difficult events to acquire in any rating curve are the rare larger events. The average 2010 stage was about two feet, but in early August and late September the creek reached a stage of over three feet. Unlike 2009, the creek bed never went dry in 2010.

The field equipment instrumentation was an ISCO 4150 datalogger, 3700 sampler and low profile A/V (area velocity) probe. The sampler was flow paced and the level feature of an A/V probe was used to obtain stage at the Xerxes station. Initially discharge was calculated with a weir discharge equation, approximating the relatively flat stream bottom, and the Xerxes bridge vertical cement wall restrictions, approximating as a broad crested weir with end contractions. When enough stage discharge readings were developed by stream gauging a datalogger look up table was used as the rating curve. It will take a few years to develop an accurate stage discharge rating curve at this site.

In 2010 one snowmelt event and five storms of varying intensity (minimum 0.18 in, maximum 2.32 in storm) were captured throughout the sampling season. The events were triggered on both stage and volume.

The Baseflow samples often had much lower concentrations of nutrients and metals than storm samples. Lead (Pb), zinc (Zn), and biological oxygen demand (cBOD) were all below the detection limit, and ammonia (NH₃), copper (Cu), and volatile suspended solids (VSS) were often below the detection limit for baseflow samples. All of the other chemical parameters stayed relative stable throughout the sampling season, until December when total Kjeldahl nitrogen (TKN), nitrates and nitrites (NO₃NO₂), chlorides (Cl), hardness, total dissolved solids (TDS), pH, and conductivity all spiked.

The majority of Minnehaha Creek storm events are from urban stormwater. For most events snowmelt had the highest water chemistry values seen in 2010. This is especially true for TKN, NO₃NO₂, NH₃, Cl, hardness, TDS, *E. coli*, Pb, and Zn. Spring snowmelt is a unique event in that pollutants accumulated over 4 to 5 months are released over a short period of time. The spring snowmelt was the only time that Pb was above detection. The source of the Cl in Minnehaha Creek is unknown but it may simply be road salt applied in winter that is continuously leaching from the soil. The increased Cl is likely the cause for the other elevated parameters of Sp. Cond. and TDS. The MPCA chronic stream Cl standard is 230mg/L for 4 days and an acute standard of 860 mg/L for 1 hour. With the exception of snowmelt the Xerxes Cl concentrations appear to be well below the chronic stream standard.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Stormwater Monitoring – Results and Data Analysis

Minneapolis Lake Trends

In 2010, MPRB scientists monitored 14 of the city's most heavily used lakes. The data collected were used to calculate a Trophic State Index (TSI) score for each of the lakes. Changes in lake water quality can be tracked by looking for trends in TSI scores over time. These values are especially important for monitoring long-term trends (5-10 years). Historical trends in TSI scores are used by lake managers to assess improvement or degradation in water quality.

All the lakes in Minneapolis fall into either the mesotrophic or eutrophic category. Calhoun, Cedar, Harriet, and Wirth Lakes are mesotrophic with moderately clear water and some algae. Brownie, Isles, Hiawatha, Nokomis, Spring, Loring and Powderhorn Lakes are eutrophic with higher amounts of algae. Webber Pond fluctuates between these two categories. Trends in lake water quality can be seen by using the annual average TSI score over the last 19 years.

Lakes with increasing water quality indicators	Lakes with stable trend	Lakes with decreasing water quality indicators
➤ Lake Calhoun	➤ Brownie Lake	➤ Diamond Lake
➤ Cedar Lake	➤ Lake of the Isles	➤ Lake Hiawatha
➤ Lake Harriet	➤ Lake Nokomis	➤ Loring Pond
➤ Powderhorn Lake	➤ Webber Pond	➤ Spring Lake
➤ Wirth Lake		

2010 Water Resources Report

The Minneapolis Park & Recreation Board's annual **2010 Water Resources Report** is a comprehensive technical reference of water quality information for the citizens of Minneapolis. Due to the length of this document, only the NPDES stormwater runoff monitoring and BMP monitoring sections are included in **Appendix A** of this Annual Report. Electronic copies of the *2010 Water Resources Report* <http://www.minneapolisparcs.org/default.asp?PageID=791> are available on the MPRB web page at www.minneapolisparcs.org. The whole report can be found in the "Caring for Our Parks - Lakes & Water Resources- Water Quality" section of the website. Reports are also available to be checked out from Minneapolis public libraries.

XV. Storm Drain System and Drainage Areas Inventory

Storm Drain System Infrastructure

The City of Minneapolis storm drain system handles runoff from approximately 50 square miles, and is the key element in ongoing efforts for flood protection and programs to improve and maintain water quality for the City's wetlands, lakes and streams.

History

From 1870 to 1922, all sewers built in Minneapolis were combined sewers intended to convey both sanitary sewage and stormwater runoff. In 1922, the City began construction of a separate storm drain system in newly developing areas of the City. In older previously developed areas, combined sewers continued as the only drainage system until 1960, when the City began actively separating combined sewers. From 1961 to 1984, construction of new storm drain piping proceeded in conjunction with the City of Minneapolis Residential Paving Program. In 1984, storm drain construction for sewer separation was accelerated because of development of a formalized Combined Sewer Separation program, called CSO Program, Phase I. There are currently approximately 600 miles of main line storm drain piping and 17 miles of deep drainage storm tunnels within the City of Minneapolis. This total does not include the State of Minnesota Department of Transportation, Hennepin County, the University of Minnesota or other agency systems. Approximately 91% of the City's storm drain system is constructed of reinforced concrete pipe (RCP). Service connections to catch basin inlets and private drains are mainly constructed of Polyvinyl Chloride (PVC). In 2003, the Minneapolis Public Works Department (MPW) was assigned to take over the storm drain system of the Minneapolis Park and Recreation Board (MPRB). This added roughly 17 miles of mainline piping and approximately 100 outfall control structures to the Minneapolis system (the exact number and delineation of areas drained is to be determined by a field survey). The total replacement cost of the City's storm drain system exceeds \$860 million (based on year 2000 dollars). In addition to the main line piping, MPW also maintains approximately 151 miles of catch basin runs.

Structural Controls

The City of Minneapolis owns and operates 25 stormwater pump stations, 156 sedimentation (grit removal) structures, 387 outlets (exclusive of the added MPRB outlets noted above), and 28 stormwater ponds and wetlands. Grit removal structures, stormwater ponds, stormwater wetlands and outfall locations are displayed in Appendix B.

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Storm Drain System and Drainage Areas Inventory

Drainage Areas and Discharges

Drainage Areas Inventory: The City of Minneapolis contributes stormwater runoff to Minnehaha Creek, Bassett Creek, Shingle Creek and Mississippi River watersheds. A map of the drainage areas that have been delineated according to topographic contours and the storm drain system is included in Appendix B. The population, size of drainage area, land uses, distribution, and runoff coefficients by body of receiving water are listed in Appendix A1.

Event Mean Concentration and Annual Pollutant Loadings

Calculated event mean concentrations and annual pollutant loading are included in Appendix A7. The following formula was used to calculate the total annual pollutant load:

$L = [(P) (P_j) (R_v) (C/1000) (A*4046.9)]$, where:

L = seasonal pollutant load, kilograms/season

P = seasonal precipitation, inches/season (meters/season)

P_j = correction factor for storms which do not produce runoff = 0.85

R_v = runoff coefficient

C = median event mean concentration of pollutants, mg/L

A = area, in acres

Conversion factors were used to convert acres to square meters, and to adjust the concentration data units. Conversion factors are as follows:

- 4,046.9 for acres → square meters
- 1,000 for liters → cubic meters

The Flow Weighted Mean Concentration (FWMC), expressed as a mean of all sites, was used for the annual load estimation calculations. The FWMC most accurately reflects stormwater loading on an annual basis. The seasonal loads were calculated from the pooled data using the median event mean concentration, as there were too few data points from each watershed. The median of the data set is a better representation of the runoff data than the mean values (Bannerman, et al, 1992). The annual load, and a summation of the seasonal loads, will not be equal due to this difference in calculation methods.

Seasonal loads were calculated on the following basis:

NPDES MS4 PHASE I PERMIT ANNUAL REPORT FOR 2010 ACTIVITIES

Storm Drain System and Drainage Areas Inventory

Season	Inclusive dates	Precipitation, National Weather Service
Winter/snowmelt	01/01/10 - 03/31/10	1.89 inches (0.048 meters)
Spring	04/01/10 - 05/31/10	4.82 inches (0.122 meters)
Summer	06/01/10 - 08/31/10	14.19 inches (0.360 meters)
Fall	09/01/10 - 12/31/10	11.99 inches (0.305 meters)
Total	01/01/10 - 12/31/10	32.89 inches (0.84 meters)