Appendix A
Watershed District and Watershed Management Organizations

The City of Minneapolis falls under the jurisdiction of four watershed management organizations. They are the Bassett Creek Watershed Management Commission (BCWMC), the Minnehaha Creek Watershed District (MCWD), the Mississippi Watershed Management Organization (MWMO), and the Shingle Creek Water Management Commission (SCWMC). The geographical extent of each organization's jurisdiction within the City of Minneapolis is shown in Figure 2. A general overview of the requirements of each organization is presented below, but readers are encouraged to contact each organization directly to obtain the most up-to-date information on their goals, policies, and programs. Contact information is current as of September, 2006.

Bassett Creek Watershed Management Commission

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The Bassett Creek watershed, nearly 40 square miles, is divided into four major subwatersheds. The nine municipalities represented by the BCWMC include: Plymouth, Medicine Lake, Golden Valley, Robbinsdale, Crystal, New Hope, Minnetonka, St. Louis Park, and Minneapolis.

The BCWMC adopted its first Watershed Management Plan in February 1972. The Commission released its Second Generation Plan (draft) for public review in July of 2003, which was subsequently approved by BWSR in August 2004 and adopted by the BCWMC in September, 2004. The BCWMC Plan sets the vision and guidelines for managing surface water within the boundaries of the BCWMC.

Summary of Goals

Water resources management goals developed by the BCWMC are included in Table A-1.

Table A-1 BCWMC Goals

Goal	Description
GOAL 1	**Manage the water resources of the watershed, with input from the public, so that the beneficial uses of wetlands, lakes and streams remain available to the community. Improve the quality of stormwater runoff reaching the Mississippi River by reducing non-point source pollution (including sediment) carried as stormwater runoff. Protect and enhance fish and wildlife habitat and maintain shoreland integrity.**

Goal	Description
GOAL 2	Reduce flooding along the Bassett Creek trunk system. Protect human life, property, and surface water systems that could be damaged by flood events. Regulate stormwater runoff discharges and volumes to minimize flood problems, flood damages and the future costs of stormwater management systems. Provide leadership and assist member cities with coordination of intercommunity stormwater runoff planning and design.
GOAL 3	Prevent erosion and sedimentation to the greatest extent possible to protect the BCWMC's water resources from increased sediment loading and associated water quality problems. Implement soil protection and sedimentation controls whenever necessary to maintain health, safety, and welfare.
GOAL 4	Implement stream restoration measures whenever necessary to maintain health, safety, and welfare. Maintain or enhance the natural beauty and wildlife habitat value of Bassett Creek.
GOAL 5	Achieve no net loss of wetlands in the BCWMC, in conformance with the Minnesota Wetland Conservation Act and associated rules (Minnesota Rules 8420).
GOAL 6	Protect the quantity and quality of groundwater resources.
GOAL 7	Manage public ditches in a manner that recognizes their current use as urban drainage systems.
GOAL 8	A. Raise awareness of the watershed's existence and the role that the BCWMC plays in protecting water quality and preserving the watershed's health and aesthetics. B. Enable the target audiences to have confidence in the BCWMC's expertise and participate in a meaningful way in the planning process and ongoing projects conducted by the BCWMC. C. Raise awareness of the impact that individuals, businesses and organizations have upon water quality and motivate these audiences to change personal/corporate behavior that has a negative impact on water quality and the watershed.

(Source: BCWMC)

Policies

Chapter 4 of the BCWMC Watershed Management establishes water quality policies in the areas of Lake and Stream Management, Stormwater Runoff Management, Fish and Wildlife Habitat and Shoreland Management, and Administration of Water Quality Management Standards. Specific policies include:

Policies Relating to Lake and Stream Management

A. Waterbodies are classified into one of four management categories.

B. Each member city will classify water bodies in local water management plans.

C. BCWMC will work with stakeholders to manage water bodies.

D. BCWMC and member cities will implement capital improvement projects listed in Table 12-2 of the BCWMC Watershed Management Plan.

E. BCWMC will give high priority to projects that include non-structural measures and education.

F. BCWMC will fund 100% of cost for water quality improvement projects that are listed in their 10-year CIP.

G. BCWMC will cooperate with member cities, MPCA and other stakeholders in preparation of TMDL studies.

H. BCWMC will continue to identify opportunities to maintain or improve excellent water quality in Twin Lake.

I. BCWMC will monitor, or coordinate with others to monitor, the water quality of lakes and streams in the watershed on a regular basis.

J. BCWMC will add projects from Table 12-3 of Watershed Management Plan to 10-year CIP using minor plan amendment process.

K. BCWMC will initiate in-stream chloride monitoring when appropriate.

L. BCWMC will compile water quality report for every sampling year that monitoring is conducted.

Policies Relating to Stormwater Runoff Management

A. BCWMC requires that all regulated stormwater be treated to Level I standards.

B. BCWMC will continue to participate in MCES Watershed Outlet Monitoring Program (WOMP).

C. Each city shall adopt an ordinance that enforces the Minnesota State Law limiting the use of lawn fertilizers that contain phosphorus.

D. BCWMC requires developers to consider/evaluate the use of BMPs in accordance with requirements of Appendix F of the BCWMC Watershed Management Plan.

Policies Relating to Fish and Wildlife Habitat and Shoreland Management

A. BCWMC requires that local water management plans contain buffer policies.

B. BCWMC will react to recommendation of other agencies, as the BCWMC deems appropriate.

C. BCWMC will collect, or coordinate with others to collect, macroinvertebrate monitoring data.

D. BCWMC will promote and encourage protection of non-disturbed shoreland areas and restoration of disturbed shoreland areas.

E. BCWMC will encourage preservation of streambank and lakeshore vegetation during and after construction.

F. BCWMC will encourage creation of buffer zone along shorelines.

G. Member cities are required to maintain control and responsibility for shoreland regulation.

Policies Relating to Administration of BCWMC Water Quality Management Standards

A. BCWMC will review projects and developments to evaluate compliance with BCWMC standards.

B. BCWMC will continue to work with other public agencies to gain compliance with BCWMC water quality management standards.

C. BCWMC will review local surface water management plans for compliance with BCWMC Watershed Management Plan goals and policies.

Summary of Rules

A synopsis of BCWMC rules is presented below. The letter system conforms to that used by the BCWMC.

Rule C. Floodplain Regulations

The following policies regarding floodplain regulation within the Bassett Creek watershed have been adopted:

1. The floodplain of Bassett Creek is defined as that area lying below the 100-year flood elevations as shown in the Water Management Plan of the BCWMC, or as subsequently revised due to channel improvement, storage site development, or requirements established by appropriate state or federal governmental agencies.
2. No land use of a type which would be damaged by flood waters is permitted within the floodplain.
3. Allowable types of land use which are consistent with the floodplain, such as recreation areas, parking lots, excavations and storage areas, agriculture, and other open space uses, would be allowed only to the extent that they would not increase flooding. Permanent storage piles, fences, and other obstructions, which would collect debris or provide restriction to flood flows are not allowed.
4. Filling will generally not be allowed within that floodplain established in the Water Management Plan of the BCWMC. If any municipality desires to fill within the established floodplain, such filling will require the approval of the BCWMC and require provisions for compensating storage and/or channel improvement so that the flood level shall not be increased at any point along the channel due to the fill.

5. Expansion of existing non-conforming land uses within the floodplain will be prohibited unless they are fully floodproofed in accordance with existing codes and regulations.

Rule D. Water Resources

Water Quality Management

The lakes, rivers, ponds, streams, and wetlands of the Bassett Creek watershed are an important community asset. These resources supply aesthetic and recreational benefits, in addition to providing wildlife habitat and refuge. The BCWMC recognizes a need to ensure adequate water quality in the water bodies in its jurisdiction, and has taken steps to protect these resources. The Water Quality Management Policy was adopted to protect, preserve, and manage the water resources in the Bassett Creek watershed.

Control of Streambank Erosion and Streambed Degradation

Streambank erosion and streambed degradation control measures must:

1. Be employed whenever the net sediment transport for a reach of stream is greater than zero or whenever the stream's natural tendency to form meanders directly threatens damage to structures, utilities or natural amenities in public areas.
2. Include effective energy dissipation devices or stilling basins to prevent streambank or channel erosion at all stormwater outfalls.
3. Specify riprap consisting of natural angular stone suitably graded by weight for the anticipated velocities.
4. Provide riprap to an adequate depth below the channel grade and to a height above the outfall or channel bottom so as to ensure that the riprap will not be undermined by scour or rendered ineffective by displacement.
5. Specify that riprap be placed over a suitably graded filter material or filter fabric to ensure that soil particles do not migrate through the riprap and reduce its stability.
6. Require that streambank stabilization and streambed degradation control structures be submitted for review by the BCWMC. The review will consider the need for the work, the adequacy of design, unique or special site conditions, energy dissipation, the potential for adverse effects, contributing factors, preservation of natural processes, and aesthetics.

Grit Chambers

Grit chambers for presettlement of stormwater must:

1. Be designed and sized to provide theoretical settlement of a 0.3-mm grit particle in still water at 10°C (based on Stokes Law).
2. Be designed to provide sufficient storage volume for the settled particles consistent with the maintenance schedule.

3. Include a device to diffuse inflow and provide a relatively uniform distribution of flow over the cross section of the chamber.
4. Provide convenient access for equipment and maintenance personnel to the chamber site and into the chamber itself.
5. Be inspected at least three times a year (spring, summer and fall) to determine the volume of stored grit, and be cleaned immediately whenever significant grit has accumulated or there is likelihood that the chamber will be full of grit before the next scheduled inspection

Regional Detention Basins
Regional detention basins must:

1. Conform to municipalities' stormwater runoff criteria.
2. Have water quality features designed based on Level I management classification as set forth in the water quality management policy.

Sediment Collection and Nutrient Entrapment
Wetlands used for sediment collection and nutrient entrapment must conform to the criteria for on-site or regional detention basins (whichever are appropriate). In addition, these wetlands and detention basins must:

1. Detain stormwater runoff in the first 1 1/2 feet of stormwater storage depth for an average period of no less than 48 hours.
2. Provide an outlet structure capable of draining the wetland or basin substantially dry to permit harvesting of wetland vegetation and removal of sediment.
3. Be harvested every fall (usually before October 15) by cutting the vegetation and removing the cuttings to an approved disposal site.

Sediment Control
In order to protect the water resources of the Bassett Creek watershed from increased sediment and associated water quality problems, the BCWMC has established the following policies to encourage land use planning and development that minimizes sediment yield:

1. The use of on-site settling ponds and/or filter fabric (silt fence) to control the sediment in runoff from construction sites, land clearing, or grading operations is required on all projects.
2. The sedimentation ponds will be cleaned on a regular interval determined by calculating the sediment yield expected from the tributary watershed and comparing it to the capacity of the pond.
3. Preservation and improvement of marsh areas for sediment removal by natural filtration is recommended as long as the natural intrinsic value of the wetland is not adversely affected.

4. The design of storm sewer, stream channel improvements, and channel crossings must consider temporary erosion control and sediment reduction measures to be implemented during construction and permanent measures to eliminate erosion and reduce sediment production during operations.

Minnehaha Creek Watershed District

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The MCWD covers approximately 181 square miles and is home to eight major creeks, 129 lakes and thousands of wetlands. The MCWD includes all or part of 27 cities and three townships in Hennepin and Carver Counties. The MCWD "seeks to conserve the natural resources of the Minnehaha Creek watershed principally through analysis of the causes of harmful impacts on the water resources, public information and education, regulation of land use, regulation of the use of waterbodies and their beds, and capital improvement projects". The MCWD's Water Resources Management Plan was adopted in January of 1997. It outlines the MCWD's mission, goals and policies, and implementation plan.

Summary of Goals

Water resources management goals developed by the MCWD are included in Table A-2.

Table A-2. MCWD Goals

Goal	Description
GOAL 1	Reduce the severity and frequency of flooding and high water, and improve the chemical and physical quality of surface water.
GOAL 2	Control temporary sources of sediment resulting from construction and land development activities, and identify, minimize, and correct the effects of sedimentation from erosion-prone areas.
GOAL 3	Preserve existing water storage capacity below flood elevations on all water bodies in the watershed to minimize the frequency and severity of high water.
GOAL 4	Preserve the natural appearance of shoreline areas and minimize degradation of surface water quality which can result from dredging operations.
GOAL 5	Maintain the hydraulic capacity of and minimize obstructions to navigation in watercourses and preserve the water quality and aesthetic appearance of shoreland areas.
GOAL 6	Improve water quality by promoting best management practices (BMPs), requiring their adoption in local management plans, and requiring their implementation on development sites.

Goal	Description
GOAL 7	Protect the recreational opportunities associated with water resources by improving water quality and enhancing fish and wildlife resources.
GOAL 8	Enhance public participation in MCWD activities and provide informational and educational material to municipalities, community groups, businesses, schools, developers, contractors, and individuals.
GOAL 9	Maintain public ditch systems within the MCWD as required under ditch authority jurisdiction.
GOAL 10	Support efforts to provide for the protection of groundwater and regulate its use to preserve it for beneficial purposes.
GOAL 11	Protect existing wetlands and restore diminished or drained wetlands.

(Source: MCWD)

Summary of Rules

MCWD rules seek to:

- Protect public health and welfare and the natural resources by reasonable regulation of the modification or alteration of lands and waters of the MCWD
- Reduce the severity and frequency of flooding and high water
- Preserve floodplains and wetlands
- Improve the chemical and physical quality of surface water
- Reduce sedimentation
- Preserve hydraulic and navigational capacity of waterbodies
- Preserve natural shoreland features
- Minimize public expenditures to avoid or correct such problems in the future

A synopsis of the MCWD rules is presented below. The lettering systems conform to that used by the MCWD.

Rule B. Stormwater Management Plan

The MCWD attains its policies for stormwater management through Rule B: Stormwater Management Plans for Individual Projects. Rule B covers developments of land for residential, commercial, industrial, institutional or public roadway uses. It also covers redevelopment and additions to existing development. It directs permit applicants to apply for a permit and prepare a local stormwater management plan for the individual project. It also directs them to prepare an erosion control plan for construction and land development activities. The MCWD Board of Managers will

transfer permit and review authority to communities that have approved stormwater management plans. An approved stormwater management plan will conform to Rule B and implement equal or equivalent design criteria for stormwater quantity and quality and require equal or equivalent exhibits. The MCWD Board of Managers will consider any variance requested from these local stormwater management plans.

Rule B. Erosion and Sedimentation Control Plan

The MCWD Board of Managers requires cities to adopt the MPCA best management practices and put these into their local surface water management plan (SWMP). These best management practices will meet the MCWD Board of Managers' Erosion and Sedimentation Control policies. MCWD approval of individual local SWMPs will require cities to take responsibility for enforcing erosion and sedimentation control plans for all development and redevelopment sites through their normal permitting procedures. This includes erosion control provisions for small sites associated with building permits, driveway permits, and grading permits.

Local SWMPs must also require documentation that the project has received a National Pollutant Discharge Elimination System (NPDES) Stormwater Permit from the MPCA (if required by the MPCA). The MCWD Board of Managers policy requires landowners proposing to develop land to prepare an erosion and sediment control plan for all construction activities that remove or disturb existing protective cover. The developer must have city approval of this plan before starting any construction. The SWMP must address sediment containment. The local SWMP must also require establishing permanent vegetative cover as soon as construction is done. The erosion and sediment control plan must outline the direction of all site runoff and the location of erosion control measures. Structural methods for erosion control may include, but are not limited to, silt fences, hay-bale barriers, diversion dikes, and sedimentation basins. The local SWMP shall also require installation of structural measures in accordance with the manufacturers' specifications and accepted MPCA guidelines. Non-structural methods include, but are not limited to, natural plant barriers, phased development practices, and grading practices that minimize slopes. Local SWMPs must require employing these methods in accordance with accepted engineering standards and in accordance with MPCA BMPs.

The erosion control plan must temporarily and permanently replace plant cover. These practices include, but are not limited to, seeding, mulching, and sodding. Local SWMPs must require proper care of all structural and nonstructural erosion control measures that must remain in place until the establishment of permanent plant cover. The MCWD Board of Managers recommends that local units of government obtain a surety to make sure that the developer adequately carries out the plan.

Rule C. Floodplain Alteration

The MCWD's Rule C applies to floodplain alterations. That rule states that it is the MCWD Board of Managers' policy to:

- Preserve existing water storage capacity below the 100-year flood levels on all water bodies in the watershed to minimize the frequency and severity of high water

- Minimize development in the 100-year floodplain that will unduly restrict flood flows or make known high-water problems worse

The MCWD Board of Managers will conduct the floodplain management program and review all projects proposed within the 100-year floodplain. Rule C criteria will guide the Board of Managers' review of developments and redevelopments within the floodplain. Local SWMPs must include floodplain management strategies. The Board of Managers will review these floodplain management strategies for conformity with Rule C and will transfer permitting authority for floodplain alterations if local floodplain ordinances conform to MCWD Rule C.

Rule D. Wetland Protection

The U.S. Army Corps of Engineers (USACE) potentially has jurisdiction over all wetlands in Minnesota. The Minnesota Department of Natural Resources (DNR) through a USACE/DNR general permit currently has authority to preserve protected waters and wetlands. The wetlands under the DNR's jurisdiction include most types 3, 4, and 5 wetlands as defined in the U.S. Fish and Wildlife Circular No. 39. The DNR requires a permit for changes to a protected water or wetland. BWSR provides administrative guidance over implementation of the Wetland Conservation Act (WCA) of 1991.

The MCWD serves as the local governmental unit (LGU) for implementing the WCA where LGU authority has not been obtained by a municipality. MCWD Rule D applies to types 1, 2, 3, 4, 5, 6, 7, and 8 wetlands. It also includes requirements for wetland buffers, restrictions for excavation in wetlands and for locating replacement wetlands. Local SWMPs must incorporate the requirements of Rule D or continue to allow the MCWD to regulate wetland protection. In addition, cities shall assess functions and values by utilizing one of a number of methodologies listed in the Wetland Conservation Act Rules. Cities issuing permits for work in and around wetlands will inform the permittee that these activities may also need DNR and USACE permits prior to approval of the local permit.

Rule F. Shoreline and Streambank Improvements

The MCWD Board of Managers encourages cities to adopt and carry out ordinances to protect shoreland. These shoreland ordinances shall address the control of shoreland development as identified in the 1989 DNR "Statewide Standards for Management of Shoreland Areas". The cities have the responsibility to administer and enforce these shoreline management regulations. MCWD Rule F applies to shoreline and streambank improvements. The MCWD Board of Managers may delegate permitting authority for shoreline improvements to cities if the Board of Managers decides that cities have either made Rule F part of their local shoreline ordinance or their ordinance does the same thing.

Rule G. Stream and Lake Crossings

MCWD Rule G discourages the use of lake beds and beds of waterbodies for the placement of roads, highways and utilities. The rule further lists criteria, which stream and lake crossing projects must meet. Local SWMPs will be reviewed for conformity to Rule G.

Mississippi Watershed Management Organization

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Boundaries of the MWMO include the Mississippi River as it runs through Minneapolis, as well as the land that drains to the river. The MWMO contains portions of the cities of Lauderdale, Minneapolis, St. Anthony, and St. Paul. The final member of the MWMO is the Minneapolis Park and Recreation Board. The MWMO provides for the long-term management of its water and associated land resources through the development and implementation of projects, programs, and policies that respect ecosystem principles and reflect changing community values. The MWMO assists and cooperates with member cities, other units of government, non-profit agencies, and a variety of groups in managing its water resources to achieve this vision.

The MWMO adopted its Water Resources Management Plan in 2000. The MWMO Plan presents the organization's missions; its goals and policies, and its priorities for implementation.

The primary purpose of the MWMO Plan is to provide for the wise, long-term management of the water and associated natural resources within the watershed through implementation measures that realize multiple objectives, respect ecosystem principles, and reflect community values.

Summary of Goals

Water resources management goals developed by the MWMO are included in Table A-3.

Table A-3. MWMO Goals

Goal	Description
GOAL 1	**Prevent the flooding of streets and structures from surface water runoff caused by the insufficient capacity of the stormdrain system and/or lack of detention basins and wetlands**
GOAL 2	**Mitigate the effects of drought that are caused due to lack of detention basins and wetlands coupled with a high percentage of impervious surfaces that reduces the landscape's ability to store water and promotes evaporation thereby increasing the effects of drought**

Goal	Description
GOAL 3	Protect and enhance surface water quality such that the water leaving the watershed is at least no more degraded than when it entered the watershed
GOAL 4	Reduce non-point sources of pollution by setting target levels for specific contaminants based on monitoring and working with members to achieve these targets
GOAL 5	Work with other organizations to improve surface water quality across watershed boundaries
GOAL 6	Provide opportunities for public outdoor recreation in a way that preserves and enhances the environment
GOAL 7	Create a continuous river corridor that would enhance the recreational and ecological value of the river
GOAL 8	Enhance public participation in MWMO activities
GOAL 9	Educate MWMO communities about environmental impacts to the Mississippi River, especially non-point sources of pollution
GOAL 10	Educate MWMO communities about redevelopment plans impacting the Mississippi River
GOAL 11	Protect and preserve groundwater quality and quantity by encouraging brownfield redevelopment, well sealing, watershed education campaigns, and projects that promote infiltration of unpolluted water
GOAL 12	Protect and restore wetland resources
GOAL 13	Control loss of soil due to erosion
GOAL 14	Preserve, minimize impact to, and restore natural habitat; especially shorelines and habitat corridors
GOAL 15	To preserve and interpret cultural resources that relate to the history of the Mississippi River and its watershed

(Source: MWMO)

Summary of Rules

The MWMO does not issue permits or provide approval letters for construction projects. Instead, it relies on the existing permitting and enforcement bodies of its member communities. The MWMO Board reserves the right to review and comment on plans that affect the quality and quantity of water within and across its watershed and subwatershed boundaries. Local governments are responsible for:

- Maintaining existing and proposed storm drain conveyance systems, including stormwater detention ponds, sewers, inlet and outlet drainage structures
- Issuing building and grading permits
- Performing inspections to ensure compliance during construction.

The MWMO maintains oversight responsibility to monitor local SWMP implementation. If member cities do not follow their approved SWMPs, the MWMO will enforce its standards and rules.

Erosion and Sediment Control

The member communities of the MWMO shall adopt and implement erosion and sediment control standards or ordinances to reduce erosion and sedimentation. Member communities shall also follow the best management practices described in the MPCA document, Protecting Water Quality in Urban Areas, or other such documents created by member cities to achieve no adverse impact to receiving water bodies. Construction activities, including redevelopment, utility installation, and road construction, are required to obtain an NPDES Construction Permit from the MPCA in addition to local permitting requirements.

Shoreline and Floodplain

The MWMO requires its member cities to have on file both a DNR approved Floodplain Ordinance and a DNR approved Shoreline Ordinance. Where no ordinance is applicable, MWMO requires there be no encroachment on floodways that reduces capacities or expedites flood flows. It is also MWMO policy to allow in the flood zone only those structures that have been protected from high water, either through floodproofing or by other construction techniques recognized and accepted by the MWMO Board.

Land Use

Although specific zoning and land use planning remains with the individual cities, the MWMO urges its member communities to regulate any activities that may cause contamination of surface and groundwater through restrictive permitting, zoning, and licensing.

Stormwater and Drainage Design Performance

The MWMO requires all its member cities to develop stormwater management ordinances that address the following requirements:

- Reduce runoff through coordinated efforts of state and local agencies
- Update development and enforcement standards for major new construction and redevelopment projects
- Promote increased stormwater retention in new construction and redevelopment projects

Shingle Creek Watershed Management Commission

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The Shingle Creek/West Mississippi Watershed covers about 67 square miles in east-central Hennepin County. There are ten cities in this watershed, and they jointly manage the water resources in this area through the Shingle Creek and West Mississippi Watershed Management Commissions. The Commissions work jointly for those communities that are members of both the Shingle Creek Watershed Management Commission and the West Mississippi Watershed Management Commission. The goal of the Commissions is to enhance the water quality of the water resources within their watersheds through public education, analysis of the causes of harmful impacts, regulation of the use of water bodies, regulation of land use and capital improvement projects.

The Commissions adopted their First Generation management plans in 1990. The Second Generation Plan was developed between May 2001 and August 2002, and describes how both Commissions will address activities in their respective watersheds over the period 2003-2012. Several citizen, agency, and Commission meetings were held throughout the planning process whereby input was actively solicited from those with an interest in the watershed. The plan was formally adopted by the SCWMC in May 2004.

The SCWMC includes an updated land and water resources inventory; goals and policies in eight specific areas; an assessment of problems and identification of corrective actions; an implementation program; and a process for amending the Plan. It describes how the Shingle Creek and West Mississippi Watershed Management Commissions (SCWMC) will address activities in the two watersheds in the ten-year period 2003-2012.

Summary of Goals

Water resources management goals developed by the SCWMC are included in Table A-4.

Table A-4 SCWMC Goals

Goal	Description
GOAL 1	Maintain the existing 100-year flood profile throughout the watersheds
GOAL 2	Protect and improve water quality based on practical use
GOAL 3	Strive to provide water quality that supports recreation, fish and wildlife based on practical use

Goal	Description
GOAL 4	Establish an education and public outreach program
GOAL 5	Develop an appropriate management strategy for Hennepin County Ditch #13
GOAL 6	Protect and improve groundwater quality and promote groundwater recharge
GOAL 7	Protect and improve wetlands
GOAL 8	Reduce erosion and sedimentation

(Source: SCWMC)

Summary of Rules

SCWMC rules and standards protect the public health, welfare, and natural resources of the watershed by regulating the improvement or alteration of land and waters in the watershed to:

- Reduce the severity and frequency of high water
- Preserve floodplain and wetland storage capacity
- Improve the chemical and physical quality of surface waters
- Reduce sedimentation
- Preserve the hydraulic and navigational capacities of waterbodies
- Promote and preserve natural infiltration areas
- Preserve natural shoreline features

In addition to protecting natural resources, these rules and standards are intended to minimize future public expenditures on problems caused by the improvement or land and water alterations. A synopsis of SCWMC rules is presented below. The lettering system conforms to that used by the SCWMC.

Rule C. General Standards

1. All land-disturbing activities, whether requiring a project review under SCWMC rules or otherwise, shall be undertaken in conformance with BMPs and in compliance with the standards and criteria in the SCWMC rules.
2. Project reviews are required of: any single family detached housing project 15 acres or larger in size; projects in any other land use such as commercial/industrial/institutional 5 acres or larger in size; and any land disturbing activity requested by a member city to be reviewed regardless of project size.

3. No person shall conduct land-disturbing activities without protecting adjacent property and waterbodies from erosion, sedimentation, flooding, or other damage.

4. Development shall be planned and conducted to minimize the extent of disturbed area, runoff velocities, and erosion potential, and to reduce and delay runoff volumes. Disturbed areas shall be stabilized and protected as soon as possible and facilities or methods used to retain sediment on-site.

5. When possible, existing natural watercourses and vegetated soil surfaces shall be used to convey, store, filter, and retain runoff before discharge into public waters or a stormwater conveyance system.

6. When possible, runoff from roof gutter systems shall discharge onto lawns or other pervious surfaces to promote infiltration.

7. Use of fertilizers and pesticides in the shoreland protection zone shall be done so as to minimize runoff into public waters by the use of earth material, vegetation, or both. No phosphorus fertilizer shall be used unless a soil nutrient analysis shows a need for phosphorus or in the establishment of new turf.

8. When development density, topographic features, and soil and vegetation conditions are not sufficient to adequately handle runoff using natural features and vegetation, various types of constructed facilities such as diversions, settling basins, skimming devices, dikes, waterways, and ponds may be used. The SCWMC encourages designs using surface drainage, vegetation and infiltration rather than buried pipes and man-made materials and facilities.

9. Whenever the SCWMC determines that any land-disturbing activity has become a hazard to any person, endangers the property of another, adversely affects water quality of any waterbody, increases flooding, or otherwise violates SCWMC rules, the SCWMC shall notify the member city where the problem occurs and the member city shall require the owner of the land upon which the land-disturbing activity is located, or other person or agent in control of such land, to repair or eliminate such condition within the time period specified therein. The owner of the land upon which a land disturbing activity is located shall be responsible for the cleanup and any damages from sediment that has eroded from such land. The SCWMC may require the owner to submit a project review application under SCWMC rules before undertaking any repairs or restoration.

Rule D. Stormwater Management

No person or political subdivision shall commence a land-disturbing activity or the development or redevelopment of land for the following types of projects without first submitting to and obtaining approval of a project review from the SCWMC that incorporates a stormwater management plan for the activity, development, or redevelopment:

1. Plans of any land development or site development of 15 acres or larger for single family detached housing use and 5 acres or larger for all other land uses.

2. Plans of any land development or individual site development adjacent to or within a lake, wetland, or a natural or altered watercourse, as listed in the final inventory of Protected Waters and Wetlands for Hennepin County, as prepared by the DNR.
3. Plans for any land development or site development within the 100-year floodplain, as defined by the Flood Insurance Study for the member city.
4. Plans of any land development or site development regardless of size, if such review is requested by a member city.
5. Single-family developments of more than 15 acres that drain to more than one watershed, for that portion of the site draining into the Shingle Creek/West Mississippi Watershed.

Rule E. Erosion and Sediment Control

No person or political subdivision shall commence a land-disturbing activity or the development or redevelopment of land for: any single family detached housing project 15 acres or larger in size; projects in any other land use such as commercial/ industrial/institutional 5 acres or larger in size; or any land-disturbing activity requested by a member city to be reviewed regardless of project size without first submitting to and obtaining approval of a project review from the SCWMC that incorporates an erosion and sediment control plan for the activity, development, or redevelopment.

Rule F. Floodplain Alteration

No person or political subdivision shall alter or fill land below the 100-year critical flood elevation of any public waters, public waters wetland or other wetland without first obtaining an approved project review from the SWMC.

Rule G. Wetland Alteration

No person or political subdivision shall drain, fill, excavate or otherwise alter a wetland without first obtaining the approval of a wetland replacement plan from the local government unit with jurisdiction over the activity.

Rule H. Bridge and Culvert Crossings

No person or political subdivision shall construct or improve a road or utility crossing across Shingle Creek or any watercourse with a tributary area in excess of 100 acres without first submitting to the SCWMC and receiving approval of a project review.

Rule I. Buffer Strips

No person or political subdivision shall commence a land-disturbing activity or the development or redevelopment of land for: any single family detached housing project 15 acres or larger in size; projects in any other land use such as commercial/industrial/institutional 5 acres or larger in size; or any land-disturbing activity requested by a member city to be reviewed regardless of project size; on land that contains or is adjacent to a watercourse or wetland without first submitting to

and obtaining approval of a project review from the SWMC that incorporates a vegetated buffer strip between the development or redevelopment and the watercourse or wetland.

Appendix B
Minneapolis Ordinances

Summary

Table B-2 contains a summary of Minneapolis ordinances that help protect water resources in the City. The table also references related ordinances and state laws.

Topic	Chapter	Section	Referenced Ordinances or State Law	Summary
Solid and Hazardous Waste	46	40 - 60	Minn. R. Ch. 7045; Minn. State.Ch. 116	• Outlines the permitting and fee requirements for any person storing, handling or processing hazardous waste
Minneapolis Watershed Management Authority	48	All	Minn. R. Ch. 4715, 4717, 4725, 7035, 7037, 7041, 7042, 7044, 7045, 7048, 7050, 7056, 7060, 7080, 7100, 7105, 7150, 7151. Minn. Stat. 115.061; Minn. Stat. 435.193 to 435.195; Minn Stat Ch 115C; Minn Stat Ch 1115B; Minn Stat 1031.05	• Establishes the Minneapolis Watershed Management Authority within the Environmental Management Section of the Department of Operations and Regulatory Services with authority to regulate and control watershed pollution. The unit is responsible for administering and enforcing all laws related to the quality of the City's water and land resources. The ordinance addresses storage of regulated substances, investigation of environmental contamination and remediation of contaminated sites.
Aboveground Storage Tanks For Regulated Substances	48	120	2002-Or-169, Section 6, 11/8/02	• Reasonable protection from spills and leaks reaching the stormwater sewer, sanitary sewer, or waters of the state are required.
Investigation of Environmental Contamination	48	190	2000-Or-017, Section 1, 4/7/00 and 2002-Or-169, Section 5, 11/8/02	• The MPCA can ask organizations that own, operate or manage devices that have leaked hazardous materials in the past to provide records and data to help identify the constituents or quantity of hazardous waste in a stormwater sewer, sanitary sewer, or surface waters.
Registration to Discharge to the Sewer System	50	40	Minn. Stat. Ch. 473; 82-Or-225, Section 1, 11/12/82; 85-Or-015, Section 1, 1/25/85; 86-Or-167, Section 1, 7/25/86; Pet. No. 250650, Section 14, 10/27/89; 90-Or-074, Section 1, 3/16/90; 92-Or-157, Section 1, 11/20/92; 2002-Or-170, Section 4, 11/8/02	• It is illegal for any non-dwelling discharger to discharge domestic waste into the Minneapolis sewer system without first registering with the City and paying an annual fee.
Industrial Waste Discharge Registration	50	50	Minn. Stat. Ch. 473; 82-Or-225, Section 1, 11/12/82; 85-Or-015, Section 2, 1/25/85; 86-Or-167, Section 2, 7/25/86; 90-Or-074, Section 2, 3/16/90; 92-Or-157, Section 2, 11/20/92; 2002-Or-170, Section 5-6, 11/8/02	• It is illegal to discharge industrial waste to the sanitary sewer system without first filing an industrial waste discharge registration and paying the annual fee.
Direct Storm Drain Discharge Registration	50	60	82-Or-225, Section 1, 11/12/82; 2002-Or-170, Section 7-8, 11/8/02	• It is illegal to discharge water used in a process (including cooling water) into the storm drain without first filing a direct storm drain discharge registration and paying the annual fee.
Erosion Control and Sediment Control Performance Standards	52	70	Minn. Stat. Ch. 40; Minn. Wetland Conservation Act of 1991, 96-Or-042, Section 1, 5/10/96	• Construction activities must have provisions to prevent soil from being deposited on other properties, in the right of way, in a public storm drainage system, wetlands, or watercourses. • Design, testing, and use of erosion control must adhere to Chapter 52 ordinances.
Erosion and Sediment Control Plan	52	100	Minn. Stat. Ch. 40; Minn. Wetland Conservation Act of 1991.	• An erosion/sediment control plan and permit are needed if a project disturbs over 5,000 ft2 of ground or 500 yd3 of soil. • An acceptable plan must allow for temporary stabilization along the perimeter of all dikes, swales, ditches, perimeter slopes, slopes greater than 3:1, embankments of ponds, basins and traps.
Lubricating and Motor Oil Discharge Control	53	20	Minn. Stat. 325 E310 et seq.; 77-Or-190, Section 1, 9/9/77	• The City has found many occasions where oils fall to the ground, contaminate runoff, and then be conveyed to surface waters and stormwater sewer systems. • Designated oil collection points shall be set up and disposal of oil to those points only will be enforced.
Oil Collection Station Requirements	53	40	Minn. Stat. 325 E310 et seq.; 77-Or-190, Section 1, 9/9/77 and 79-Or-248, Section 1, 12/14/79	• No one shall dispose of used oil anywhere in the City except for a city-operated station or privately maintained service station. • It is then the station operators' responsibility to prevent the oil from being released.
Applicability of a Stormwater Management System	54	50	Minn. Stat. Ch. 103B; Minn. Stat. Ch. 462; Minn. Stat. 103G.005; Minn. R. Ch. 8410; Minn. R. Ch. 8420; 99-Or-156, Section 1, 11/24/99	• A construction project requires a stormwater management system if the site is greater than 1 ac.
Stormwater Management Standards	54	70	Minn. Stat. Ch. 103B; Minn. Stat. Ch. 462; Minn. Stat. 103G.005; Minn. R. Ch. 8410; Minn. R. Ch. 8420; 99-Or-156, Section 1, 11/24/99	• The Stormwater Design Manual sets stormwater management standards which include: o A reduction in suspended solids concentration discharged into the Mississippi o Controlled rate of discharge into streams o A reduction in nutrients in stormwater draining into lakes and wetlands o Minimum requirements for nutrient removal

Topic	Chapter	Section	Referenced Ordinances or State Law	Summary
Ways to Manage Stormwater Runoff	54	70	Minn. Stat. Ch. 103B; Minn. Stat. Ch. 462; Minn. Stat. 103G.005; Minn. R. Ch. 8410; Minn. R. Ch. 8420; 99-Or-156, Section 1, 11/24/99	• If development density, topographic features, or soil/vegetative conditions can not handle storm water runoff then the Stormwater Design Manual suggests one uses natural features, vegetation and constructed facilities to control runoff: o Facilities include: wetlands, wet-ponds, detention ponds, pocket ponds, multiple-pond systems, settling basins, infiltration basins and trenches, filter systems, bioretention systems, swales, grass channels, waterways, rooftop detention, skimming devices, grit chambers, sweeping or diversions.
Planning of Ground Disturbances During Construction	54	70	Minn. Stat. Ch. 103B; Minn. Stat. Ch. 462; Minn. Stat. 103G.005; Minn. R. Ch. 8410; Minn. R. Ch. 8420; 99-Or-156, Section 1, 11/24/99	• Development must be planned to minimize: o Ground disturbances o Runoff velocity o Erosion potential • Development should reduce or delay the volume of runoff
Maximizing Infiltration to Minimize Stormwater Runoff	54	70	Minn. Stat. Ch. 103B; Minn. Stat. Ch. 462; Minn. Stat. 103G.005; Minn. R. Ch. 8410; Minn. R. Ch. 8420; 99-Or-156, Section 1, 11/24/99	• Natural drainage ways and vegetative soil surfaces should be used to convey, store, filter, and retain stormwater before it is discharged into the public storm system. Ways to maximize infiltration include: o Minimizing impervious surfaces on the property. o Directing runoff from impervious surfaces (such as roofs) to lawns or other pervious areas.
General Regulations on Fertilizer Application	55	40	2001-Or-113, Section 1, 9/28/01 and 2002-Or-068, Section 4, 7/26/02	• Commercial and non-commercial applicators shall not apply fertilizer at times when excess runoff is likely including: o When the ground is frozen o When heavy rain is in the forecast • Except for the exceptions in Chapter 55.50, all fertilizer can not contain phosphorous. • Fertilizers can not be applied to impervious surfaces
Phosphorous-Containing Fertilizer Exemptions	55	50	2001-Or-113, Section 1, 9/28/01 and 2002-Or-068, Section 4, 7/26/02	• The following can apply fertilizers containing phosphorous: o On new lawns during the first growing season o Soils in which a test has been performed in the past three years demonstrating that phosphorous-containing soils will promote healthy turf growth. o On golf courses and under the direction of a licensed and certified person or by an approved organization with an ongoing training course.
Application of Phosphorous Containing Fertilizers	55	60	2002-Or-068, Section 6, 7/26/02	• On properties permitted to apply phosphorous-containing fertilizers (Chapter 55.50) the applier must: o Apply at a rate that does not exceed the rate recommended by the University of Minnesota's Extension Service and approved by the Commissioner of Agriculture. o Fertilizer must be watered so it is immobilized and protected from loss by runoff.
Sale of Fertilizers Containing Phosphorous	55	70	2001-Or-113, Section 1, 9/28/01 and 2002-Or-068, Section 7, 7/26/02	• When selling fertilizers, retailers must: o Not display phosphorous-containing fertilizers in or outside of their store. o Should post usage restrictions in accordance to Chapter 55 o At the time of purchase, make available to the buyer a copy of Chapter 55 or a summary prepared by a regulatory agency.
Prohibited Connections to the Sanitary Sewer	56	70	2003-Or-053, Section 1, 5/2/03	• At one time, some stormwater drains were allowed to connect to the sanitary sewer system. In an effort to minimize sanitary sewer overflows, the following are prohibited from being connected to the sanitary sewer system: o Rainwater pipes, rainleaders, and area drains for conveying stormwater/clearwater from any building, structure, ground or premises o Drains from the uncovered top decks of parking garages can not be connected to the sanitary sewer system. ▪ Drains from covered parking garage decks can be connected to the sanitary sewer system via a separator
Disconnection of Previously Allowed Connected	56	80	2003-Or-053, Section 1, 5/2/03	• All building connections (rainwater pipes, rainleaders, area drains and other connections used for conveying stormwater and Clearwater from any building, structure, ground or premises) installed before 1961 or allowed after 1961 must be disconnected by January 1, 2005.
Disconnection of Stormwater Drains	56	100	2003-Or-053, Section 1, 5/2/03	• No one can perform a disconnection of a rainwater pipe, rain leader, area drain or connection conveying rainwater from a building without first obtaining a disconnection permit.
Diseased, injured or dead animals	72	all		• Prohibits the possession of dead animals, unless in the care of a licensed veterinarian. The ordinance also regulates the abandonment, care and disposal of diseased and dead animals. • The disposal rules can protect water resources from prohibiting the disposal of animals to the sanitary sewer.
Polluted Water Wells	215	10 – 55	Code 1960, As Amend., Section 789.010; Petition Number 251060, Section 1, 12/15/89	• The use of a contaminated water well is prohibited. • This code gives rules on testing polluted wells. • Allows the commissioner of health to test the water of any well in the City upon cause and to order any polluted wells to be tagged as impure.
Water Well Construction	216	15 - 150	Minn. Stat. Ch. 1031; Minn. Laws 1991, Ch. 355; Minn. R. Ch. 4725; 91-Or-155, Section 1, 8/9/91	• Gives rules for constructing and sealing water wells.
Pesticide Licensing	230	20	87-Or-078, Section 1, 5/8/87	• Anyone in the business of handling or applying pesticides must be licensed by the State.

Topic	Chapter	Section	Referenced Ordinances or State Law	Summary
Creation of a Stormwater Utility	510	20	2004-Or-132, Section 1, 11/5/04	• The City Council establishes a stormwater management system (pumping station, sewers, wetlands, ditches, flood control facilities, etc.) and stormwater utility. • The Council intends to operate, construct, maintain, repair, and replace the stormwater management system
Stormwater System Findings	510	30	2004-Or-132, Section 1, 11/5/04	• The stormwater management system has been found to benefit the entire City.
Powers of the Stormwater Utility	510	40	2004-Or-132, Section 1, 11/5/04	• The stormwater utility has the power to: o Administer the design, construction, maintenance, and operation of the stormwater management system. o Prepare regulations to implement Chapter 510. Regulations will then be presented to the City Council. o Administer the ordinances in Chapter 510 and all adopted regulations and guidelines including: ▪ Advising the City Council on stormwater management ▪ Develop plans on design of the sewer system and make recommendations to the City Council ▪ Inspect private systems for compliance ▪ Make recommendations to the City Council on ordinances and regulations to protect water quality in the stormwater system ▪ Analyze the cost of service and the structure of fees of the system at least once per year ▪ Make recommendations to the City Council on the Cost of service and structure of fees ▪ Analyze appropriateness of providing credits against stormwater charges for properties that use best management practices to minimize the quantity or improve quality of runoff ▪ Administer programs that provide credit to reduce stormwater charges imposes against properties
Operating Budget for the Stormwater Utility	510	50	2004-Or-132, Section 1, 11/5/04	• The City will adopt an annual operating budget for the following fiscal year. The first budget is from January 1, 2005 to December 31, 2005.
Stormwater Charges for Single Family Properties, Residential Developed Properties, Non-Residential Developed Properties, and Vacant Properties	510	60	2004-Or-132, Section 1, 11/5/04	• This Chapter sets up the charge structure for each type of property. Single Family Residential Properties can be adjusted (as shown in Chapter 510.60) based on acres of impervious land on the property.
Credit to Stormwater Charges	510	60	2004-Or-132, Section 1, 11/5/04	• Stormwater charge credits can be given to properties that use best management practices to reduce the quantity or improve quality of stormwater runoff. • The City Engineer Director can set propose rules and provide guidance to award credits. The City Council will approve of these rules.
Procedure to Appeal Stormwater Charges	510	70	2004-Or-132, Section 1, 11/5/04	• Owners of a property can appeal: o The property class in which a single-family residence was placed when assigning a stormwater charge o The calculation of a stormwater charge o If a property is benefited by the stormwater utility o Whether a property is entitled to a stormwater credit • The person overseeing the hearing will be appointed by the City Engineer Director and is someone who is not regularly assigned to utility billing or the stormwater utility. • The burden of proof in the hearing is placed on the appellant. • The appellant can appeal to the City Council if they believe the decision is wrong. • If money is owed to the appellant then a check will be mailed within 10 days of the decision.
Collection of Stormwater Charges	510	80	2004-Or-132, Section 1, 11/5/04	• Stormwater charges will be billed and collected by the City.
Use of stormwater charges	510	90	2004-Or-132, Section 1, 11/5/04	• Stormwater charges will be put into an account called the 'Stormwater Fund'. The fund will be used for capital improvements, administration of the stormwater utility, O&M on the stormwater utility and debt service.
Equivalent Stormwater User Rate	510	100	2004-Or-132, Section 1, 11/5/04	• The ESU rate that will be charged is set in an ordinance adopted by the City Council and will be amended as needed.
Rainwater draining into sanitary sewers	511	10	Code1960, As Amended., Section 614.010	• No rainwater pipes, leaders or conductors from any building, grounds or premises shall be connected with any sewer, sewer pipe, sewer connection in any sewer district in which sewers are provided for disposal of sewage alone.
Discharging sewage into a watercourse	511	20	Code1960, As Amended., Section 614.020	• It is illegal to discharge sewage or commercial or industrial waste into the Mississippi River or any stream within or adjacent to the City boundaries.
Discharging unpolluted water to a watercourse	511	30	Code 1960, As Amended, Section 614.030	• It is illegal to build or repair a ditch, lay or repair a pipe or a conduit to discharge storm, surface, cooling or condenser water into the Mississippi River or stream within or adjacent to the City boundaries.
Disposing wastes from outside the City	511	40	Code 1960, As Amended, Section 614.040	• It is illegal to bring septage from containers located outside of the City into sewers of the city.
Removal of manhole covers	511	50	Code 1960, As Amended, Section 614.040	• It is illegal to remove manhole covers without a permit from the City Engineer.

Topic	Chapter	Section	Referenced Ordinances or State Law	Summary
Fish in sewers	511	60	Code 1960, As Amended, Section 583.115, Ord of 6/14/74, Section 1	• No one can put live fish into the sewer
Substances prohibited from the sewers	511	130	Code 1960, As Amended, Section 611.250	• It is illegal to deposit butchers' waste, garbage, dead animals, ashes, shavings, gas drippings or solid waste
Discharge of solids into the sanitary sewer	511	230	Code 1960, As Amended, Section 615.070	• No one can dispose of glass, metal, crockery, sand, gravel, clay, concrete, shellfish shells, wood or plastic down a garbage disposal drain.
Development Guidelines to Protect Waters in the City	535	300	None referenced	• Areas that are within 50 ft. of protected waters that are governed by SH Shoreland (1,000 ft from the highwater mark of a lake, pond, wetland or flowage; or 300 ft from a river or streams floodplain extend – whichever is greater) and MR Mississippi River Critical Area (300 ft from the Mississippi River) Overlay Districts shall remain undeveloped.
Development Guidelines to Protect Wetlands	535	300	None referenced	• No development, grading or alterations are allowed within 50 ft. of a wetland
Development Guidelines to protect shoreland areas	535	300	None referenced	• Areas within the SH Shoreland Overlay District (1,000 ft from the highwater mark of a lake, pond, wetland or flowage; or 300 ft from a river or streams floodplain extend – whichever is greater) shall avoid placements of parking lots, structures or other impervious structures.
Development Guidelines for the SH Shoreland Overlay District	551	440 – 530	2000-Or-048, Section 2 - 7, 5-19-2000	• The SH Shoreland Overlay district is defined as 1,000 ft from the highwater mark of a lake, pond, wetland or flowage; or 300 ft from a river or streams floodplain extend – whichever is greater • Development will not be within 500 ft of the highwater mark of any protected water except when approved by a conditional use permit. • Development will not be on of a steep slope or bluff (slope greater than 18% and bluff taller than 10 ft) or within 40 ft of the top of a steep slope or bluff. • If vegetation is removed during construction it is to be replaced to minimize surface runoff, provide screening, and minimize surface erosion. • All development will comply with regulations to govern stormwater management. • Development will employ best management practices to: o Minimize off-site runoff o Maximize overland flow distances across vegetative areas o Increase on-site filtration, o Replicate pre-development hydrologic conditions • Minimize off site discharge of pollutants.
Development Guidelines for the MR Mississippi Overlay District	551	660 - 720	2000-Or-048, Section 8 - 10, 5-19-2000	• The Mississippi River Overlay District is defined as the Mississippi River and Mississippi River Corridor (Executive Order 79-19). • The regulations for the SH Shoreland Overlay District (Chapter 551.440-530) shall apply to the Mississippi River Overlay District located within 300 ft of the river or the Mississippi River's landward extent of the floodplain. • The Mississippi River is assumed to be a protected water. • Development will not be on a bluff or within 40 ft from the top of a bluff.

Appendix C
Water Resource Management Guiding Principles – Existing Activity Inventory

1. Protect people, property and the environment

Construct improvements to sanitary sewer and storm drainage systems that provide protection

- Construct projects to mitigate flooding caused by inadequate capacity of storm drainage system

  The City will continue to pursue a policy aimed at reducing flood potential through either land use changes or structural measures, as it deems appropriate. The City may employ any or all of the following means:

  1. Review plans to ensure development proposals include adequate rate control
  2. Construct dry detention basins
  3. Construct stormwater ponds
  4. Use design standards that reduce the probability of flooding in problem areas during critical periods
  5. Consider all development, redevelopment and rehabilitation projects in light of potential downstream impacts, particularly in downstream areas with known flooding problems
  6. Upgrade existing storm sewers in areas known to have flooding problems
  7. Provide more inlet capacity by replacing grates with higher capacity models
  8. Construct more catch basins
  9. Provide backup generators for pump stations
  10. Floodproof or acquire properties deemed vulnerable to repeated flooding
  11. Increase inspections and maintenance of inlets and drains located in flood-sensitive areas
  12. Reduce sewer backups by removing cross-connections between storm and sanitary systems, reducing infiltration and inflow, and replacing existing sanitary manhole covers with watertight covers

13. Consider aesthetics as well as design standards in new development, redevelopment or flood mitigation projects

- Construct projects to mitigate sewer backups into buildings by hydraulic deficiencies in sanitary sewers

- Cooperate with public and private partners towards creation of multipurpose stormwater quality and quantity structures

  On-site management to achieve stormwater standards will be incorporated on all sites to the greatest extent possible. When development density, topographic features, soil, or vegetation conditions prohibit this, full or partial participation in existing regional stormwater facilities within the drainage area of the same receiving body may be permitted with the City's prior approval.

  At its discretion, the City will allow shared or joint use of stormwater facilities in new developments and redevelopments, including public or private stormwater basins.

  The City will continue to coordinate with government entities such as watershed management organizations, the Minnesota Department of Natural Resources (MNDNR), the Minnesota Pollution Control Agency (MPCA), highway departments, neighboring cities, Hennepin County, and the Metropolitan Council.

- Monitor Beaches

2. Maintain and enhance infrastructure

Maintain condition of sanitary sewer and stormwater drainage systems

- Ensure adequate funding for maintenance activities

  The estimated replacement cost of Minneapolis' stormwater drainage infrastructure, based on recent studies by the City, is $860 million.

  Industry standards recommend that 1% of the infrastructure value should be spent annually to rehabilitate and maintain the system. This equates to a minimum of $8.6 million per year for just the storm drainage system. This amount is simply to maintain the existing level of service and does not include money necessary to improve the level of service like money spent on flood mitigation. Other studies have identified non-routine maintenance improvements, which would increase the base figure of $8.6 million per year. These include rehabilitation of storm drains on MPRB lands, tunnel rehabilitation (estimated at $12,000,000) and maintenance and rehabilitation of stormwater pumping stations, grit chambers, and storm ponds.

- Ensure a dedicated source of revenue for maintenance activities

With the implementation of the City's stormwater utility there will now be a revenue source dedicated solely to the stormwater program.

- Maintain infrastructure in accordance with NPDES CSO and Stormwater permits

Maintain capacity of sanitary sewer and stormwater drainage systems

- Limit peak flow rates to prevent surcharging or flooding of downstream storm drains, basements, CSO regulators, or surface waters

  The City has eliminated a large number of known CSOs to the Mississippi River. It continues to work in a systematic manner through a special program designed to eliminate all known CSOs in the City. The City has written ordinances to support the elimination of CSOs (Chapter 56 of the City of Minneapolis Ordinances) and to eliminate rainwater leader connection to the City's sewage system (Chapter 511.10 of the City of Minneapolis Ordinances). The City has also committed $10 million over the next five years toward CSO elimination.

  For new construction and other activities associated with new development or redevelopment, computed post-development peak flow rates will not exceed computed existing peak flow rates. Computations will be based on accepted engineering practice and/or modeling assumptions for the 2-year (2.8 inches in 24 hours) event, 10-year (4.2 inches in 24 hours), or 100-year (5.9 inches in 24 hours) storm events.

  As opportunities for new development and redevelopment arise, the City will continue to use plan review, and modeling techniques to identify existing deficiencies and potential flooding problems. If plan review and modeling indicate increased flooding potential for downstream areas, the City will require the developer to incorporate such practices as are necessary to resolve a proportionate share of the problems to mitigate the downstream impact of such development. These standards are intended to preserve the integrity of downstream conveyance facilities and detention areas.

- Limit Volume of stormwater runoff where feasible to meet goals of City's sustainability plan

  Where soil conditions permit, and it is feasible, infiltration is strongly encouraged in new development and redevelopment in sites. See Appendix O. Where infiltration is not possible, the City encourages the use of alternative BMPs, particularly reduction of impervious area, conducive with existing site conditions and in compliance with the design and performance standards for Best Management Practices (BMPs) as outlined in the 2005 Minnesota Stormwater Manual. This infiltration policy is consistent with the City's Stormwater Management Ordinance and the 2005 Minnesota Stormwater Manual. When infiltration is considered and rejected by a project proposer the reasons for rejecting the infiltration shall be part of the project submittal.

The City encourages reduction of, or minimizing increases in, the amount of impervious surface created as a result of land development or redevelopment activities through the following:

1. The development plan review process and engagement by developers with staff on designing with less impervious surface.

2. Review and consideration of modifications to City code so that less parking is required of development and redevelopment sites.

3. Determining future stormwater utility fees, in part, on a given parcel's percent impervious area.

- Maximize stormwater storage in existing and future stormwater quality controls

  Freeboard requirements will be implemented to provide new structures flood protection from any immediately adjacent surface waterbody, wetland or stormwater basin. Additional protection may be required for new structures adjacent to landlocked basins with no identifiable overflow route.

  The City will maintain a policy of "no net loss of storage capacity" in designated stormwater basin ponding areas, and of at least maintaining the existing level of flood protection for all areas within a given watershed.

  Compensatory storage will be required to mitigate fill within wetlands, ponds, and other similar runoff storage sites. Compensatory storage will be provided for flood storage lost below the City's calculated high water level plus free board. This requirement applies to all development and redevelopment activities, regardless of size. It should be emphasized that this policy applies to storage areas that serve sites and not to the large contiguous flood plain attached to the City's lakes, creeks, and the Mississippi River. The floodplains are regulated in the City's floodplain ordinance (Chapter 551 Articles VI and VII). Chapter 12, Article 1 of MPRB ordinances provides for shoreland and floodplain preservation over MPRB lands.

  The City will attempt to establish and maintain overflow routes, including pond overflows where feasible to provide relief from storms which exceed design conditions, provided that downstream areas would not flood due to the overflow operation.

- Line sanitary sewers to seal out extraneous groundwater infiltration

  The City conducts visual inspections of sanitary sewers each year to determine if the sewers have structural problems, root intrusion and/or excessive groundwater infiltration. Areas determined to have one or more of these problems are lined.

- Investigate source of inflow connections from public and private buildings

The Regulatory Services Department began a building by building inspection for sources of rooftop connections to the sanitary sewer. Inspections are scheduled to be complete in 2007.

3. Provide cost-effective services in a sustainable manner

Optimize enhancements to sanitary sewer and stormwater drainage systems

- Life cycle costs are analyzed for all capital improvement projects

  Understanding that portions of the City's stormwater system have historically been designed according to different standards, newly constructed conveyance facilities will be designed to convey the 10-year storm event (based on standard engineering practices) without surcharging. This will be true except in designated flood areas where the goal will be to design new storm sewer and other conveyance to prevent boulevard flooding for the critical 100-year storm:

  1. The 100-year, 24-hour storm event (5.9 inches in 24 hours) Source: SCS NEH

  2. The 100-year, 1-hour storm event (3.0 inches in 1 hour) Source: U.S. Weather Service T.P. 40

- Inspect stormwater management facilities during construction and periodically after construction to determine that facilities are functioning properly.

- Priority is given to projects which are multi-functional or which solve multiple problems

- Priority is given to cooperative projects with multiple funding partners

4. Meet or surpass regulatory requirements

Operate and maintain public lands consistent with best current practices and City's NPDES permits

- Maintain system in accordance with NPDES permits

  The City will continue to be actively engaged in stormwater inspection, operation and maintenance, and repair of the stormwater system on a day-to-day basis. The City will follow a formal inspection, cleaning, and repair schedule. Frequency of maintenance is event-based and driven by experience and inspection history. Practice good housekeeping on City-owned land

- The City will follow best management practices and environmental friendly approaches in managing and maintaining City-owned land and property in accordance with NPDES permit requirements.

- The City has dedicated one full time inspector to inspect street construction sites and to ensure the projects are in compliance with erosion and sediment control

requirements. The City will continue to prevent erosion and sedimentation from all City-owned construction projects.

- Roadways are maintained in a manner that prevents wash-off of pollutants during rainfall and snowmelt

  Every year, in the spring and the fall, there is a city-wide comprehensive street sweeping program, in which parking restrictions are put into place and the entire city is swept, curb to curb, over a 3-4 week period. The Fall Sweep this year will be starting on October 25th. Various watersheds in the City (examples being around the Chain of Lakes, Minnehaha Creek, Shingle Creek, Bassett Creek, Mississippi River, etc.) are on a more frequent sweeping cycles, since debris in the street has a direct route to these water bodies. Averaged throughout the "sweeping" year, these areas are swept at an average frequency of approximately every 20 - 30 days. Each street maintenance district has on average 1 sweeper operating in their district throughout the "sweeping" year. These sweepers are assigned to sweep areas on an "as-need" basis. There are many other sweeping schedules that exist throughout the city. Examples being major commercial nodes, the Downtown Central Business District, Warehouse District, day sweepers, night sweepers, State Trunk Highway Routes, etc.

  Minneapolis implemented Best Management Practices (BMPs) and advanced technology for snow and ice control such as introducing "smart spreaders", and a pilot anti-icing and alternative de-icing program to more effectively treat streets and reduce chloride release/salt release to the water bodies. When applying sand and salt to City roadways, efficient application methods will be used. Maintenance supervisors will continue to receive training at the Local Road Research Board on application rates, techniques, and spreader calibration. Reasonable precautions will be taken to minimize salt and sand runoff in storage areas.

- Maintain emergency preparedness, including spill response and flood response capabilities

  The City will continue to have a hierarchical spill response capability based on size and hazardous/non-hazardous category of the spill. Spills meeting the specified volumetric criteria will be reported to both the Duty Officer at the Minnesota Department of Public Safety and the MPCA.

  The response program will focus on containing, neutralizing, and properly disposing of spilled material. It will extend to include preventing the discharge of spilled toxic or hazardous materials into the storm drainage system. Appropriate spill kits will be available to prevent spills from entering the storm drain system.

  A number of City departments will coordinate the work, including Emergency Communications, Regulatory Services, Environmental Management, Fire Department, Sewer Maintenance and Street Maintenance Departments.

Procedures will continue to be documented, and response guidelines strictly followed. City staff will have a readily available supply of response materials, including containment booms, absorbent pads, and buckets of sand for immediate response to small spills. A proper procedure for disposal of containment material will continue to be used.

- Eliminate inflow sources from public properties

  The City has designated funds in the Capital Improvement Program to pay for removal of inflow sources from City-owned properties.

- Use Integrated Pest Management practice on Park properties

  The MPRB has an Integrated Pest Management (IPM) Policy as part of its General Operating Procedures that guides a logical and stepwise method of solving pest infestations. The MPRB uses these procedures on their land. MPRB staff is involved in seeking better and more innovative solutions to solving vegetation management problems through education, training and pilot projects.

Provide on-going assessments of sanitary sewer and storm drainage systems

- Monitor stormwater runoff and BMP effectiveness in accordance with NPDES Stormwater Permit

  Monitoring set up as part of the NPDES Phase I Permit will continue as per Permit requirements. The data will be used to evaluate changes in the runoff quality over time.

- Monitor sanitary sewers in accordance with NPDES CSO permit

- Monitor lakes and beaches

- Coordinate monitoring efforts with public agencies

  The City will continue stormwater monitoring. In particular, the City of Minneapolis will continue to assist other agencies, especially the watersheds, in their monitoring efforts and work together to avoid duplication.

- Cooperate with TMDL studies on Minneapolis surface waters.

5. Educate, engage the public and stakeholders and improve compliance and use of BMPs

Enhance quality of runoff from redevelopment

- Inspect redevelopment projects for sources of inflow

- Maintain stormwater management requirements

The City has implemented stormwater ordinances (Chapter 54 of the City Ordinances) to guide stormwater management in the City. The City will continue its efforts to implement these ordinances to the best of its ability. Stormwater quantity and quality design standards will continue to be enforced for redevelopment of existing sites that have substandard or no on-site stormwater facilities. The City will encourage and promote stormwater management in redevelopment and new developments to include:

1. A reduction in impervious area; or
2. The implementation of stormwater best management practices; or
3. A combination of both (1.) and (2.); and
4. Total load reductions and discharge requirements.

The City will limit phosphorus levels in runoff by regulating all new developments and redevelopment over one acre in accordance with Minneapolis Code of Ordinances, Chapter 54, developed by the City for all receiving waterbodies within its jurisdiction. The City has developed these targets based upon the destination water resource. Wherever feasible, the City will implement these reductions as land comes up for development or redevelopment. The standards are determined in relation to percent reductions over the benchmark of existing conditions. Once a property has redeveloped under this standard this is memorialized in their permit so that if the property were to redevelop again the current treatment level, if preserved, would be a credit toward the load reduction.

- Maintain erosion and sediment control requirements

  The City has an erosion and sediment control ordinance, Chapter 52, Erosion and Sediment Control for Land Disturbance, that is supported by a site inspection program as well as enforcement capability. Best management practices to be used on-site are outlined in this ordinance. Information is detailed in the City's Storm and Surface Water Management web page.

  Additional guidance should be obtained from the MPCA (October 1989) publication entitled Protecting Water Quality in Urban Areas: Best Management Practices and the Met Council's Minnesota Urban Small Sites BMP Manual.

- Educate developers and contractors

  The City has a pesticide control ordinance (Chapter 230 of the City of Minneapolis Ordinances) that outlines licensing and signage requirements.

- Encourage use of natural site characteristics

- Provide financial credits in stormwater utility for projects that incorporate quality and quantity controls

Maintain or enhance quality of runoff from existing private properties

- Inspect private properties for sources of inflow
- Educate homeowners about organic waste in gutters and other practices
- Provide financial credits in stormwater utility fee for projects that incorporate quality and quantity controls
- Encourage retrofit of stormwater quality and quantity controls on private properties
- Engage the public in advising on aspects of water resource programs and projects
- Inspect and enforce illicit discharge ordinance

  In keeping with NPDES requirements, the City prohibits by ordinance (Chapters 511 and 53 of the Minneapolis Ordinances) the dumping of foreign material into the stormwater management system, including petroleum based products, antifreeze, paint, solvents, herbicides/pesticides, yard debris, animal waste and other material that may be harmful to the environment. The City will continue to inspect and investigate on a complaint basis.

- Inspect and enforce mercury ordinance

6. Enhance Livability and Safety

Preserve, maintain and enhance the City's natural and recreational resources

- Maintain shoreline buffers
- Preserve or create riparian corridor connections

  The City will make river/stream corridor connectivity a priority through land use and planning. Wherever possible, the City will attempt to preserve, maintain and create green space along riparian corridors for the benefit and enjoyment of both wildlife and people. This will promote habitat connectivity for wildlife as well as present opportunities for introduction of linear sports such as biking, hiking, inline skating, and cross-country skiing. The City will work with various watershed management organizations that have land acquisition programs to achieve this goal.

- Protect floodplains in accordance with Floodplain Overlay District requirements of the Minneapolis Zoning Code

- Protect shoreland zones in accordance with Shoreland Overlay District requirements of the Minneapolis Zoning Code.

  The City and MPRB will continue to protect shoreland and floodplain (in accordance with FEMA floodplain and shoreland management rules, Minnesota Rule Chapter 6120) through the use of structural and vegetative techniques as well as regulatory measures, as stated in Chapter 551 of the City Ordinances and Park Board Chapters 12 and 13 (PB12 and PB13). The City and MPRB will introduce native vegetation wherever feasible.

- Administer requirements of the Minnesota Wetland Conservation Act

  The City acts as the local government unit for protection of wetlands and administration and enforcement of WCA within the City's limits.

- Conserve and stabilize shorelines, streambanks and steep slopes from damaging erosion

  The City and MPRB will continue to engage in bank and slope stabilization for priority waterbodies through their respective Capital Improvement Programs. Wherever possible, natural appearance of a shoreline will be preserved. And where repairs are necessary, the City will encourage the use of bioengineering, landscaping and preservation of natural vegetation as a means of stabilizing the shoreline.

  1. The City will continue to participate in bank and slope stabilization.
  2. Funding mechanisms may vary by project and partners.
  3. Responsibilities may vary based on cooperative agreements with watersheds for maintaining slopes and banks.

- Examine opportunities to optimize buffers as component of Park planning efforts

Maintain and/or improve the quality of the City's surface waters

- Use innovative lake management approaches (e.g., barley straw, in-lake wetland planting of deltas)
- Inspect stormwater outfalls for erosion and repair in accordance with NPDES Stormwater Permit
- Inspect bridges for scour
- Cooperative with other water resource public agencies

Appendix D
Environmental Pool Plans for the Mississippi River

The Environmental Pool Plans are a result of cooperative efforts among state and federal agencies and the public to help develop common habitat goals and objectives for the Upper Mississippi River. They are intended to serve as a guide to habitat management sequencing in the St. Paul District of the Corps of Engineers and a way to reverse negative trends in habitat quality toward a sustainable ecosystem.

Though Pool Plans are available for Pools 1-10 from Minneapolis to Guttenberg Iowa, only Pool 1 and 2 are discussed here due to their relevance to the City of Minneapolis. Included in this discussion is a summary of the descriptions of Pool Areas 1 and 2 and actions proposed to meet desired future goals.

Opportunities and Visions

Just as awareness of the recreational, aesthetic and habitat potential of the Upper Mississippi is on the rise, extensive redevelopment opportunities in Minneapolis seem to be increasing. Stormwater treatment, improved water quality and habitat restoration and protection are some of the priorities that are emerging.

Regional parks as well as private ownership are recognizing the importance of natural shoreline and native vegetation. As a result, a number of strategies, including short-term drawdown to expose the buried rapids or construction of a parallel channel to mimic the once existing rapids, are being considered.

Existing commercial navigation is a constraint around which a number of possible management strategies are being considered. Elimination of commercial navigation would allow for permanent drawdown and increase opportunities for the establishment of fringe flora and fauna communities. However, this would be unlikely in the foreseeable future due to additional impacts on hydroelectric power generation as well as concerns about the fate of the large amounts of exposed sediment.

Pool 1

Pool 1 results from an impoundment of the Mississippi River about 2 miles upstream of Fort Snelling, at river mile 847.6. Lock and Dam 1, also known as the Ford Dam and originally as the Twin Cities Dam, includes the reach of river from Coon Rapids, at river mile 866.2, to Lock and Dam 1. The reach includes two other locks and dams, the Upper and Lower St. Anthony Falls at river miles 854 and 853.9, respectively. The drainage area to Pool 1 includes about 1,500 acres, of which Minneapolis occupies a large part.

Pool 1 is entirely within Minneapolis/St. Paul and has a large corridor of open space and habitat for both aquatic and terrestrial plant and animal communities. A large portion of the corridor is publicly owned and forms a large north-south wildlife corridor. Much of the area is parkland and managed by the respective park boards of the two cities.

Two of the three distinct areas defined within Pool 1 are located within City boundaries:

- **I-694 Bridge to Upper St. Anthony Falls Lock and Dam** upstream portion is characterized by a wooded shoreline, lawns and high banks. Land use downstream is mostly industrial, commercial and residential with significantly more impervious surface than the upstream segment. Shingle Creek is the significant tributary entering the river in this segment. The City of Minneapolis water intake structure and treatment plant are located here and serve about 500,000 people.

- **Mississippi Gorge** extends from Upper St. Anthony Falls to Lock and Dam 1. Along this stretch, the river drops 73.6 feet, the steepest drop found on the entire length of the Mississippi. Originally, rapids that provided critical spawning grounds for fish dominated this segment of the river. These rapids are now submerged and covered by sand deposition upstream of the Ford Dam. Bassett Creek enters the Mississippi just below the Upper St. Anthony Falls via an underground tunnel. The gorge area is bordered on either side by steep, wooded slopes and rock cliffs. Water extends from shore to shore with very little room on either side for wildlife species or human recreation.

Pool 2

Pool 2 results from the impoundment of the river by Lock and Dam 2 at Hastings. This is the most engineered section of the river in the St. Paul District. Pool 2 extends from Lock and Dam 1 at river mile 847.6 to Lock and Dam 2 at river mile 815.2. A large number of communities are located along this stretch of river, including Minneapolis. The Pool 2 drainage area encompasses about 9,652 acres.

Pool 2 represents a significant corridor of open space, aquatic areas and floodplain forests that offer unique habitat for both plants and animals. The Minnesota River is the only significant tributary to the Mississippi within the Pool 2 area that has a strong influence on the size and water quality of the Mississippi. Smaller tributary creeks that contribute are: Minnehaha, Phalen, Fish and Battle Creeks.

Significant floodplain lakes exist along the Minnesota and Mississippi Rivers in this segment.

Two of the five distinct areas defined within Pool 2 are partially located within Minneapolis:

- The first sub-area known as the **Minnesota River Valley** includes the Minnesota River upstream from Savage to its confluence with the Mississippi River. The segment includes the Black Dog Power Plant, Fort Snelling State Park and the Minnesota Valley National Wildlife Refuge.

- The second sub-area, known as the **Gorge Area,** begins from Lock and Dam 1 to the confluence of the Minnesota and the Mississippi Rivers. This is a continuation of the Gorge area in Pool 1. The river flows through a steep sided gorge over once existing rapids. A former flowing channel of the Minnesota River now called Snelling Lake enters at the upstream end of Pike Island. Bluffs along the gorge provide habitat for migratory birds.

Potential Actions to Achieve Future Goals

Implementation of the Environmental Pool Plans for Pools 1 and 2 will bring the Mississippi River's ecosystem to a sustainable state by reestablishing the desired flow regime and habitat structure.

Planning guidelines to be considered through the process are:

1. Locks and dams will exist for the life of this plan
2. Public involvement and awareness are critical components for implementation of the plan
3. Implementation is dependent on adequate funding and personnel
4. The reach and pool plans will continue to be revised and updated
5. Social values and issues will affect habitat management decisions

The **goals** identified in the Pool Plans are as follows:

1. Improve water quality
2. Reduce erosion, sediment and nutrient impacts
3. Restore natural floodplain to allow for more habitat diversity
4. Provide for seasonal flood pulses and periodic low flow conditions
5. Restore backwater channel connectivity
6. Manage side channels; create islands, shoals and sandbars
7. Manage channel maintenance and dredged material placement
8. Sever pathways for exotic species
9. Provide native fish passage at dams

In order to meet the nine goals that have been identified in the Pool Plans, five **primary tasks** are required:

1. Promote watershed management programs on tributary streams
2. Manage for more natural water levels by restoring or mimicking the natural range of variations that would occur seasonally
3. Restore native plant communities along the riparian corridor
4. Modify or remove non-essential infrastructure
5. Further improve the quality of effluents discharged into the river upstream

Local Level Action

The goals listed in the Environmental Pool Plans can be achieved through committed cooperation from the municipalities, watershed management organizations, and neighborhood and non-profit groups interested in working toward a responsible and sustainable riparian urban corridor. Some actions that, if taken at the municipal and watershed level, will help further these goals are:

- Freeing the floodplain of manmade encumbrances and restoring floodplain through acquisition or conservation easements
- Increasing diversity and abundance of floodplain vegetation
- Reducing sediment and nutrient input to the Mississippi River through both structural and non-structural best management practices (BMPs)
- Providing shoreline protection both at the river and tributary/creek level
- Making land use changes where appropriate
- Protecting, managing and developing prairie and wet meadow communities
- Managing floodplain plant communities to eradicate exotic species
- Implementing management recommendations to stop the spread of aquatic exotics

Appendix E
Lake Assessments

Bassett Creek Water Management Commission

In addition to Bassett Creek, the other water bodies in Minneapolis that fall within the Bassett Creek watershed are Spring Lake, Birch Pond and Wirth Lake (see Table 4.21). The City of Minneapolis recently designed, funded and constructed a large flood control pond at 29th and Logan Avenue North that serves both a flood control and water quality purpose.

Current Status: TSI for lakes in the Bassett Creek Watershed are presented in Table E-1. Spring Lake is a type 5 wetland affected by highway salt runoff. Limited water quality data is available for Spring Lake. Birch Pond is not included in the MPRB monitoring program.

Table E-1 Trophic State Index Trends for Lakes in the Bassett Creek Watershed

Water Body	1998	1999	2000	2001	2002	2003	2004
Spring Lake	ID	ID	ID	ID	76	68	ID
Birch Pond	NS	NS	NS	NS	NS	NS	NS
Wirth Lake[1]	61	60	58	57	55	55	56

Note: Wirth Lake is monitored by MPRB (it is not within the City of Minneapolis)

NS = Not sampled

ID = Insufficient Data

(Source: MPRB)

Assessment Methodology and Standards: The BCWMC conducts routine monitoring of its water resources. Due to distinctions between use and expectation for various water bodies, the BCWMC classifies water bodies according to their expected use and corresponding water quality necessary to support that use. Table E-2 outlines the desired uses. Level I water bodies require the highest water quality. Levels II, III and IV require successively lower water quality to support their intended uses.

Table E-2 Definition of Management Classification According to Desired Uses

Level	Definition
Level I	Water-based recreational activities including swimming, scuba diving and snorkeling fully supported
Level II	Appropriate for all recreational uses, such as sailboating, water skiing, canoeing, wind surfing and jet skiing except full body contact activities
Level III	Supports fishing, aesthetic viewing and observing wildlife
Level IV	Generally intended for runoff management and has no significant recreational value

(Source: BCWMC)

Table E-3 - Management Classification of Major Water bodies in the Bassett Creek Watershed.

Table E-3 Definition of Management Classification According to Desired Uses

Waterbody	Management Classification
Birch Pond	Level III
Wirth Lake	Level I
Bassett Creek (Mississippi River to Medicine Lake)	Level III

(Source: BCWMC)

In addition to classifying water bodies according to their intended use, the BCWMC has set specific water quality goals for each lake or stream. In order to meet these goals, the watershed considers development review a major component of its management strategy. The watershed's development review policy is seen as a way of controlling the amount of phosphorus and suspended sediment that may enter a waterbody through runoff.

Minnehaha Creek Watershed District

With the exception of Lake of the Isles, the rest of the lakes that form the Minneapolis Chain of Lakes (i.e., Cedar, Brownie, Calhoun and Harriet) have maintained good water quality over the last five years. In general the Chain of Lakes shows a general trend of increasing transparency over recent years. Among the lower watershed lakes, Lake Nokomis shows improvement in concentration of total phosphorus and Chlorophyll-a. Included among lakes of poorer water quality is Diamond Lake. The water quality in Diamond Lake results from its shallowness and wetland tendencies. Lake and watershed management and water quality improvements have either improved water quality or arrested further deterioration in most cases.

A summary of diagnostic studies carried out on the Chain of Lakes since the 1980s is the Minneapolis Chain of Lakes Phase I – Diagnostic Report (MPRB, 1991-1993). It provides detailed information on monitoring efforts carried out by the MPRB as well as various consultants over time. According to the report, watershed areas of lakes are typically 40-45% impervious, and 14% of rainfall over a Chain of Lakes watershed ends up as runoff. In the Phase I diagnostic study, loading rates were estimated as shown in Table E-4.

Table E-4 Loading Rates (kg/ha/year) for Chain of Lakes Watershed

Land Use	Total Nitrogen	Total Phosphorus	Ortho-phosphorus
Residential	2.52	0.54	0.22
Green Space	1.59	0.13	0.03
Commercial/Mixed	2.61	0.41	0.15

(Source: MPRB)

Assessment Methodology and Standards: A number of goals and recommendations have been developed to protect water quality in the Chain of Lakes. They are presented in Table E-5.

Table E-5 Goals for Chain of Lakes Watershed

Goal #	Identified Goal
Goal 1	Increase public awareness of water quality issues
Goal 2	Protect public health and safety
Goal 3	Reduce in-lake pollutants
Goal 4	Reduce pollutant loadings through implementation of best management practices
Goal 5	Improve government management
Goal 6	Monitor lake water quality and management practices effectively

(Source: MPRB)

MPRB calculates trends in average TSI over time for all the lakes. Based on this, the lakes were placed in three categories:

- Lakes showing water quality improvement
- Lakes showing stable water quality
- Lakes showing water quality degradation

The classifications are presented in Table E-6.

Table E-6 Trophic State Index Trends for Lakes in the Minnehaha Creek Watershed

Lakes Showing Water Quality Improvement	Lakes with Stable Water Quality	Lakes Showing Water Quality Degradation
Cedar Lake	Brownie Lake	—
Lake Calhoun	Lake Hiawatha	—
Lake Harriet	Lake of the Isles	—
—	Lake Nokomis	—
—	Powderhorn Lake	—

Note: Brownie Lake has too few data points for long term trend analysis. *(Source: MPRB)*

As part of the 1993 Minneapolis Chain of Lakes Phase I – Diagnostic Report (MPRB, 1991-1993), both short term and long term goals were developed for some of the water bodies in the Chain of Lakes (Table E-7):

Table E-7 Short and Long Term Goals for Some of the Water Bodies in the Chain of Lakes

Lake	Mean Summer TP (ug/L)		Mean Summer Secchi (m)		Mean TSI Value	
	Short term (3-5 years)	*Long term (5-10 years)*	*Short term (3-5 years)*	*Long term (5-10 years)*	*Short term (3-5 years)*	*Long term (5-10 years)*
Brownie	35	35	1.4	1.4	55	55
Cedar	30	25	1.6	1.9	53	51
Isles	45	40	1.1	1.2	59	57
Calhoun	30	25	1.6	1.9	53	51
Harriet	22	20	2.2	2.4	49	47

(Source: MPRB)

Similar to the MPRB system of assigning a TSI to every lake, the MCWD has established a system of assigning lake grades to show how a lake measures compared with other area lakes (see table E-8.) The method was developed by the Met Council, and combines the same three water quality measurements used to estimate the TSI: total phosphorus, chlorophyll-a, and Secchi disk transparency. In addition, the grades consider what is average or normal for lakes in a given area, making lakes within the seven-county metro area comparable in terms of the grades assigned.

Table E-8 Lake Water Quality Report Card Grade Ranges and Descriptions

Grade	Percentile	Description
A	Top 10%	Crystal clear, beautiful. Exceptional and are enjoyed recreationally without hesitation.
B	10-30%	Generally good water quality but algae may limit swimming toward the end of summer.
C	70-90%	Average quality. Swimming, boating and fishing may be undesirable relatively early in the season.
D	Lowest 10%	Severe algae problems. No interest in recreational use.
F		Not enjoyable. Severe limitations to recreational use.

(Source: MCWD)

Lake grades for the Minneapolis Lakes in the MCWD for 2002 are listed in Table E-9.

Table E-9 Water Quality Grades for Lakes in the Minnehaha Creek Watershed

Lake	2002 Grade	2005 Grade
Brownie Lake	————	————
Lake Calhoun	A	A
Cedar Lake	B+	B+
Lake Harriet	A	A
Lake of the Isles	C	B-
Lake Hiawatha	C+	B-
Lake Nokomis	C	C+

(Source: MCWD)

Due to the strong correlation of depth with water quality, the MCWD sorted the lakes into three major groups according to maximum depth. The MCWD then developed generalized goals for the lakes based on lake depth as follows:

Lake Depth (meters)	Target Phosphorus Concentrations (ug/L)
>20	30
5-20	50
<5	90

With non-degradation as the goal for lakes that currently have higher water quality than the generalized goals presented above, specific target in-lake phosphorus concentrations have been developed. The MCWD does not have a lake management classification system based on use as some of the other watershed management organizations do. Target in-lake phosphorus concentrations are updated as necessary through a fairly in-depth process of citizen input and waterbody assessment. The most recently updated target phosphorus concentrations are listed in Table E-10.

Table E-10 Target Phosphorus Concentrations for Lakes in the Minnehaha Creek Watershed

Lake	Target phosphorus concentration[2] (ug/L)	Long-term mean phosphorus concentration[1] (ug/L)	Meets target phosphorus concentration (Y/N)
Brownie Lake	35	90	N
Lake Calhoun	25	30	Y
Cedar Lake	25	25	Y
Lake Harriet	20	20	Y
Lake Hiawatha	50	147	N
Lake of the Isles	40	57	N
Lake Nokomis	50	67	N
Powderhorn Lake	120	150	N
Diamond Lake	90	174	N

[1] 1980-1990 data from City of Minneapolis NPDES Permit Application for MS4s
[2] Data from MCWD 2003

MCWD identified Diamond Lake as being of poorer quality than most due to its shallowness and due to the fact that it is a wetland. According to the MNDNR, nearly all basins in the watershed have problems related to urbanization. The MCWD has addressed this concern by setting restrictive water quality standards for development and developing a capital improvement program that emphasizes improving water quality in a number of high priority lakes.

Mississippi River Watershed Organization

Loring Pond is a shallow (maximum depth is 4 meters) euthrophic lake that primarily receives overland flow from adjacent park areas. It is composed of two basins, with the northerly originally a wetland. In 1997, a number of water quality improvements were undertaken at Loring Pond. In 1997 the pond was drained and lined with bentonite to reduce the loss of water. The pond shoreline and island were well seeded with native vegetation species. In 1998, a lake aeration system was installed and native shoreline vegetation was restored. The pond has consistently maintained high algal levels over the monitoring period as seen from the TSI shown in Table E-11. The primary stormwater input into Loring Pond is local runoff.

Table E-11 Trophic State Index Trends for Lakes in the Mississippi Watershed

Water Body	1998	1999	2000	2001	2002	2004
Loring Pond	63	71	73	71	70	65

(Source: MPRB)

Bridal Veil Creek and Kasota Pond are located at the eastern edge of the City within the MWMO. Most of Bridal Veil Creek runs underground through culverts. Kasota Pond and adjacent land are polluted from chemical runoff due to adjacent industrial activities. The site is listed as hazardous and is designated for remediation in the near future.

Shingle Creek Watershed Management Commission

Shingle Creek's July 2004 draft Water Quality Plan includes no changes to the classification system described above. The Plan does state that upon creation of management plans for each lake, that specific BMPs would be revised to that lake's specific management goals.

The SCWMC Watershed Management Plan sets specific numeric goals for Total Phosphorus, Chlorophyll-a, and Secchi depth. For Ryan Lake the goal for TP is 35-45ppb, Chl-a is 10-18 ppb, and Secchi depth is 1.1 to 1.4 meters. Webber Pond is not one of the lakes recognized by the SCWMC.

Table E-12 presents data collected by the MPRB for Webber pond. Webber Pond is a shallow pond (maximum depth is 2 meters) adjacent to Shingle Creek. It receives runoff from surrounding park areas and has achieved stable water quality over time.

Ryan Lake was only recently added to the MPRB monitoring program. Ryan Lake was monitored by the Citizen's Assisted Monitoring Program (CAMP) run by the MCES in 2003.

Table E-12 Trophic State Index Trends for Lakes in the Shingle Creek Watershed, Based on MPRB Monitoring

Water Body	1998	1999	2000	2001	2002	2004
Webber Pond	51	46	56	61	62	67
Ryan Lake	ID	ID	ID	ID	ID	ID

Note ID = insufficient data. Ryan Lake is only partially within Minneapolis (eastern shore). It was included in MPRB monitoring as of 2002. A limited number of water quality parameters were sampled. A TSI is not available for Ryan Lake at this time. *(Source: MPRB)*

Information on the MPRB monitoring program can be obtained in the annual MPRB Water Resources Report.

The SCWMC's First Generation Management Plan identified the following classification scheme (Table E-13) for water bodies within the City of Minneapolis:

Table E-13 Classification Scheme for Water Bodies in Minneapolis Under the Jurisdiction of SCWMC

Recreational Group	Aesthetic Group	Runoff Management Group
Ryan Lake	DNR Protected Waters	- Judicial ditches - County ditches - All wetlands including DNR Protected Wetlands and all water bodies other than DNR Protected Waters
Webber Pond	DNR Protected Waters	- Judicial ditches - County ditches - All wetlands including DNR Protected Wetlands and all water bodies other than DNR Protected Waters

(Source: SCWMC)

The classification scheme was used to designate appropriate BMPs for those water resources. These BMPs include:

- Recreational Group: Inflow treated with BMPs, including removal of fine sands and sediment, skimming of oil and floatable materials, and nutrient removal.
- Aesthetic Group: Same BMPs as above except for nutrient removal. Waters may be used for runoff management as long as state water quality standards are not violated and flow and elevations are controlled.
- Runoff Management Group: Managed as stormwater storage and conveyance components. BMPs implemented where reasonable and prudent.
- Special Purpose Group: Treatment as necessary to maintain the characteristics necessary to support the special purpose. No special purpose areas were designated.

Summary Tables

Table E-14 303(d) List of Impaired Lakes in Minneapolis

Lake	DNR Lake #	Affected Use	Pollutant or Stressor	Target Start// Completion	Category[1]
Powderhorn	27-0014	Aquatic recreation	Excess nutrients	2003//2006	5A
Powderhorn	27-0014	Aquatic consumption	Mercury1FCA	2006//2021	5A
Harriet	27-0016	Aquatic consumption	Mercury1FCA	1999//2011	5C
Hiawatha	27-0018	Aquatic recreation	Excess nutrients	2003//2006	5C
Nokomis	27-0019	Aquatic recreation	Excess nutrients	2003//2006	5A
Nokomis	27-0019	Aquatic consumption	Mercury1FCA	1999//2011	5A
Nokomis	27-0019	Aquatic consumption	PCB FCA	2002//2015	5A
Diamond	27-0022	Aquatic recreation	Excess nutrients	2003//2006	5C
Calhoun	27-0031	Aquatic consumption	Mercury1FCA	1999//2011	5C
Crystal	07-0034	Aquatic Recreation	Excess Nutrient	2006/2007	5C
Wirth	27-0037	Aquatic recreation	Excess nutrients	2011//2016	5A
Wirth	27-0037	Aquatic consumption	Mercury1FCA	1999//2011	5A
Brownie	27-0038	Aquatic recreation	Excess nutrients	2003//2006	5A
Brownie	27-0038	Aquatic consumption	Mercury1FCA	1999//2011	5A
Cedar	27-0039	Aquatic consumption	Mercury1FCA	1999//2011	5C
Lake of the Isles	27-0040	Aquatic recreation	Excess nutrients	2003//2006	5A
Lake of the Isles	27-0040	Aquatic consumption	Mercury1FCA	1999//2011	5A
Ryan	27-0058	Aquatic recreation	Excess nutrients	2003//2005	5C

Note: The absence of a waterbody from the 303d List does not necessarily mean the reach is meeting its designated uses. It may be that the reach has either not been sampled or there are not enough data to make an impairment determination.

[1]Category 1: all designated uses are meeting water quality standards

Category 2: some uses are meeting water quality standards and there are insufficient data to assess other uses

Category 3: there are insufficient data to assess any uses

Category 4: at least one use is impaired, but a TMDL is not required

4A: Impaired, but a TMDL study has been approved by EPA

4B: Impaired, but a TMDL study is not required because water quality standards are expected to be met in the near future

4C: Impaired, but a TMDL study is not required because the impairment is not caused by a pollutant

4D: An assessment unit is impaired or threatened but doesn't require a TMDL because the impairment is due to natural conditions with only insignificant anthropogenic influence. To be considered "insignificant", the elimination of the anthropogenic influence would not lead to the attainment of water quality standards and it would not be included in formal pollution reduction goal-setting activities. A reach-specific water quality standard based on local natural conditions has yet to be determined. Upon determination, the assessment unit will be considered non-impaired for the natural conditions and re-categorized to an appropriate category

Category 5: at least one use is impaired and a TMDL is required. These become the List of impaired waters

5A: Impaired by multiple pollutants and no TMDL study plans are approved by EPA

5B: Impaired by multiple pollutants and some TMDL study plans are approved by EPA

5C: Impaired by one pollutant and no TMDL study plan is approved by EPA

FCA: Fish Consumption Advisory

Table E-15 Trophic State Index Ranges

TSI	Trophic State	Description
> 55	Eutrophic	Highly fertile or productive, abundance of algae and high phosphorus levels, low clarity
40–55	Mesotrophic	Less productive due to lower nutrient availability, less algal growth and clearer water
< 40	Oligotrophic	Least productive of the lakes, least algae and clearest water

(Source: MPRB)

Table E-16 Average Carlson Trophic State Index Scores (TSI) for Minneapolis lakes.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Brownie	NS	NS	55	55	55	56	58	ID	ID	ID	ID	58	NS	58
Calhoun	54	59	50	46	48	47	43	48	47	46	46	43	43	40
Cedar	54	54	62	52	58	51	45	43	45	47	48	48	49	47
Diamond	NS	67	59	66	71	60	68	73	67	71	68	60	71	73
Grass	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	77	80	61
Harriet	47	50	45	47	51	52	43	47	49	48	45	44	45	43
Hiawatha	NS	58	58	57	59	59	58	58	59	65	58	59	58	60
Isles	55	64	65	58	59	55	52	56	56	53	58	59	62	58
Loring	NS	60	59	61	65	65	NS	63	71	73	71	70	69	65
Nokomis	NS	65	57	60	58	61	60	58	60	61	60	57	57	64
Powderhorn	NS	66	68	66	68	69	75	73	73	75	72	70	63	68
Spring	NS	NS	NS	62	64	67	76	ID	ID	ID	ID	76	69	NS
Webber	NS	58	57	58	58	59	49	51	46	56	61	62	67	67
Wirth	NS	63	63	64	61	57	59	61	60	58	57	55	55	57

ID = insufficient data; NS = not sampled *(Source: MPRB)*

Appendix F
Impaired River and Streams

TableF-1 303(d) List of Impaired Rivers and Streams in Minneapolis

Reach	River Assessment ID	Affected Use	Pollutant or Stressor	Target Start// Completion	Category[1]
Bassett Creek; Medicine Lake to Mississippi River	07010206-538	Aquatic Life	Fish IBI	20006//2009	5C
Minnehaha Creek; Lake Minnetonka to Mississippi River	07010206-539	Aquatic Life	Fish IBI	2005//2007	5C
Mississippi River; Coon Cr to Upper St. Anthony Falls	07010206-509	Aquatic consumption	Fecal Coliform	2008//2011	5A
Mississippi River; Coon Cr to Upper St. Anthony Falls	07010206-509	Aquatic consumption	Mercury[1]FCA	1999//2011	5A
Mississippi River; Coon Cr to Upper St. Anthony Falls	07010206-509	Aquatic consumption	PCB FCA	2002//2011	5A
Mississippi River; Upper St. Anthony Falls to Lower St. Anthony Falls	07010206-513	Aquatic consumption	Mercury[1]FCA	1999//2011	5A
Mississippi River; Upper St. Anthony Falls to Lower St. Anthony Falls	07010206-513	Aquatic consumption	PCB FCA	2002//2015	5A
Mississippi River; Lower St. Anthony Falls to Lock & Dam #1 (RM 853.3 to RM 847.6)	07010206-503	Aquatic recreation	Fecal coliform	2008//2015	5A
Mississippi River; Lower St. Anthony Falls to Lock & Dam #1 (RM 853.3 to RM 847.6)	07010206-503	Aquatic consumption	Mercury[1]FCA	1999//2011	5A
Mississippi River; Lock & Dam #1 to Minnesota R	07010206-514	Aquatic consumption	Mercury[1]FCA	1999//2011	5A
Mississippi River; Lock & Dam #1 to Minnesota R	07010206-514	Aquatic consumption	PCB FCA	2002//2015	5A
Shingle Creek (County Ditch 13); Headwaters to Mississippi R	07010206-506	Aquatic life	Chloride	2002//2006	5A
Shingle Creek (County Ditch 13); Headwaters to Mississippi R	07010206-506	Aquatic life	Invertebrate IBI	2013//2015	5A
Shingle Creek; Headwaters to Mississippi R Shingle Creek (County Ditch 13); Headwaters to Mississippi R	07010206-506	Aquatic life	Low Oxygen[2,5]	2004//2006	5A

Note: The absence of a water body from the 303d List does not necessarily mean the reach is meeting its designated uses. It may be that the reach has either not been sampled or there are not enough data to make an impairment determination.

Source: MPCA Draft List of Impaired Waters, 2006

[1]*Category 1: all designated uses are meeting water quality standards*

Category 2: some uses are meeting water quality standards and there are insufficient data to assess other uses

Category 3: there are insufficient data to assess any uses

Category 4: at least one use is impaired, but a TMDL is not required

- *4A: Impaired, but a TMDL study has been approved by EPA*
- *4B: Impaired, but a TMDL study is not required because water quality standards are expected to be met in the near future*
- *4C: Impaired, but a TMDL study is not required because the impairment is not caused by a pollutant*
- *4D: An assessment unit is impaired or threatened but doesn't require a TMDL because the impairment is due to natural conditions with only insignificant anthropogenic influence. To be considered "insignificant", the elimination of the anthropogenic influence would not lead to the attainment of water quality standards and it would not be included in formal pollution reduction goal-setting activities. A reach-specific water quality standard based on local natural conditions has yet to be determined. Upon determination, the assessment unit will be considered non-impaired for the natural conditions and re-categorized to an appropriate category*

Category 5: at least one use is impaired and a TMDL is required. These become the List of impaired waters

- *5A: Impaired by multiple pollutants and no TMDL study plans are approved by EPA*
- *5B: Impaired by multiple pollutants and some TMDL study plans are approved by EPA*
- *5C: Impaired by one pollutant and no TMDL study plan is approved by EPA*

FCA: Fish Consumption Advisory

Appendix G
Monitoring Activities

Type of Work	Date	Responsible	Description
Monitoring			
Audubon Cooperative Sanctuary (ACS) Golf Course Certification Monitoring	Ongoing	MPRB	Water quality monitoring of select water bodies; vegetation monitoring at Wirth and Meadowbrook golf courses
Wetland Health Evaluation Monitoring (WHEP)	2003-ongoing	MPRB/MPW	Plant and invertebrate species diversity at: - Theodore Wirth Golf Course Site - Amelia Pond at Lake Nokomis - Roberts Bird Sanctuary - Grass Lake
Stormwater BMP Monitoring	2002-ongoing	MPRB/MPW	Inlet and outlet pipe discharge monitoring for TP, TKN, TDP, TDS, TSS among others
Wetland Health Evaluation Monitoring (WHEP)	2002-ongoing	WHEP/MPRB	Plant and invertebrate species diversity at various sites
NPDES Monitoring	2000-ongoing	MPRB/MPW	- Outfall monitoring - Runoff and water quality monitoring for different land uses
Constructed Wetlands Monitoring for Pollutant Removal and Performance Assessment	1999-2001	MPRB/MCES	- Cedar Meadows - SENA wetland - Lake Harriet subsurface flow wetland
Watershed Outlet Monitoring	1998-ongoing	MPRB/MCES/ MCWD/BCWMC	Flow monitoring and water quality sampling at Minnehaha Creek and Bassett Creek
Mississippi Watershed Management Organization Monitoring Program	ongoing	MWMO	Monitoring at 6 locations along the Mississippi River, 5 stormwater outfalls and Loring Pond. Monitors for fecal coliform, and *E. coli* at all points. Also monitors various physical and chemical parameters at the stormwater outfalls.
Survey and Assessment			
Macroinvertebrate Surveys on Bassett Creek, Minnehaha Creek, Shingle Creek	ongoing	River Watch/ VSMP/BCWMC/ MCWD/SCWMC	Completed by trained volunteers
Nine Lakes TMDL Study	2006	MCWD	Six of those lakes are within Minneapolis: Brownie Lake, Diamond Lake, Lake of Isles, Lake Hiawatha, Lake Nokomis and Powderhorn Lake; Study includes monitoring information of the lakes, allocation of sources of pollutants, in-lake modeling, and TMDL determination.
Ryan Lake TMDL Study	2005	SCWMC	Monitoring information of the Ryan Lake
Shingle Creek Chloride	2005	SCWMC	Spatial extent, persistence, and severity of chloride exceedances, identification and quantification of the sources of chloride in Shingle creek including point and nonpoint sources, allocation of Shingle Creek's assimilative capacity to both point and nonpoint sources and development of safety margins protective of State water quality standards
Function and Value Assessment of all Wetlands in District	2003	MCWD	Complete assessment of all wetlands within the Minnehaha Creek Watershed
Hydrologic and Hydraulic Study	2000	MCWD	Assessment of loading (water volume as well as nutrient/pollutant loading) to Minnehaha Creek , inadequate definition of floodplain

Type of Work	Date	Responsible	Description
			zones, and the direction of the District's regulatory system
Land Cover Classification and Management Plan for Theodore Wirth Park and Minnehaha Creek Corridor	2000	MPRB/DNR	Inventory of existing land cover at Wirth Park and Minnehaha Creek Corridor
Above the Falls: A Master Plan for the Upper River in Minneapolis	1999	MPRB/Hennepin County/Mpls Planning/MCDA	Master land use plan, includes restoration of natural areas
Powderhorn Park Restoration Project (Diagnostic Study and Implementation Plan)	1999	MPRB/MPW	Assessment of lake and development of a work plan that led to many of the Powderhorn Lake improvements
Minneapolis Chain of Lakes Clean Water Partnership	1994-2001	MPRB/MCWD/ Minneapolis/St. Louis Park/MPCA	Comprehensive watershed study of the Minneapolis Chain of Lakes
Diamond Lake Vegetation Survey	1994 – recur (2)	MPRB	Documentation of plant species and their area extent to evaluate plant species diversity
Vegetation Management			
Eurasian Milfoil harvesting at Calhoun, Cedar, Harriet and Isles	ongoing	MPRB	Top 2 meters of milfoil plants removed
Purple Loosestrife control in problem areas of the park system: Wirth and Birch (2001) Calhoun, Cedar, Harriet and Isles (2002)	ongoing	MPRB/DNR	- Spraying and biological control: Introduction and monitoring of leaf-feeding beetles as a bio-control for purple loosestrife control - Spraying selected problem areas in the park system
Buckthorn, Mulberry, Garlic Mustard, Poison Ivy and Honeysuckle control	1998-ongoing	MPRB	Management through education and removal in park system problem areas of park system
Shingle Creek Natural Area Management Plan	2002	MPRB	Land cover classification priority areas and creek erosion assessment
Improvements			
Powderhorn Lake Barley Straw Treatments	2004-2006	MPRB	Treatments to improve water clarity
Powderhorn Lake Alum	2003	MPRB	Injection of a specified amount of Al_2SO_4 in the lake
Powderhorn Lake Restoration	2002	MPRB/MPW	- Installation of 5 CDS units - Sluiceways along the sides replaced with storm drains - Shoreline plantings - Replacement and stabilization of walkway on eastern shore
Powderhorn Lake Aeration System Installed	2002	MPRB	Summer aeration in addition to winter aeration for better oxygenation of water and to help control release of phosphorus from bottom sediment
Powderhorn Lake Retaining Wall	2002	MPRB	Retaining wall restored
Inflatable Weir at Lake Nokomis	2002	MCWD	An inflatable weir was installed between Lake Nokomis and Minnehaha Creek to prevent flow from entering the lake from the creek during low flows
Lake Nokomis Wetlands	2001	MPRB	Construction of the wetlands to capture contaminated runoff prior to its entry into Lake Nokomis and downstream waters
Minnehaha Creek Shoreline Restoration	2001	MPRB/MCWD	A stretch of creek was converted to a natural meander with an adjacent wet pond
Lake Nokomis North Shoreline Restoration	2001	MPRB	Tree cover thinned, placement of wave protection barriers in lake, installation of emergent aquatic vegetation in littoral zone, planting of prairie

Type of Work	Date	Responsible	Description
Minnehaha Creek Trail Corridor	2001	MPRB	Shoreline erosion repairs, construction of channel meander and adjacent wetland, placement of vortex treatment structures upstream of wetland at Cedar Avenue
Lake Hiawatha Shoreline and Littoral Area Revegetation	2001	MPRB	Two shoreline and littoral areas at the lake were revegetated, littoral emergent plants and upland wet-to-dry prairie plants introduced
Cedar Meadows Structure Maintenance	2001	MCWD	Structure maintenance
Wirth Lake Aerator	2001	MPRB/DNR	Temporary baffle aerator replaced with permanent pump and baffle aerator
Lake Harriet and Lake Calhoun Alum Treatment	2001	MPRB/U of M/ MCWD/ MPCA	381 tons of Al_2SO_4 placed in Lake Harriet and 1575 tons of alum placed in Lake Calhoun to limit algae growth by reducing available phosphorus
Lake Nokomis Carp Removal	2001	MCWD	Removal of carp to limit phosphorus
Lake Nokomis/Hiawatha Blue Water Partnership	2000-2001	MPRB/MPW/ MCWD	- Construction and planting of three wetlands/ponds at Lake Nokomis, installation of new lake outlet structure, and placement of two vortex treatment units in watershed - Construction of detention basins/wetlands within the major subwatersheds to Lake Hiawatha
Lake Calhoun and Lake of the Isles Grit Chambers	1999	MPRB/MPW	Grit chambers have been installed and will continue being installed until 2004
Lake Harriet Delta Shoreline Improvement	1999	MPRB	Sediment reworked to create a delta and 3 small islands that act as a micropool that slows down stormwater runoff entering the lake and provides habitat for birds
Southwest Calhoun Wetlands	1999	MPRB/MCWD	Construction of wet detention basins/wetlands within the major subwatersheds of the lake
Cedar Lake and Lake of the Isles Goose Removal	1998-ongoing	MPRB/U of M	Goose removal program to limit phosphorus started with Clean Water Partnership project
Lake of the Isles and Lake Calhoun Shoreline Repair	1998-1999	MPRB	Shoreline repairs to prevent erosion; native plantings
Minnehaha Creek Channel Modifications/Erosion Management	1998	MCWD	Hydrologic modeling of creek flows in the lower basin of MCWD under severe runoff conditions. Identification of reaches of creek with severe erosion problems. Channel modification plan
Regional Wetland Restoration	1998	MCWD	Restoration of significant acres of drained wetlands on multiple sites
SENA Wetland	1997	MPRB	Wetlands constructed to remove nutrients and debris from runoff entering Minnehaha Creek
Lake Harriet Subsurface Flow Wetland	1997	MPRB	Wetland constructed to treat stormwater runoff before it enters Lake Harriet
Regional Water Quality Detention Storage	1997-2000	MCWD	Construction of regional wet detention basins/wetlands, expansion of existing storage areas to remove sediment, phosphorus, and other pollutants
Cedar Lake and Lake of the Isles Alum Treatment	1996-1997	MPRB	Alum treatment to limit algae growth by reducing available phosphorus
Cedar Meadows Wetland	1995	MCWD	Wetlands constructed to improve water quality in Cedar Lake

Appendix H
Studies and Reports Inventory

Over 100 plans and studies have been written that inventory, monitor, analyze, and/or set policy that affect water resources in Minneapolis. Table H-1 is an index to the reports that are listed in the remainder of this Appendix.

Table H-1 Index to Minneapolis Water Resource Studies and Reports

Report	Page	Responsible Organization
Management Plans		
Water Resources Management Policy Plan	H-5	Metropolitan Council
Regional Recreation Open Space Policy Plan	H-5	Metropolitan Council
Metropolitan Council Blueprint 2030 (2002)	H-6	Metropolitan Council
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SCWMC Annual Report	H-6	Shingle Creek Watershed Management Commission
SCWMC Second Generation Management Plan Draft (2003)	H-6	Shingle Creek Watershed Management Commission
BCWMC Annual Report	H-7	Bassett Creek Watershed Management Commission
BCWMC Second Generation Management Plan Draft (2004)	H-7	Bassett Creek Watershed Management Commission
Wirth Lake Watershed and Lake Management Plan (1996)	H-7	Bassett Creek Watershed Management Commission
Bassett Creek Main Stem Watershed Management Plan (2004)	H-7	Bassett Creek Watershed Management Commission
Bassett Creek Park Pond Watershed Management Plan (2004)	H-7	Bassett Creek Watershed Management Commission
MWMO Watershed Management Plan (2000)	H-8	Mississippi Watershed Management Organization
Shingle Creek Natural Area Management Plan	H-8	Minneapolis Park and Recreation Board
Minneapolis Chain of Lakes Implementation Plan: Clean Water Partnership Phase I Project (1993)	H-8	Minneapolis Park and Recreation Board
Water Quality Management Citizens Advisory Committee Report and Recommendations (1993)	H-8	Citizens Advisory Committee
Monitoring and Assessment Reports		
MCES Aquatic Resource Assessment (2003)	H-9	Metropolitan Council
Watershed Outlet Monitoring Program (WOMP2)	H-9	Metropolitan Council
MCES 2001 Stream Monitoring Report	H-9	Metropolitan Council
Bassett Creek Monitoring (2001)	H-10	Metropolitan Council
Minnehaha Creek Monitoring Information (2001)	H-10	Metropolitan Council
Study of Lake Water Quality of the 145 Metropolitan Lakes (1980-present)	H-10	Metropolitan Council
Upper Mississippi (1994 – present)	H-11	United States Geographical Survey
Shingle Creek TMDL (1996)	H-11	United States Geographical Survey

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Diamond Lake Watershed Monitoring and Modeling Projects: 2005	H-11	Minnesota Department of Transportation
Citizens Lake Monitoring Program (1996-present)	H-12	Minnesota Pollution Control Agency
Citizen Stream – Monitoring Program (1998-2003)	H-12	Minnesota Pollution Control Agency
Environmental Data Access	H-12	Minnesota Pollution Control Agency
305b Assessments of Stream Conditions in Minnesota's Major River Basins (1998-2001)	H-13	Minnesota Pollution Control Agency
305b Lake Listings (2000-2002)	H-13	Minnesota Pollution Control Agency
Water Quality Reconstruction from Fossil Diatonics Applications for Trend Assessment, Model Verification and Development of the Nutrient Criteria for Lakes in Minnesota, USA	H-13	Minnesota Pollution Control Agency
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Macroinvertebrate Monitoring	H-15	Shingle Creek Watershed Management Commission
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Bassett 1992 Storm Monitoring Study	H-16	Bassett Creek Water Management Commission
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2005 Lake Water Quality Study	H-16	Bassett Creek Water Management Commission
A Biotic Index Evaluation of Bassett Creek and Plymouth Creek: 2000	H-16	Bassett Creek Water Management Commission
Wirth Lake Watershed and Lake Management Plan: 1996	H-16	Bassett Creek Water Management Commission
2003 and 2004 Water Quality Study of Wirth Lake (MPRB) and Bassett Creek	H-16	Bassett Creek Water Management Commission
Powderhorn Park Restoration Plan: 1999	H-16	Minneapolis Park and Recreation Board
Theodore Wirth Park and Minnehaha Creek Corridor Land Cover Classification and Management Plan: 2000	H-16	Minneapolis Park and Recreation Board
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2003 and 2004 Fish Stocking Information (Annual Report)	H-21	Minneapolis Park and Recreation Board
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Shingle Creek Water Quality Data (NAWQA, 1995)	H-27	United States Geological Survey
Minnesota Wetland Conservation Manual (2003)	H-27	Minnesota Board of Water and Soil Resources (BWSR)

Report	Page	Responsible Organization
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2003 Draft Storm Water Sewer Infrastructure Report	H-28	City of Minneapolis
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Minneapolis Lakes and Parks: Proceedings of a Special Session	H-29	Minneapolis Park and Recreation Board

Management Plans

Metropolitan Council (Met Council)

Water Resources Management Policy Plan (2005, periodically updated)

Coverage: Twin Cities Metro Area
http://www.metrocouncil.org/planning/environment/WRMPP/WRMPP2005.htm

The Plan presents the Met Council's water resources strategy with regard to issues of water quality, wastewater service and water supply. It outlines the Met Council's reliance on a watershed focus to control pollution from point (specific) and non-point (diffuse) sources, bringing together agencies and organizations in partnerships for collaborative planning and implementation. This document outlines the Met Council's intent to develop a program of baseline data and measures to mark the progress in meeting water quality objectives. It lists collaborative goal-setting, joint action and coordination as the strategy to achieve water quality efforts through region-wide partnerships.

Regional Recreation Open Space Policy Plan (2001, periodically updated)

Coverage: Twin Cities Metro Area
http://www.metrocouncil.org/planning/parks/2005/2030RegionalParksPolicyPlan.pdf

The Open Space Policy Plan discusses existing issues facing the regional system and others that may come up in the future if preventive actions are not taken now. The policies and directives it contains are specific actions that should be taken as a response to the issues. Taken as a group, the policies express the Met Council's most basic views as to what the regional recreation open space system should be, now and in the future. Significant policy changes and additions are: siting and acquisition; finance; recreation activities and facilities; planning and system protection. A five-year capital improvement program (CIP) is included as an integral part of an adopted *Regional Recreation Open Space Policy Plan*.

Metropolitan Council Blueprint 2030 (2002)

Coverage: Twin Cities Metropolitan Area
http://www.metrocouncil.org/planning/blueprint2030/documents.htm

The Blueprint lays out a framework for growth that reduces stress on the natural environment, improves commutes and strengthens communities in addition to saving tax dollars. Blueprint 2030 emphasizes on growth near transit corridors, mixed land uses, population responsive housing stock, protection of natural areas, reinvesting in the urban core, preservation of rural character and collaboration to achieve these goals.

Minnehaha Creek Watershed District (MCWD)

MCWD Water Resources Management Plan (509 Plan, 1997)

Coverage: Minnehaha Creek WD Water Resources Management Plan *(509 Plan*)

The Water Resources Management Plan, also known as the 509 plan was developed as required by rules and policies promulgated by the Board of Water and Soil Resources (Minnesota Rules Chapter 8410). It includes an inventory of land and water and biological resources and land use patterns within the District. The Plan looks at surface water systems and ground water in general, and at lakes within the District and associated water quality issues. Also discussed are the results of modeling done by the District on two distinct hydrologic basins within the watershed. The first, or "Upper Basin", consists of that part of the watershed from Gray's Bay dam on Lake Minnetonka to the western boundary of the District. The second, or "Lower Basin", includes the area east of Gray's Bay dam that is drained by Minnehaha Creek to the Mississippi River. Each basin was analyzed to define overall watershed response to individual storms and help quantify runoff rates and volumes on a District-wide basis. The Plan discusses flooding issues as well as stormwater quantity and quality issues faced within the District. In the implementation part of the Plan, solutions, standards, controls and priorities are considered. The District also outlines its goals and policies and lays out the regulatory authority structure of the District and the Municipalities. A Capital Improvement Program is included at the end with projects following a prioritization ranking.

Shingle Creek Watershed Management Commission (SCWMC)

Annual report (Published annually, synopsis not available)

Coverage: SCWMWMC area of jurisdiction
http://www.shinglecreek.org/waterquality.pdf

Second Generation Management Plan Draft (2003)

Coverage: Shingle Creek WMO area of jurisdiction
http://www.shinglecreek.org/mgmtplan.shtml

The Plan, adopted in May 2004, describes how the Shingle Creek and the West Mississippi Watershed Management Commissions will address activities in the two

watersheds during a 10-year period from 2003-2012. It includes an updated land and water resources inventory, a detailed description of the hydrologic system for Districts, as well as water quantity and quality modeling results. Management issues, and goals for the period from 2003-2012 are identified for both Districts, as well as priorities and strategies are outlined. An estimated budget and Capital Improvement Plan are included at the end.

Bassett Creek Watershed Management Commission (BCWMC)

Annual Report (Published annually)

Coverage: Bassett Creek WMO area of jurisdiction
http://www.bassettcreekwmo.org/2004%20Annual%20Report/2004%20cover%20page.htm

The report is in accordance with the Annual Reporting Requirements as set forth in the Minnesota Rules Chapter 8410.0150. The report consists of a description of goals and activities in 2004 and work plan for 2005. Water quality monitoring data and information on capital improvements is included in the appendix.

Second Generation Management Plan (2004)

Coverage: Bassett Creek WMO area of jurisdiction
http://www.bassettcreekwmo.org/2nd%20Generation%20Plan/bcwmc%202nd%20generation%20plan/Contents.htm

The Bassett Creek Water Management Commission (BCWMC) Watershed Management Plan (Plan) sets the vision and guidelines for managing surface water within the boundaries of the BCWMC. It covers the location, history, goals, policies and implementation tasks of the BCWMC.

Wirth Lake Watershed and Lake Management Plan (1996, synopsis not available)

Coverage: Wirth Lake
http://www.bassettcreekwmo.org/Wirth%20Lake%20Feasibility%20report.pdf

Bassett Creek Main Stem Watershed Management Plan (2004, synopsis not available)

Coverage: Bassett Creek
http://www.bassettcreekwmo.org/2nd%20Generation%20Plan/Final%20Plan%20September%202004/TOC.htm

Bassett Creek Park Pond Watershed Management Plan (2004, synopsis not available)

Coverage: Bassett Creek
Not online at this time

Mississippi Watershed Management Organization (MWMO)

Watershed Management Plan *(2000)*
Coverage: MRWO area of jurisdiction
http://www.mwmo.org/plan.pdf

The MWMO (the Plan) is intended to meet and, whenever possible, exceed the water resource protection requirements under 33 Minnesota Statutes 103A through 103G in conformance with Minnesota Rules Chapters 8410 and 8420. The document includes a land and water resources inventory with description of important lakes, ponds and wetlands. This is followed by assessment of water quality, water quantity and erosion and sedimentation problems. The plan elaborates on the mission of the MWMO and its goals. The implementation plan focuses on three approaches: policies and standards, projects, and programs. Included at the end is a 10-yr capital plan for proposed improvements.

Minneapolis Park and Recreation Board (MPRB)

Shingle Creek Natural Area Management Plan (July, 2002)

Coverage: Shingle Creek *Corridor*

The Minneapolis Park and Recreation Board completed an ecological inventory, stream analysis and trails and interpretive opportunities assessment for the Shingle Creek Corridor, Humboldt Greenway and parts of the North Mississippi Regional Park. Potential areas for recreation and management strategies were identified and recommendations made for stream and trail improvements.

Minneapolis Chain of Lakes Implementation Plan: Clean Water Partnership Phase I Project (1993)

Coverage: Minneapolis
Not Available Online

The Phase I project had three goals. The first goal was to investigate the impact of surface water runoff on the Chain of Lakes. Next, the project analyzed the storm water loads of fifteen sub watersheds that contribute to Lake Harrier. Finally, the plan assessed the impact of storm water on the Chain of Lakes water quality. The study found that the quality of the lakes degraded form 1950 to 1960 but has remained stable since the 1960's.

Citizen's Advisory Committee

Water Quality Management Citizens Advisory Committee Report and Recommendations (1993)

Coverage: Minneapolis
Not Available Online

The Citizen's Advisory Committee made recommendations on how the City of Minneapolis could improve water quality. The recommendations included public education suggestions, and a monitoring and action program. The report set water

quality goals for lakes. The goals were intended to be obtainable and would also restore lake quality to pre-build conditions.

Monitoring and Assessment Reports

Metropolitan Council (Met Council)

Metropolitan Council Aquatic Resource Assessment (2003)

Coverage: Twin Cities Metro Area
http://www.metrocouncil.org/planning/environment/ara_report.pdf

The report consists of a GIS-based assessment used to evaluate selected physical, biological, and cultural indicators for surface water resources in the Twin Cities Metropolitan Area (TCMA). The results from this assessment are relative rankings of the regional importance of the region's surface water resources for various purposes (i.e. water supply, recreation, ecological). This represents an important platform from which policy and management issues can be discussed.

Watershed Outlet Monitoring Program (WOMP 2)

Coverage: Minnehaha Creek and Bassett Creek and Shingle Creek
http://www.metrocouncil.org/environment/RiversLakes/Streams/StreamResults.htm

The Metropolitan Area Watershed Outlet Monitoring Program (WOMP) was implemented in early 1998. The new WOMP program expanded the existing MCES stream-monitoring network in the metro area. Seven new watershed outlet monitoring sites were established in seven watersheds. These included both the Minnehaha Creek monitoring station, (located at 32nd Avenue South and Minnehaha Parkway) and the Bassett's Creek monitoring station, (located at 100 Irving Avenue North, near the Minneapolis Impound Lot). The Minnehaha Creek and Bassett's Creek WOMP stations are used to continually monitor the discharge level and water chemistry of the creeks over time. This data can be used to assess the effects of stormwater runoff from the surrounding watershed. It also allows natural resource managers to track changes in each creek through long term data collection, as well as document differences between creeks in the metro area with varying watershed characteristics. Details of the 2001 monitoring can be found in this report.

Metropolitan Council Environmental Services (MCES) 2001 Stream Monitoring Report

Coverage: Twin Cities Metropolitan Area
http://www.metrocouncil.org/environment/RiversLakes/Streams/Reports/CoverIntroFormat.pdf

This report presents results from monitoring conducted by the MCES and its partners at 28 stations on 26 streams in the Twin Cities Metro Area (TCMA) and in the vicinity of Mankato. The purpose of the monitoring is to determine the extent of non-point source pollutant loading from tributaries to the Mississippi, Minnesota, and St. Croix

Rivers. This would provide the information necessary for the development of target pollutant loads for these tributary watersheds, and to evaluate the effectiveness of watershed best management practices for reducing non-point source pollution and improving water quality in streams and rivers. The streams are monitored during significant runoff events, such as snowmelt and heavy rainfalls, and during base flow conditions, to help determine the sources and extent of non-point sources of pollution.

Bassett Creek Monitoring (2001)

Coverage: Bassett Creek in Minneapolis
http://www.metrocouncil.org/environment/RiversLakes/Streams/Reports/Bassett.pdf

The report is the result of a partnership between MCES, the Minneapolis Park and Recreation Board and the Bassett Creek Watershed Management Commission. Stream flow and precipitation on the site were monitored, and water samples collected and analyzed for a number of variables including nitrate, total phosphorus (TP), zinc, cadmium, total dissolved solids (TDS), total suspended solids (TSS) and volatile suspended solids (VSS). Loadings and flow weighted mean concentrations for TSS, TP, dissolved phosphorus and nitrate are included in the report.

Minnehaha Creek Monitoring Information (2001)

Coverage: Minnehaha Creek in Minneapolis
http://www.metrocouncil.org/environment/RiversLakes/Streams/Reports/Minnehaha.pdf

MCES supported water quality monitoring at Minnehaha Creek has been taking place since 1999. The monitoring station is located in Minneapolis, 1.7 miles upstream from the creek confluence with the Mississippi River near Fort Snelling. Stream flow and macro-invertebrate populations were monitored. Water samples were collected and analyzed for a number of variables including nitrate, total phosphorus (TP), zinc, cadmium, total dissolved solids (TDS), total suspended solids (TSS) and volatile suspended solids (VSS). Loadings and flow weighted mean concentrations for TSS, TP, dissolved phosphorus and nitrate are included in the report.

Study of Lake Water Quality of the 145 Metropolitan Lakes (1980- present)

Coverage: Twin Cities Metro Area
http://www.metrocouncil.org/environment/RiversLakes/Lakes/04FullREPORT.pdf
http://www.metrocouncil.org/environment/RiversLakes/Lakes/04ExecSum.pdf

This report is the latest in a continuing series of reports summarizing results of the Metropolitan Council's "Citizen-Assisted Monitoring Program" (CAMP). Since 1980, volunteers have collected surface water samples from area lakes on a biweekly basis from mid-April to mid-October. The samples are analyzed for total phosphorus, total kjeldahl nitrogen, and chlorophyll-a. Lakes are assigned water quality grades based on the results of the sampling (List of lake samples may change every year, list for

2004 is available, Ryan Lake which is partially in Minneapolis has been monitored in 1996, 1998 and 2000 through this program).

United States Geological Survey (USGS)

Upper Mississippi *(1994-present)*
Coverage: Upper Mississippi River from Itasca to Lake Pepin
http://mn.usgs.gov/umis/index.html

Studies have been conducted by the USGS since 1994 in the Upper Mississippi River Basin from Itasca to the outlet at Lake Pepin. Nutrients, sediment, major ions, organic carbon, pesticides, trace metals, semi-volatile organic compounds, and volatile organic compounds are routinely monitored. The goal is to describe the status of, and trends in, the quality of the nation's streams and rivers. Surface water, ground water and aquatic biology studies are included under this program. Special studies, data, publications and maps are available at the web site.

Shingle Creek TMDL (1996)

Coverage: Shingle Creek
http://water.usgs.gov/nawqa/informing/tmdls.html

USGS collected chemical and biological samples in Shingle Creek as part of the national Water-Quality Assessment (NAWQA) Program. The assessment surfaced a chloride problem that led to the inclusion of Shingle Creek in the state list of impaired waters.

United State Army Corps of Engineers (USACE)

Environmental Pool Plans – Mississippi River Pools 1-10(2004)

http://www.mvp.usace.army.mil/rrf/eppfinal.pdf

The Environmental Pool Plans are a result of cooperative efforts among state and federal agencies and the public to help develop common habitat goals and objectives for the Upper Mississippi River. They are intended to serve as a guide to habitat management sequencing in the St. Paul District of the Corps of Engineers and a way to reverse negative trends in habitat quality toward a sustainable ecosystem. The project area includes 11 pools (Pools 1 through 10, and 5A) within the Upper Mississippi River System from Minneapolis, Minnesota, to just south of Guttenberg, Iowa; the lower 14.7 miles of the Minnesota River; and the St. Croix River upstream to Stillwater, Minnesota.

Minnesota Department of Transportation

Diamond Lake Watershed Monitoring and Modeling Projects: 2005

Coverage: Diamond Lake
Not available Online

The MNDOT is planning on constructing I-35W/Crosstown Commons Improvements. This goal of the Diamond Lake Report was to evaluate the pollutant loading to Diamond Lake from current land users in the watershed. Then, a water quality model of the area was developed. Finally, the report evaluated lake protection scenarios that may be implemented during the MNDOT project. The lake protection scenarios include diverting some flows from Diamond Lake to a new treatment pond, installing a series of treatment manhole structures, and routing flow to Lake Mead for treatment.

Minnesota Pollution Control Pollution Control Agency (MPCA)

Citizens Lake Monitoring Program (1996 - present)

Coverage: Twin Cities Metro and surrounding area
http://www.pca.state.mn.us/water/clmp-publications.html

The MPCA's Citizen Lake-Monitoring Program (CLMP) is ongoing since 1973. Lakes are monitored through voluntary participation of citizens residing on or near lakes or those who are frequent lake users. Weekly transparency measurements are recorded and archived in a STORET database. This information is used to deduce water quality of a lake and to estimate the amount of algae (chlorophyll a) and nutrient (phosphorus) status of a lake. Reports from all years can be found at the website.

Citizen Stream-Monitoring Program (1998-2003)

Coverage: Twin Cities Metro and surrounding area
http://www.pca.state.mn.us/water/csmp-reports.html

The MPCA's Citizen Stream-Monitoring Program (CSMP) began in 1998. Reports from all years are available at the website and include transparency readings as well as recreational suitability rankings.

Environmental Data Access

http://www.pca.state.mn.us/data/eda

The EDA initiative was created by the Minnesota Legislature in 2001 to address those deficiencies in the availability of surface water quality data from MPCA and others. In 2003, EDA went online providing access to water quality data through a map-based system. Air quality data becomes available in 2004. Ground water data will also be available through the EDA system in 2005.

305b Assessments of Stream Conditions in Minnesota's Major River Basins (1998– 2001)

Coverage: All of Minnesota
http://www.pca.state.mn.us/water/basins/305briver.html

Stream assessments were prepared, by the Minnesota Pollution Control Agency (MPCA) under Section 305b of the Clean Water Act to estimate the extent to which Minnesota waterbodies meet the goals of the Clean Water Act (CWA) and attain state

water quality standards, and share this information with planners, citizens and other partners in basin planning and watershed management activities. Under each river/stream, information is available on the uses, indicators of impairment and suspected pollutant sources.

305b lake listings (2000-2002)

Coverage: All of Minnesota
http://www.pca.state.mn.us/water/basins/305blake.html

Lake assessments are prepared under Section 305b of the Clean Water Act to estimate the extent to which Minnesota waterbodies meet the goals of the CWA and attain state water quality standards, and share this information with planners, citizens and other partners in basin planning and watershed management activities. Under each lake, information is available on the uses, indicators of impairment and suspected pollutant sources. Lakes are also assessed for the swimmable goal of the CWA.

Water Quality Reconstruction from Fossil Diatonics Applications for Trend Assessment, Model Verification and Development of the Nutrient Criteria for Lakes in Minnesota (September 2002)

Coverage: All of Minnesota
http://www.pca.state.mn.us/publications/reports/lakes-wqdiatoms.pdf

This study conducted a diatom reconstruction of historical phosphorous and chloride concentrations and sediment accumulation rate, based on sediment cores from 55 lakes in MN. The historical data used sediment cores from 1995 – 1998 and section data from as early as 1750. The data provides an opportunity for examining temporal and spatial trends in eutrophication, validating eutrophication models, and providing historical perspective for developing nutrient criteria.

Department of Natural Resources (DNR)

Regionally Significant Ecological Areas (RSEA) (2003)

Coverage: Seven county metro area
http://www.dnr.state.mn.us/rsea/metro_assessment.html

The DNR Central Region conducted a landscape-scale assessment of the seven-county metro area to identify ecologically significant terrestrial and wetland areas

Minnehaha Creek Watershed District

Functional Assessment of Wetlands (FAW) (2003)

Coverage: Minnehaha Creek Watershed District
Not available online at this time

Functional Assessment of Wetlands within the MCWD was developed to provide a comprehensive inventory and assessment of existing wetland functions within the MCWD. The project also provides comprehensive wetland resource data to improve wetland management throughout the District. The plan includes:

- A field inventory of all wetlands greater than 0.25 acres in size
- A functional assessment of all wetlands greater than 0.25 acres in size
- A digital photograph of each wetland greater than 0.25 acres in size
- The establishment of reference wetlands within the entire watershed, each major subwatershed, and each municipality
- Identification and evaluation of potential wetland restoration opportunities
- Identification of critical wetland resources
- Management of all wetland functional assessment data in a Microsoft Access© database
- Development of a GIS wetland data management system
- Recommendations for classifying wetland management standards and criteria

Calhoun Wetland Pond: 1999 Performance Report

Coverage: Calhoun Wetland Pond
Not available online at this time

The Calhoun Wetland Pond Performance Report monitored flow in Lake Calhoun and three tributary ponds. The report was intended to document the success of pollutant removal from Lake Calhoun. The report compared modeled removal results against actual measured impact and concluded that the actual impact exceeded the modeled report results by 66%.

Shingle Creek Watershed Management Commission

Stream monitoring program (Conducted annually)

Coverage: Shingle Creek
http://www.shinglecreek.org/waterquality.pdf

Monitoring has been taking place on Shingle Creek since 1996. The program comprises of monitoring at the upper watershed and the outlet. The outlet monitoring site is located at 45th Ave. and Shingle Creek. Stream stage is recorded and samples are collected at regular intervals from March to November. Samples are analyzed for: TP, DP, VSS, COD and chloride. Estimates for pollutant loading are available for the period sampled.

Macroinvertebrate Monitoring (conducted annually since 1996)

Coverage: Shingle Creek
http://www.minneapolisparks.org/documents/caring/WQ_Annual_2002/2002WR_8.pdf

A macroinvertebrate survey was chosen to assess the health of Shingle Creek. The study is important to understand the effects of changes in the urban environment both on Shingle Creek and the Mississippi River. Three sites are currently monitored on Shingle Creek, with one in Minneapolis. The macroinvertebrate sampling was done twice on Shingle Creek in 2002; results of this monitoring are reported on the MPRB website.

Rapid Bioassessment Sampling (1996, updated in 1997 {fish sampling not included})

Coverage: Two reaches of Shingle Creek
http://www.shinglecreek.org/waterquality.pdf

Biological sampling and habitat assessment was conducted in the Shingle Creek to analyze invertebrate (i.e., insects, mollusks, and crustaceans) community composition and diversity. The information obtained has been used to compare existing conditions to historical conditions within the creek and the watershed, and for documenting potential water quality and biological problems. Three sites were sampled including Queen Ave. (in Minneapolis) for abundance and diversity of invertebrate and fish species. Stream habitat and biologic diversity were also evaluated.

Shingle Creek Channel Profile Survey (1998, synopsis not available)

Coverage: Shingle Creek
http://www.shinglecreek.org/waterquality.pdf

A profile survey and an inspection of Shingle Creek was performed, noting erosion, blockages, bank failures, and the need for repairs as well as the conveyance capacity of the channel. Local communities constructed improvements where necessary

Bassett Creek Water Management Commission

Bassett 1992 Stormwater Monitoring Study *(Synopsis not available)*

A Biotic Index Evaluation of Bassett and Plymouth Creeks: 1995 *(Synopsis not available)*

2005 Lake Water Quality Study *(Synopsis not available)*

http://www.bassettcreekwmo.org/2005%20Bassett's%20Lakes%20Report.pdf

A Biotic Index Evaluation of Bassett Creek and Plymouth Creek: 2000 *(Synopsis not available)*

http://www.bassettcreekwmo.org/2000%20Biotic%20Index%20Figure.pdf

Wirth Lake Watershed and Lake Management Plan: 1996

(not available on-line)

2003 and 2004 Water Quality Study of Wirth Lake (MPRB) and Bassett Creek

http://www.bassettcreekwmo.org/Wirth%20Lake%20Feasibility%20report.pdf

Minneapolis Park and Recreation Board

Powderhorn Park Restoration Plan: 1999

(not available on-line)

Theodore Wirth Park and Minnehaha Creek Corridor Land Cover Classification and Management Plan: 2000

(not available on-line)

2003 and 2004 Lake Water Quality (1991-present)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=922

The report contains data and results resulting from lake monitoring undertaken by Minneapolis Park and Recreation, wherein, scientists monitored 13 of the city's lakes. The data collected were used to estimate the fertility, or trophic state, of the lakes. Trophic State Index (TSI) numbers are calculated using lake water transparency, chlorophyll-a levels and phosphorus levels. Using this information, changes in lake water quality can be tracked as well as used by lake managers to assess improvement or degradation in water quality. Data from the studies can be used to predict problems likely to occur and decide management strategies most effective for improving the recreational quality and ecological health of the lakes. Lakes monitored include: Brownie, Calhoun, Cedar, Diamond, Harriet, Hiawatha, Isles, Loring, Nokomis, Powderhorn, Spring, Webber, Wirth.

According to recent reports, Calhoun, Cedar and Wirth Lakes showed strong water quality improvement trends, Lake of the Isles and Webber Pond also showed an improvement in water quality over the last 11 years, but it was a weaker trend; Hiawatha showed a decline in water quality, but it was a weak trend; Powderhorn Lake showed a strong decline in water quality. Due to insufficient data, trend in water quality for Spring Lake and Brownie Lake could not be determined

Minneapolis Chain of Lakes Project. Minnesota Clean Water Partnership Program Project Implementation Grant 941-2-059-27 (1997-2000)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/documents/caring/Chain_Water_Pro.pdf

The report is a culmination of multi-lateral effort involving the City, watersheds, neighboring cities, and agencies known as The Minneapolis Chain of Lakes Clean Water Partnership project. The project is focused on developing a plan for improving and preserving four lakes: Cedar Lake, Lake of the Isles, Lake Calhoun, and Lake

Harriet. Water quality, especially nutrient loading and algal blooms, is a concern due to the extensive use of these lakes for recreation.

The report describes the process used to assess lake water quality through monitoring, diagnostic studies, as well as user perception. A large part of the report is dedicated to results from the monitoring done by the Minneapolis Parks and Recreation Board. Overall goals and objectives are described in detail along with a description of the implementation plan and recommended BMPs to improve water quality. The report list a chronological summary of project activities by program element at the end.

Minneapolis Storm Water Wetlands Monitoring Report Twin Cities Water Quality Initiative (1991-2001)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/documents/caring/WQ_Annual_2001/7%20Wetlands%20Monitoring%20Report.pdf

The Minneapolis Park & Recreation Board received a grant from the Metropolitan Council of the Twin Cities to monitor the effectiveness of constructed wetlands (1991-2002).

This report is the culmination of that work, providing an overview of the project and results. This study documents the effectiveness of three wetland systems, namely Cedar Meadows, SENA and the Lake Harriet Subsurface Flow (SSF) wetland for treating storm water runoff in Minneapolis.

These constructed systems were monitored to determine their treatment efficiencies and flow characteristics. Sections in the document are segmented into annual work product results and project summarization.

2003 and 2004 Water Quality Projects (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

The report provides a description of water quality projects completed by the City of Minneapolis and the Minneapolis Park and Recreation Board. Some of the projects listed are: shoreline restoration at Lake Nokomis and Bassett Creek near Fruen's Mill; shoreline and littoral vegetative restoration at Lake Hiawatha; installation of an aerator and baffle at Lake Wirth; the Chain of Lakes Clean Water Partnership Project which included alum treatments at Lakes Harriet and Calhoun; installation of grit chambers at Powderhorn Lake; construction of wetland at Lake Nokomis and installation of the new lake outlet structure, placement of two vortex treatment manholes in the watershed and removal of unwanted species of fish; biological control of purple loosestrife at selected sites in the City and milfoil harvesting on Calhoun, Cedar, Harriet and Isles in 2001.

2003 and 2004 Lake Trophic State Report (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

From 1999-2004 the Minneapolis Park and Recreation Board monitored 13 City's lakes. Transparency, chlorophyll-a and phosphorus data was collected and used along with a mathematical formula to estimate the trophic state of the lake. It was found that all the lakes in the City fell into either the mesotrophic or eutrophic category as is expected of lakes in fully developed areas. Calhoun, Cedar and Harriet are ` mesotrophic whereas Isles, Weber, Wirth, Hiawatha, Nokomis, Powderhorn and Loring are eutrophic and have higher levels of algae.

2003 and 2004 Phytoplankton-Zooplankton Monitoring (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

As part of the Chain of Lakes study covering Brownie, Cedar, Isles, Calhoun, Harriet, Hiawatha, Nokomis, Diamond, Powderhorn, Loring, Webber and Wirth, biological parameters were routinely measured. Phytoplankton and zooplankton are the two most common biological parameters collected because they form the base of aquatic food web and influence lake clarity and fish production. The study gives insight into the occurrence of algal blooms of late summer and early autumn that impedes recreational uses. Powderhorn was found to have the greatest chlorophyll-a concentrations over the 2001 growing season, Loring and Spring Lake followed in second and third position. Brownie, Calhoun, Cedar, Harriet and the Isles typically had the least.

2003 and 2004 Beach Monitoring (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

The Division of Environmental Health Services at the City of Minneapolis collects samples twice a week from public beaches in the City from June through mid-September. The samples are analyzed for non-pathogenic indicator bacteria to determine if a health risk was present for swimmers. Total coliform bacteria, fecal coliform and fecal streptococcus levels are monitored. Decisions on beach closures are made based on the monitoring results and EPA recommendations. The majority of Minneapolis public beaches were within acceptable limits for body-contact recreation for most of the time the beaches were open.

2003 and 2004 Lake Levels (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

Lake levels are recorded weekly for Calhoun, Cedar, Brownie, Harriet, Hiawatha, Nokomis, Loring, Powderhorn and Wirth lakes from ice out to ice in. The lake level for the Upper Chain of Lakes is taken at Lake Calhoun. Since the lakes are connected, this gives the lake level for Brownie, Cedar, Isles and Calhoun. Lake levels can vary from year to year depending on the amount of rainfall received in spring.

2003 and 2004 Ice out - Ice on dates (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

Ice in, ice out data tracks the date a lake freezes up in the fall and the date it thaws in spring. Ice freezing and thawing affects migration and breeding patterns of birds, food supply of fish and animals and water chemistry. The historical records are not complete and the coverage varies by lake, Lake Calhoun with the most data and Diamond Lake with the least.

2003 and 2004 Summary of NPDES Monitoring

Coverage: City of Minneapolis (*some sites in St. Paul*)
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

Five sites in Minneapolis and St. Paul were monitored for runoff and water quality between March and November as part of the NPDES Phase I requirements. Samples were analyzed for a large number of parameters including: TSS, TDS, TKN, TN and trace metals. Event mean concentrations were calculated using FLUX and P8. Sampled data, compared with NURP standards as well from the literature, was found to be fairly typical of urban storm water data.

2003 and 2004 Grit Chamber Monitoring

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

As of 2003, the City of Minneapolis had installed 96 grit chambers to improve water quality of downstream waterbodies. In order to determine the effectiveness of grit chambers, the City monitored the grit chamber that drains to Bassett Creek in Wirth Park in 1998 and 2001.Chemical parameters analyzed were total phosphorus (TP), soluble reactive phosphorus (SRP) , total nitrogen (TN), total kjeldahl nitrogen (TKN, total suspended solids (TSS), total dissolved solids(TDS) as well as trace metals.

The study indicated concentrations leaving the chamber were higher than those coming in. These results suggest that more frequent cleaning of the chamber might be

needed to prevent solubilization of pollutants from the sediments trapped in the chamber.

2003 and 2004 Weather Summary (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

The Minneapolis Parks and Recreation Board (MPRB) records data from 3 tipping buckets rain gages in Minneapolis. In 2001, the MPRB used four of the Ramsey County Soil and Water Conservation District (RCSWCD) manual rain gages and recorded rainfall data with the help of volunteers. Precipitation amounts can vary greatly within a city and recording rainfall data at various sites helps better understand the pattern of rainfall.

2003 and 2004 Fish Stocking Information (annual report)

Coverage: State of Minnesota
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

Fish stocking information for Minneapolis lakes is maintained by the Department of Natural Resources on their website
http:/www.dnr.state.mn.us/lakefind/stocking.html

2004 Wetland Health Evaluation Project (WHEP)

Coverage: Wirth, Diamond and Legion
http://www.minneapolisparks.org/default.asp?PageID=922

http://www.hennepin.us/vgn/portal/internet/hcdetailmaster/0,2300,1273_83222_100256784,00.html

WHEP is a wetland monitoring program coordinated by the Hennepin Conservation District. The program was designed by the MPCA to evaluate wetland health. In 2002, the Minneapolis team (including one MPRB staff member) monitored three wetlands in Minneapolis. The study included vegetation and invertebrate sampling.

Shingle Creek Natural Area Management Plan (2002)

Coverage: Shingle Creek
Not online at this time

The Natural Area management Plan (NAMP) is a collaborative effort involving the MPRB, SCWMC, Hennepin County and City of Minneapolis. The plan presents the results of a natural resource inventory for Shingle Creek corridor and the Humboldt Greenway in Minneapolis. Based on the area assessment recommendations, priority areas for restoration are listed along with management goals.

Minneapolis Chain of Lakes – Phase I Diagnostic Study

Coverage: City of Minneapolis
http://www.minneapolisparks.org/documents/caring/WQ_Annual_2001/1A%20Monitoring%20Program%20Overview.pdf

This study is the largest and most comprehensive attempt to quantify the status of lake water quality and document the impacts of storm water runoff. The ultimate goal of the study was to develop a water quality management plan for the Chain of Lakes that could then be applied to all the surface waters of Minneapolis.

Chain of Lakes Alum-Macrophyte Interaction Assessment

Coverage: City of Minneapolis
Not online at this time

The Chain of Lakes Alum-Macrophyte Interaction Assessment was conducted to investigate and document the efficiency of alum treatment in Lake Calhoun, Lake Harriet, Cedar Lake and the Lake of the Isles. Additional goals of this study were to determine the response of plant community to changes in water quality, determine if any changes affect the internal nutrient loading of the lakes, and to determine if any improvements in clarity will change effectiveness of the watermilfoil biocontrol agent Euhrychiopsis leconetei.

Pesticide Study: Lake Harriet Watershed Site 1 (1992 – 1995)

Coverage: City of Minneapolis
Not online at this time

The Pesticide Study Reports are a collection of data measured at the Lake Harriet Watershed Site 1 from 1992 – 1995. Water and street sweeping samples were taken and analyzed for pesticides. The study also contains hyetographs at Lake Harriet.

City of Minneapolis

Flood Report

Coverage: City of Minneapolis
http://www.ci.minneapolis.mn.us/stormwater/flood-information/index.asp

In response to numerous severe storms experienced by the City of Minneapolis in the summer of 1997, the Department of Public Works studied the resulting flooding and developed a mitigation program. This report presents findings and recommendations of the Minneapolis Public Works, Sewer Design Division for flood mitigation in 39 discrete problem areas of the City.

Standards

Metropolitan Council (Met Council)

Urban Small Sites Best Management Practice Manual

http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm

Minnesota Pollution Control Agency

Protecting Water Quality in Urban Areas

http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html

Minnesota Lake Water Quality Assessment Data

http://www.pca.state.mn.us/water/lakereport.html

Water Quality Standards

http://www.pca.state.mn.us/water/standards/index.html

Minnesota Stormwater Manual

http://www.pca.state.mn.us/water/stormwater/stormwater-manual.html

Minnehaha Creek Watershed District

Minnehaha Creek WD Rules A-N

Coverage: MCWD
http://www.minnehahacreek.org/rules.php

Any person(s) undertaking any activity for which a permit is required must comply with the District Rules as described on the website.

Shingle Creek Watershed Management Commission

Suggested Guidelines for Stormwater Treatment Pond Design Management

Coverage: Shingle Creek WMO area of jurisdiction
http://www.shinglecreek.org/appendixb.pdf

Standards for New Development, Redevelopments, or additions to Existing Developments

Coverage: Shingle Creek WMO area of jurisdiction
http://www.shinglecreek.org/appendixb.pdf

Bassett Creek Watershed Management Commission

Requirements for Improvements and Development Proposals

Coverage: Bassett Creek Water Management Commission
http://www.bassettcreekwmo.org/require/97reptab.htm

Water Quality Management Policy

Coverage: Bassett Creek Water Management Commission
http://www.bassettcreekwmo.org/require/98policytab.htm

The document sets forth the Water Quality Management Policy of the Commission. Part I explains the rationale and strategy of the Bassett Creek Water Management Commission in establishing its Water Quality Management Policy. Management Levels for various waterbodies are identified, and management requirements for each

classification listed. Part II describes the Commission's review process and its specific standards and requirements for construction activities within the watershed.

Capital Improvements Programs

Metropolitan Council (Met Council)

Regional Parks Capital Improvement Program Proposed Projects

Coverage: Twin Cities Metro Area
http://www.metrocouncil.org/directions/parks/parks_projects.htm

Parks and Open Spaces CIP

Coverage: Twin Cities Metro Area
http://www.metrocouncil.org/directions/parks/ParksCIP_2004_2009.pdf

Minnehaha Creek Watershed District

Capital Plan 2003-07 - Projects (only summary available online)

Coverage: MCWD area of jurisdiction
no longer available

City of Minneapolis

Capital Programs

Coverage: City of Minneapolis
http://www.ci.minneapolis.mn.us/city-budget/2005adopted/index.asp#P55_2603

Minneapolis Park and Recreation Board

Current Projects and Funding

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=33

Mississippi Watershed Management Organization

Capital Programs

Coverage: MWMO
http://www.mwmo.org/projects&programs.html

Shingle Creek Watershed Management Commission

2003-2012 Budget (in process)

Coverage: SCWMWMC
http://www.shinglecreek.org/appendixg.pdf

Bassett Creek Watershed Management Commission

CIP Program (in process)

Coverage: BCWMC
http://www.bassettcreekwmo.org/2006_Budget_BCWMC.pdf

Minnehaha Creek Watershed District

Minnehaha Creek Southwest Calhoun Pond Project: A Model Solution

Coverage: Minnehaha Creek area of jurisdiction
http://www.minnehahacreek.org/lake_calhoun.php

Lake Nokomis Wetland Settling Ponds

Coverage: Minnehaha Creek area of jurisdiction
http://www.minnehahacreek.org/lake_nokomis_ponds.php

MCWD H/H Progress

Coverage: Minnehaha Creek area of jurisdiction
http://www.minnehahacreek.org/hh_updates.php

The Blue Water Partnership – History Lakes Cleanup Project History: The Blue Water Commission: Grass Roots Neighborhood Approach

Coverage: Minnehaha Creek area of jurisdiction
http://www.minnehahacreek.org/lake_nokomis_bluewater.php

Chain of Lakes Project

Coverage: Minnehaha Creek area of jurisdiction
http://www.minnehahacreek.org/chain_of_lakes.php

Lake Water Quality

Coverage: Minnehaha Creek area of jurisdiction
http://www.minnehahacreek.org/wq.php

Data

Minneapolis Park and Recreations Board

2001 Minneapolis Lakes Data

Coverage: City of Minneapolis
http://www.minneapolisparks.org/documents/caring/WQ_Annual_2001/Lakes%20Data%20-%202001.pdf

Miscellaneous

Metropolitan Council (Met Council)

Infiltration/Inflow Surcharge

Coverage: Regional
http://www.metrocouncil.org/Environment/ProjectTeams/I-I-Home.htm

CSO Separation Evaluation Report (2002)

Coverage: City of Minneapolis

The purpose for the Combined Sewer Overflow (CSO) Separation Evaluation project was to address concerns of the Metropolitan Council Environmental Services Division

(MCES) and the City of Minneapolis (City): an expiring National Pollution Discharge Elimination System (NPDES) permit for CSOs, an existing national policy for CSOs, pending new regulations for Sanitary Sewer Overflows (SSOs), and the persistence of overflows despite previous efforts to eliminate them.

This project has gathered information relating to the amount of wet weather flow in the sewer system and how the system operates under a variety of wet weather conditions. An intensive study of the flow patterns in the City and the hydraulics of the system completed the investigation. Corrective actions have been developed to reduce overflows at each of the permitted locations based on the findings of this study. The executive summary provides a brief description of the project setting and background, data collection and analysis, objectives and results, and recommendations.

Department of Natural Resources

Water Resources Data

Coverage: State of Minnesota
http://www.dnr.state.mn.us/waters/data/index.html

Water Statutes and Rules

Coverage: State of Minnesota
http://www.dnr.state.mn.us/waters/law.html

Division of Waters Publications

Coverage: State of Minnesota
http://www.dnr.state.mn.us/publications/waters/index.html

Lakes

Coverage: State of Minnesota
http://www.dnr.state.mn.us/ecological_services/lakes.html

Wetlands

Coverage: State of Minnesota
http://www.dnr.state.mn.us/ecological_services/wetlands.html

Rivers and Streams

Coverage: State of Minnesota
http://www.dnr.state.mn.us/ecological_services/rivers.html

Ecological Services Publications

Coverage: State of Minnesota
http://www.dnr.state.mn.us/ecological_services/pubs.html

Shoreland and Floodplain Ordinances

http://www.revisor.leg.state.mn.us/arule/6120/

Shingle Creek Watershed Management Commission

Report on Minneapolis Industrial Park Storm Sewer System for Plymouth, MN (*Not dated, synopsis not available)*

Shingle Creek Inspection Report
Coverage: Shingle Creek

Inspection to identify blockages, bank erosion or other conditions that could potentially cause flooding or water quality problems.

Regional Pond Investigation

Coverage: Shingle Creek Watershed

Identified subwatersheds with little or no water treatment facilities

United States Geological Survey

Shingle Creek Flow and Water Quality Data (NAWQA, 1996-2001)

Coverage: Shingle Creek at Queens Ave. in Minneapolis
http://nwis.waterdata.usgs.gov/usa/nwis/qwdata/?site_no=05288705

Shingle Creek Water Quality Data (NAWQA, 1995)

Coverage: Shingle Creek at 46th Street in Minneapolis
http://nwis.waterdata.usgs.gov/usa/nwis/qwdata/?site_no=05288710

Shingle Creek Water Quality Data (NAWQA, 1996-2001)

Coverage: Shingle Creek

http://nwis.waterdata.usgs.gov/usa/nwis/qwdata/?site_no=450518093201903

Minnesota Board of Water and Soil Resources (BWSR)

Minnesota Wetland Conservation Manual (2003)

http://www.bwsr.state.mn.us/wetlands/wcamanual/wcamanual02.pdf

City of Minneapolis

NPDES Phase I Annual Report (2002)

Coverage: City of Minneapolis

The NPDES annual report provides annual documentation of the City's stormwater management activities designed to meet the requirements of the NPDES Phase I Permit for the current year.

NPDES Phase I Annual Report (2003)

Coverage: City of Minneapolis

The NPDES annual report provides annual documentation of the City's stormwater management activities designed to meet the requirements of the NPDES Phase I Permit for the current year.

2003 Draft Sanitary Sewer Infrastructure Report

Coverage: City of Minneapolis

This is the most up-to-date inventory of the City of Minneapolis sanitary sewer system. The report includes descriptive statistics, conditional ratings and maintenance issues surrounding sanitary sewers. The functionality of the system is discussed as well as system valuation and rehabilitation costs.

2003 Draft Storm Water Sewer Infrastructure Report

Coverage: City of Minneapolis

The report provides descriptive statistics about the status of infrastructure including quantity, age and condition. Financial information on past expenditures, asset valuation, capital improvements and operating budgets is also included. The report also highlights trends and offers policy/programming options and implications.

CSO Annual report (2001)

Coverage: City of Minneapolis

The report details the projects, and activities initiated during the past 2 years in formulating and implementing a long-range plan for total elimination of CSOs in the near future.

CSO Tier II Sewer Plan Update (2002)

Coverage: City of Minneapolis

City of Minneapolis Comprehensive Plan includes as part of the public facility plan requirements, the 1999 Sewer Plan. This document is a sewer policy plan, classified as a Tier II Sewer Plan according to the content requirements in the Met Council's Local Planning Handbook (1998). The plan describes the sanitary sewer system history, features, and current problems; and provides projections of future sewage flows and schedules for improvements. This report updates the Tier II Sewer Plan as well as serves to meet the requirement of the Memorandum of Understanding Relating to Combined Sewer Overflow Elimination Efforts

(MOU) for submittal of an implementation plan for CSO improvements based on the joint study completed in April 2002.

Surface Water Quality Monitoring in the City of Minneapolis

Coverage: City of Minneapolis

This report was prepared jointly by the City of Minneapolis Public Works and the Minneapolis Park and Recreation Board. It gives an overview of surface water monitoring efforts and resulting publications over time in the City of Minneapolis

City of Minneapolis Ordinances

Coverage: City of Minneapolis

http://www.ci.minneapolis.mn.us/cityhall/laws/ordinances/

Minneapolis Park and Recreation Board

Minneapolis Lakes and Parks: Proceedings of a Special Session

Coverage: Minneapolis
Not Available On-Line

This report collected papers form the 16th annual North American Lake Management Society International Symposium on Lake, Reservoir and Watershed Management. Papers included a summary of Minneapolis Parks and Lakes, A summary of MCES monitoring, water quality trends in the City, Watershed-level approaches on lake restoration, a discussion of BMPs, and a discussion on public participation.

Appendix I
Minneapolis Stormwater Management Goals

Adopted. Yeas, 12; Nays none.
Absent - Herron.
Passed February 4, 2000.
Approved February 7, 2000. S. Sayles Belton, Mayor.
Attest: M. Keefe, City Clerk.

T&PW - Your Committee, having under consideration the establishment of stormwater management standards as called for the Stormwater Ordinance, now recommends passage of the accompanying resolution that establishes interim stormwater discharge standards for construction sites of one acre and greater, in accordance with Chapter 54 of the Minneapolis Code of Ordinances (Stormwater Management Ordinance).
Adopted. Yeas, 12; Nays none.
Absent - Herron.
Passed February 4, 2000.
Approved February 7, 2000. S. Sayles Belton, Mayor.
Attest: M. Keefe, City Clerk.

RESOLUTION 2000R-042
By Mead

Establishing interim stormwater discharge standards for construction sites of one acre and greater in accordance with the requirements of Chapter 54 of the Minneapolis Code of Ordinances, Stormwater Management Ordinance.

Resolved by The City Council of The City of Minneapolis:
That the following interim stormwater discharge standards be required for stormwater management on all construction sites greater than 1 acre:

Lake	Stormwater Discharge Goal
Chain of Lakes	
Brownie	10% phosphorus load reduction
Cedar	40% phosphorus load reduction
Lake of the Isles	20% phosphorus load reduction
Calhoun	30% phosphorus load reduction
Harriet	20% phosphorus load reduction
Other Minneapolis Lakes & Wetlands	
Powderhorn	30% phosphorus load reduction
Lake Hiawatha	42% phosphorus load reduction
Lake Nokomis	25% phosphorus load reduction
Loring Park Pond	0% phosphorus load increase
Webber Pond	0% phosphorus load increase
Wirth Lake*	30% phosphorus load reduction
Spring Lake	30% phosphorus load reduction
Crystal Lake**	30% phosphorus load reduction
Diamond Lake	30% phosphorus load reduction
Grass Lake	30% phosphorus load reduction
Birch Pond	0% phosphorus load increase
Ryan Lake	30% phosphorus load reduction
Other wetlands	30% phosphorus load reduction

*Wirth Lake is within the Minneapolis Park system but not within the City limits of Minneapolis
**Crystal Lake is in Robbinsdale and receives stormwater drainage from an area of north Minneapolis

Mississippi River	70% removal of total suspended solids
Minneapolis streams	No increase in runoff rate from project site

Be It Further Resolved that projects not able to comply with the on-site stormwater standards shall be allowed to contribute towards construction of a regional stormwater treatment facility at a rate of $15,000 per acre of runoff that is being discharged from the site.

Be It Further Resolved that the design standards for stormwater treatment devices be those recommended in the Minnesota Pollution Control Agency manual titled **Protecting Water Quality in Urban Areas, Best Management Practices for Minnesota, October, 1989,** and future updates of this manual.

Adopted. Yeas, 12; Nays none.
Absent - Herron.
Passed February 4, 2000. J. Cherryhomes, President of Council.
Approved February 7, 2000. S. Sayles Belton, Mayor.
Attest: M. Keefe, City Clerk.

T&PW - Your Committee recommends passage of the accompanying Resolution establishing uniform assessment rates for street construction and street renovation improvements for the 2000 calendar year.

Adopted. Yeas, 12; Nays none.
Absent - Herron.
Passed February 4, 2000.
Approved February 7, 2000. S. Sayles Belton, Mayor.
Attest: M. Keefe, City Clerk.

RESOLUTION 2000R-043
By Mead

Establishing uniform assessment rates for street construction and street renovation improvements for the 2000 calendar year.

Whereas, the City Council adopted a policy on October 31, 1980 establishing yearly uniform assessment rates for similar improvements at various locations; and

Whereas, the City Council adopted assessment policies on May 22, 1998 and June 12, 1998 relating to residential and non-residential properties and relating to Local and Other streets; and

Whereas, the City Engineer has submitted the recommended 2000 Uniform Assessment Rates, all as contained in Petn No 265573 on file in the Office of the City Clerk;

Now, Therefore, Be It Resolved by The City Council of The City of Minneapolis:

That the following rates are hereby established as the 2000 uniform assessment rates and are to be applied in determining the assessments for the benefited parcels for certain types of work ordered by the City Council in the 2000 calendar year:

Construction (street paving, curb and gutter and other street paving related improvements) - appropriate rate is applied to the land area of benefited parcels located within the street influence zone along the improved street:

$0.95/sq ft - Local - Non-Residential;
$0.95/sq ft - Other - Non-Residential;
$0.37/sq ft - Local - Residential;
$0.296/sq ft - Other - Residential.

Renovation (mill and overlay of street surface and selected curb and gutter and street construction as needed) - appropriate rate is applied to the land area of benefited parcels located within the street influence zone along the improved street:

$0.475/sq ft - Local - Non-Residential;
$0.475/sq ft - Other - Non-Residential;
$0.185/sq ft - Local - Residential;
$0.148/sq ft - Other - Residential.

0 #11

City of Minneapolis

Department of Public Works
David J. Sonnenberg
City Engineer
Director

Brian J. Lokkesmoe
Deputy Director

350 South 5th Street - Room 203
Minneapolis MN 55415-1390

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(612) 673-3759

Property Services
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350 South 5th St. – Room 223
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Solid Waste & Recycling
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(612) 673-2433

Transportation & Parking
G. A. Finstad, Director
350 South 5th St. – Room 233
Minneapolis, MN 55415-1390
(612) 673-2411

Water Works
A. J. Kramer, Director
250 South 4th St. – Room 206
Minneapolis, MN 55415-1330
(612) 673-2418

www.ci.minneapolis.mn.us
Affirmative Action Employer

January 19, 2000

The Honorable Dore' Mead
Chair, Transportation and Public Works Committee
Minneapolis City Council
307 City Hall
Minneapolis, MN 55415

Re: Establishing Interim Stormwater Management Goals

Dear Council Member Mead:

The newly adopted stormwater ordinance (Chapter 54) went into effect on January 1, 2000. The primary purpose of the ordinance is to minimize negative impacts of stormwater runoff rates, volumes and quality on Minneapolis lakes, streams, wetlands and the Mississippi River by guiding future significant development and redevelopment activity, and by assuring long-term effectiveness of existing and future stormwater management facilities. Contained in the ordinance are standards and specifications for construction and maintenance of stormwater controls for all construction projects 1 acre and greater in area. The actual standards that site plans must comply with are to be published in a Minneapolis Stormwater Manual. Interim standards are required until the final stormwater manual is published and approved by the City Council.

Stormwater Management Goals

The Minneapolis Stormwater Ordinance specifies that stormwater management standards be set according to the receiving waterbody. The standards are to include (but not be limited to) reductions of suspended solids for the Mississippi River discharges, controlled rate of runoff for discharges to streams, and a reduction in nutrients for stormwater discharging to lakes and wetlands.

a regional facility. It is proposed that the fee be based on the cost for construction of a City facility. Typical components of a project would include property acquisition, excavation, stormwater structures, landscaping and engineering. Using costs developed in the flood mitigation program, it can be estimated that a pond designed to treat runoff from 100 acres would cost approximately $1,500,000 (this does not include the additional costs to create area for flood mitigation). Therefore for each acre of redevelopment the City's typical cost would be $15,000.

It is recommended that the fee for contribution to a regional facility in lieu of onsite treatment be established at $15,000 for January 1 to December 31, 2000.

Minneapolis Stormwater Manual

In an effort to find funding for the Minneapolis Stormwater Manual, staff solicited partnership with the City of St. Paul and the City of Bloomington. After both cities agreed, then a joint application was made to the Metropolitan Council for funding from their stormwater grant program. The Metropolitan Council agreed that this would be an important project for the entire Twin Cities area and agreed to fund the development of the manual. Instead of awarding the grant to Minneapolis they decided to coordinate the creation of the manual and make the final product available to the entire region. It is expected that the manual will be complete in approximately 18 months.

RECOMMENDATION:

It is recommended that the City Council adopt an ordinance that establishes interim standards for stormwater discharges in accordance with the requirements of the newly adopted Minneapolis Stormwater Management Ordinance, Chapter 54.

Sincerely,

David J. Sonnenberg, P.E.
City Engineer - Director of Public Works

By
Ramankutty Kannankutty, P.E.
Director, Engineering Services

RK:JMP:gb

Report prepared by: Jodi Polzin Phone Number: 673-3626

cc: Michael Orange (Planning)
Jeff Lee (Park Board)
Tom Frame (Inspections)
Bill Dunning (City Attorney)

T&PW – Your Committee Recommends adoption of the following resolution that establishes interim stormwater discharge standards for construction sites of 1 acre and greater in accordance with the requirements of Chapter 54 of the Minneapolis Code of Ordinances, Stormwater Management Ordinance.

MEAD

Establishing interim stormwater discharge standards for construction sites of 1 acre and greater in accordance with the requirements of Chapter 54 of the Minneapolis Code of Ordinances, Stormwater Management Ordinance.

Resolved by the City Council of the City of Minneapolis:

That the following interim stormwater discharge standards be required for stormwater management on all construction sites greater than 1 acre:

Lake	Stormwater Discharge Goal
Chain of Lakes	
Brownie	10% phosphorus load reduction
Cedar	40% phosphorus load reduction
Lake of the Isles	20% phosphorus load reduction
Calhoun	30% phosphorus load reduction
Harriet	20% phosphorus load reduction
Other Minneapolis Lakes & Wetlands	
Powderhorn	30% phosphorus load reduction
Lake Hiawatha	42% phosphorus load reduction
Lake Nokomis	25% phosphorus load reduction
Loring Park Pond	0% phosphorus load increase
Webber Pond	0% phosphorus load increase
Wirth Lake*	30% phosphorus load reduction
Spring Lake	30% phosphorus load reduction
Crystal Lake**	30% phosphorus load reduction

Diamond Lake	30% phosphorus load reduction
Grass Lake	30% phosphorus load reduction
Birch Pond	0% phosphorus load increase
Ryan Lake	30% phosphorus load reduction
Other wetlands	30% phosphorus load reduction

*Wirth Lake is within the Minneapolis Park system but not within the City limits of Minneapolis

**Crystal Lake is in Robbinsdale and receives stormwater drainage from an area of north Minneapolis

Mississippi River	70% removal of total suspended solids
Minneapolis streams	No increase in rate of runoff from project site

Be it further resolved that projects not able to comply with the on-site stormwater standards shall be allowed to contribute towards construction of a regional stormwater treatment facility at a rate of $15,000 per acre of runoff that is being discharged from the site.

Be it further resolved that the design standards for stormwater treatment devices be those recommended in the Minnesota Pollution Control Agency manual titled Protecting Water Quality in Urban Areas, Best Management Practices for Minnesota, October, 1989, and future updates of this manual.

Appendix J
Minneapolis Lakes Recreational/Aesthetic Indicator Development

Purpose: To develop indicators that can be used to measure and report multiple aspects of the recreational and aesthetic condition of Minneapolis lakes. These indicators were created by the Minneapolis Surface Water Quality Monitoring Task Force.

Environmental Indicators

> ***An indicator is something that points to a problem or condition. Its purpose is to show you how well a system is working. If there is a problem, an indicator can help you determine what direction to take to solve the problem. – Minnesota Planning Environmental Quality Board (2000)***

Environmental indicators are selected parameters or indices that can be used to characterize the overall condition or trend of a resource. Indicators can provide a generalized measure of changes in water quality and the effectiveness of management measures. Indicators are useful in conveying complex environmental monitoring information in an understandable format to policy makers, lake users and the public. Indicators must be scientifically valid, meet practical considerations and consider current and future program needs.

Important considerations in selecting appropriate indicators include cost and cost effectiveness, level of difficulty, measurable and quantifiable metrics, reproducibility from year to year and locations, relevance to the recreational uses and understandability by target audiences. Indicators need to be representative of factors that can change over time. Indicators also need to provide for a meaningful tracking of changes, i.e., water quality or vegetation changes on an annual basis. Indicator measures such as fish community composition that change relatively slowly over time are thus less useful.

The Minneapolis Park and Recreation Board (MPRB) currently monitors water quality through a mixture of monitoring efforts. The monitoring programs measure and report lake trophic status, chemical water quality of streams and lakes, beach bacteria levels, lake vegetation, biological monitoring of lakes and wetlands, lake levels and the quality of stormwater runoff. It is important for managers to be able to clearly communicate the basic findings, conclusions and recommendations of indicator studies to stakeholders and elected officials, and how study results can be used to improve water quality programs. (Bicknell, 2002). The results of the current monitoring efforts have been reported in the annual Water Resources Report (produced by MPRB) and the State of the City Report (produced by the Minneapolis Planning Division) and the annual NPDES stormwater report (produced by the

Minneapolis Public Works Department). As new indicators are developed, it will also be important to develop an effective means of communicating the results of indicator measures. A critical component of that communication effort will be providing the public the background needed to understand the basis for the measurements and the meaning of the environmental indicator results. Policy makers and managers must also be prepared to make suitable changes to management efforts when indicator results point to the need for such modifications.

The trophic state index (TSI) has been used as the primary measure to report and track lake water quality trends over the last 12 years. According to a number of scientists and policy makers, the TSI as measured in the open water area of lakes, appears to incompletely represent the state of lakes with regard to other aspects such as aquatic vegetation, public health concerns, recreational use and aesthetic condition. To the average recreational user, trophic status provides a good indicator of swimming suitability in the middle of the lake. However, other factors such as smell, debris, interference from vegetation, bacteria levels and isolated near-shore problems are not considered by the TSI measurement.

Considerations for Selection of Indicators for Measuring Recreation and Aesthetic Suitability

The development of multi-metric indicators to measure recreational suitability for Minneapolis lakes emphasizes the need to move beyond sole dependence upon chemical water quality and incorporate additional measures reflective of other recreational uses. Another central aspect to the indicator development process was the desire to use existing data gathering efforts, and (as much as possible) limit the addition of new parameters to existing monitoring programs.

The important measures that would/will be included in the overall indicator can generally be categorized as:

- environmental quality
- public health
- aesthetic considerations
- recreational interferences

1. The chosen environmental quality measure is the Carlson's Trophic State Index (TSI), as discussed above. Carlson's TSI quantifies lake trophic status by using three key indicator variables: Secchi disc transparency, total phosphorus concentration, and chlorophyll a concentration. As conceived, the TSI is technically sound and provides an attractive index for the complex series of water quality changes that occur in lakes during eutrophication (aging process by which lakes are fertilized with nutrients). This data is collected as part of the twice

monthly lake water quality sampling program currently underway in Minneapolis.

2. The selected public health measure is the number of *Escherichia coli* (*E. coli*) measurements that exceed the EPA's criteria for swimming beaches over the summer. High levels of indicator bacteria such as *E. coli* demonstrate the presence of fecal pollution in quantities high enough to require limiting body contact to protect recreational bathers. Indicator organisms such as these have long been used to protect bathers from illnesses that may be contracted from surface waters contaminated by fecal pollution. This indicator is applied only to Minneapolis lakes that have primary contact recreation, i.e., swimming beaches.

3. Aesthetic considerations are often qualitative in nature and can elicit highly variable reactions from one person to the next. In an attempt to quantify lake aesthetics, three measures were selected – odor, color of the water and debris. These measures will be assigned numeric values based upon condition descriptors. The aesthetic evaluation will be conducted at selected locations around each lake, such as boat landings, beaches, fishing piers and overlooks. The number of sampling locations will be determined by the relative lake size and public access to the shoreline.

4. Recreational interferences are much more difficult to measure, but in Minneapolis lakes, excessive amounts of Eurasian watermilfoil and other aquatic vegetation can interfere with sailing, boating and swimming. Increased plant growth can reduce algae growth, lead to greater water clarity and provide valuable habitat Nevertheless, the barriers excessive growth creates to full recreational use of a lake often outweighs the water quality benefits. Measures of plant interference with recreational uses will include presence or absence of exotic species (i.e., Eurasian watermilfoil), density of aquatic vegetation, and coverage of the lake by aquatic vegetation. Lake vegetation has been quantitatively sampled on a rotating basis in the past, but was recently cut back due to staffing shortages as a result of budget cuts. Thus the data included in any annual index monitoring will be a qualitative estimation of vegetation coverage and density.

Measurement of the Minneapolis Lake Quality Indicator

The existing Minneapolis monitoring programs and the environmental indicator efforts by other organizations were reviewed. Based upon the results of this review and input from city staff, policy makers and the public, a multi-metric indicator scheme was developed for Minneapolis lakes that incorporate the four measures described above.

Trophic State Index (Environmental Quality)

The TSI scale is a simple way to integrate nutrient concentrations, the algal response to phosphorus and the public perception of the eutrophication process into one indicator measurement. Total phosphorus (TP) is the limiting nutrient; chlorophyll (CHLA) is used to represent algal biomass; and Secchi disc (SD) transparency is

widely recognized by the public as an indicator of "water quality" (Osgood, 2000; Carlson, 1977; MPCA, 2004).

The index represents a logarithmic transformation of the three variables and forces them onto a 0-to-100 scale in which a Secchi disc transparency of 1 meter equals 60. Low TSI values signify good water quality and high TSI values signify poor water quality. Every doubling (or halving) of transparency represents a decrease (or increase) in the index value of 10. The TSI equations are as follows:

$$TSI(TP) = 4.14 + 14.4 \ln(TP)$$
$$TSI(CLA) = 30.6 + 9.81 \ln(CLA)$$
$$TSI(SD) = 60 - 14.4 \ln(SD)$$

where TP and CLA are in µg/L, SD is in meters, and all are seasonal averages (May – September)

In Minneapolis, a TSI value of less than 57 is required for full support of swimming. The MPCA set the TSI threshold for swimmable lakes in the North Central Hardwood Forests ecoregion based upon impairment of swimming from algae and the relationship between phosphorus, chlorophylla and Secchi disc. Minneapolis is in the MPCA's North Central Hardwood Forests ecoregion. MPCA set the phosphorus criteria for this ecoregion as 40 micrograms per liter as the upper threshold for swimmable use. This phosphorus concentration corresponds to a Carlson's TSI value of 57. This threshold ensures that conditions associated with "impaired swimming" would occur during less than ten percent of the summer season. Phosphorus concentrations above the criteria levels would result in greater frequencies of nuisance algal blooms and increase the frequencies of "impaired swimming." (MPCA, 2004).

Escherichia coli (Public Health)

Prior to 1986 the EPA recommended the use of fecal coliforms as the indicator organisms to protect bathers from gastrointestinal illness in recreational waters. The EPA has since conducted epidemiological studies that evaluated the use of several other organisms as indicators. In 1986 the EPA recommended the use of *E. coli* for fresh recreational waters because they were better predictors of acute gastrointestinal illness than fecal coliforms. EPA guidelines for *E. coli* are that a single sample should not exceed 235 organisms per 100 mL of water and the geometric mean of not less than five samples over a 30-day period should not exceed 126 organisms per 100 mL of water. Beaches that exceed these criteria should be closed until such time as the levels of bacteria return to below the thresholds. The number of *E. coli* measurements exceeding EPA criteria in a summer season, expressed as percent of sampling dates, will be the scoring for a 0 – 100 scale. This section of the index will be applied only to Minneapolis lakes that have primary contact recreation, i.e., swimming beaches (US EPA, 2002a; US EPA 2002b; MPCA, 1997).

Odor/Color/Debris (Aesthetic Considerations)

The measurement of aesthetic conditions quantifies lake aesthetics using three measures – odor, color of the water and debris. These qualitative measures will be assigned numeric values based upon condition descriptors listed in the following table J-1. This scheme was originally developed by the Rouge River National Wet Weather Demonstration Project (1998, Wayne County, Michigan). The three measures would be summed (50 possible points) and averaged over the summer to develop an annual rating. The higher the aesthetic condition rating, the "poorer" the overall quality of the lake's aesthetics (Fellows, et al, 1996; Heidtke, 1998, US EPA, 2003).

Table J-1. Aesthetic Conditions Descriptors

Parameter	Descriptor	Value
Color	Clear	0
	Light brown	2
	Green	2
	Bright green	5
	Milky white	8
	Gray/black	10
Odor	None/natural	0
	Musty, faint	1
	Musty, strong	2
	Harsh (sewage/fishy)	
	Faint	5
	Strong	8
	Anaerobic	10
Debris	None	0
	Natural	1
	Foam	2
	Trash, floating	4
	Trash, fixed	5
	Green scum	8
	Oil scum	9
	Sewage solids	10

Plant Growth/Species (Recreational Interferences)

Excessive amounts of Eurasian watermilfoil and other aquatic vegetation can interfere with sailing, boating and swimming, and can be perceived as unsightly by lake users. Qualitative measures of plant interference with recreational uses will include presence or absence of exotic species (i.e., Eurasian watermilfoil), density of aquatic vegetation, and coverage of the lake by aquatic vegetation as shown in Table J-2. Measurements would be made monthly (May – September) and a summer average reported for each lake based upon the rating scale. As with the aesthetic condition measurement, the higher the rating score, the poorer the perceived quality of the lake would be (BDWMO, 2003; Doucette, 2001. USEPA, 2002b).

Table J-2. Qualitative Measures of Plant Interference

Parameter	Descriptor	Value
Exotic Species Present	More than one	10
	One	5
	None	0
Average Macrophyte Density	High	10
	Medium	5
	Low	0
Vegetation Coverage of Lake Surface ≤ 15 N deep	100%	10
	≥ 50%	5
	≤ 50%	0

Index Scoring

Tracking of four components allow for management actions to be taken with regard to issues identified by each of the subparts.

The scoring system is weighted toward environmental status and public health concerns because they are important considerations for lake users and visitors. Following the same indexing as the TSI, the Minneapolis lake index is designed so that a lower value designates better quality.

Lakes with beaches:

- Calhoun
- Cedar
- Harriet
- Hiawatha
- Nokomis
- Wirth

No *E. coli* scores are used as this measurement is collected only at swimming beaches (*E. coli* measurements are not taken at lakes without beaches since those lakes are used for recreation that does not involve direct contact and thus ingestion of water)

Lakes without beaches:

- Brownie
- Diamond
- Grass
- Isles
- Loring
- Powderhorn
- Ryan
- Spring
- Webber

Implementation Issues

Discussion still needs to be completed regarding data collection and reporting of the index.

Current data collection efforts include:

- Lake sampling for TSI every two weeks for the May through September time period
- *E. coli* monitoring at beaches two times per week with two samples per beach for each sampling event over the entire beach season

Collection of the vegetation and aesthetic data will require an additional level of effort beyond current monitoring programs.

Reporting of the index would ideally be used as an annual benchmark, but could also be reported monthly, although there is a three week minimum lag between data collection and data reporting due to the complexity of the laboratory analyses.

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Appendix K
NPDES CSO Permit

Minnesota Pollution Control Agenc

October 1, 1996

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Sharon Sayles Belton
Mayor, City of Minneapolis
350 South Fifth Street
Minneapolis, Minnesota 55415

RE: Draft Reissued NPDES Permit No. MN 0046744
Minneapolis Combined Sewer Overflow Permit

Dear Mayor Belton:

Your National Pollutant Discharge Elimination System (NPDES) Permit Application has been reviewed and a determination has been made to draft the referenced reissued permit for the combined sewer system.

I would like to draw your attention to Part I.E., Schedule of Compliance, which requires that the Joint Permittees eliminate the remaining combined sewer overflow bypass/overflow regulator structures.

Enclosed is a copy of the public notice and reissued draft permit in accordance with Minn. R. 7001.0100.

If you have any questions, please contact Dave Sahli of my staff at (612) 296-8722.

Sincerely,

Russell C. Felt

Russell C. Felt, Supervisor
Point Source Compliance Section
Water Quality Division

RCF:jmg
Enclosure: (1)
cc: Jodi Polzin, Minneapolis Public Works, Engineering Design (w/enclosure)
Jake Burggraf, Minneapolis Public Works, Engineering Design (w/enclosure)

STATE OF MINNESOTA

Minnesota Pollution Control Agency

WATER QUALITY DIVISION

PUBLIC NOTICE OF INTENT TO REISSUE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) AND
STATE DISPOSAL SYSTEM (SDS) PERMIT MN 0046744

Public Comment Period Begins: October 1, 1996
Public Comment Period Ends: October 31, 1996

Current Permit Issued: January 3, 1991
Current Permit Expiration Date: December 31, 1995

Name and Address of Joint Permittees
Minneapolis Department of Public Works
309 Second Avenue South
Third Floor
Minneapolis, MN 55401

Metropolitan Council Environmental Services
230 East Fifth St.
St. Paul, MN 55101

Facility Name and Location
Fifteen (15) Overflow Outfalls
Located Throughout the City of Minneapolis

Receiving Waters: Mississippi River

Description of Permitted Facilities

All wastewater from domestic and industrial sources within the city are normally conveyed to the Metropolitan Council Environmental Services' Metropolitan Wastewater Treatment Plant in St. Paul for treatment. However, with combined sewers, storm water mixed with untreated wastewater overflows to the Mississippi River during rainfall and snowmelt events. Combined sewers carry both wastewater and storm water and the capacity of the pipe can be exceeded during wet weather conditions resulting in an overflow.

The city is in the process of completing the final construction projects in a ten-year program to separate combined sewers and eliminate combined sewer overflows. The separation program consisted of the construction of either a new sanitary sewer system or a new storm sewer system in the combined sewer areas. The separation program has provided separate sanitary and storm sewer systems within the area served by the city.

Petition for Contested Case Hearing

You also may submit a petition for a contested case hearing. A contested case hearing is a formal evidentiary hearing before an administrative law judge. In accordance with Minn. R. 7000.1900, the MPCA will grant a petition to hold a contested case hearing if it finds that: (1) there is a material issue of fact in dispute concerning the application or draft permit; (2) the MPCA has the jurisdiction to make a determination on the disputed material issue of fact; and (3) there is a reasonable basis underlying the disputed material issue of fact or facts such that the holding of the contested case hearing would allow the introduction of information that would aid the MPCA in resolving the disputed facts in making a final decision on the draft permit. A material issue of fact means a fact question, as distinguished from a policy question, whose resolution could have a direct bearing on a final MPCA decision.

A petition for a contested case hearing must include the following information:

1. A statement of reasons or proposed findings supporting the MPCA decision to hold a contested case hearing according to the criteria in Minn. R. 7000.1900, as discussed above; and
2. A statement of the issues proposed to be addressed by a contested case hearing and the specific relief requested or resolution of the matter.

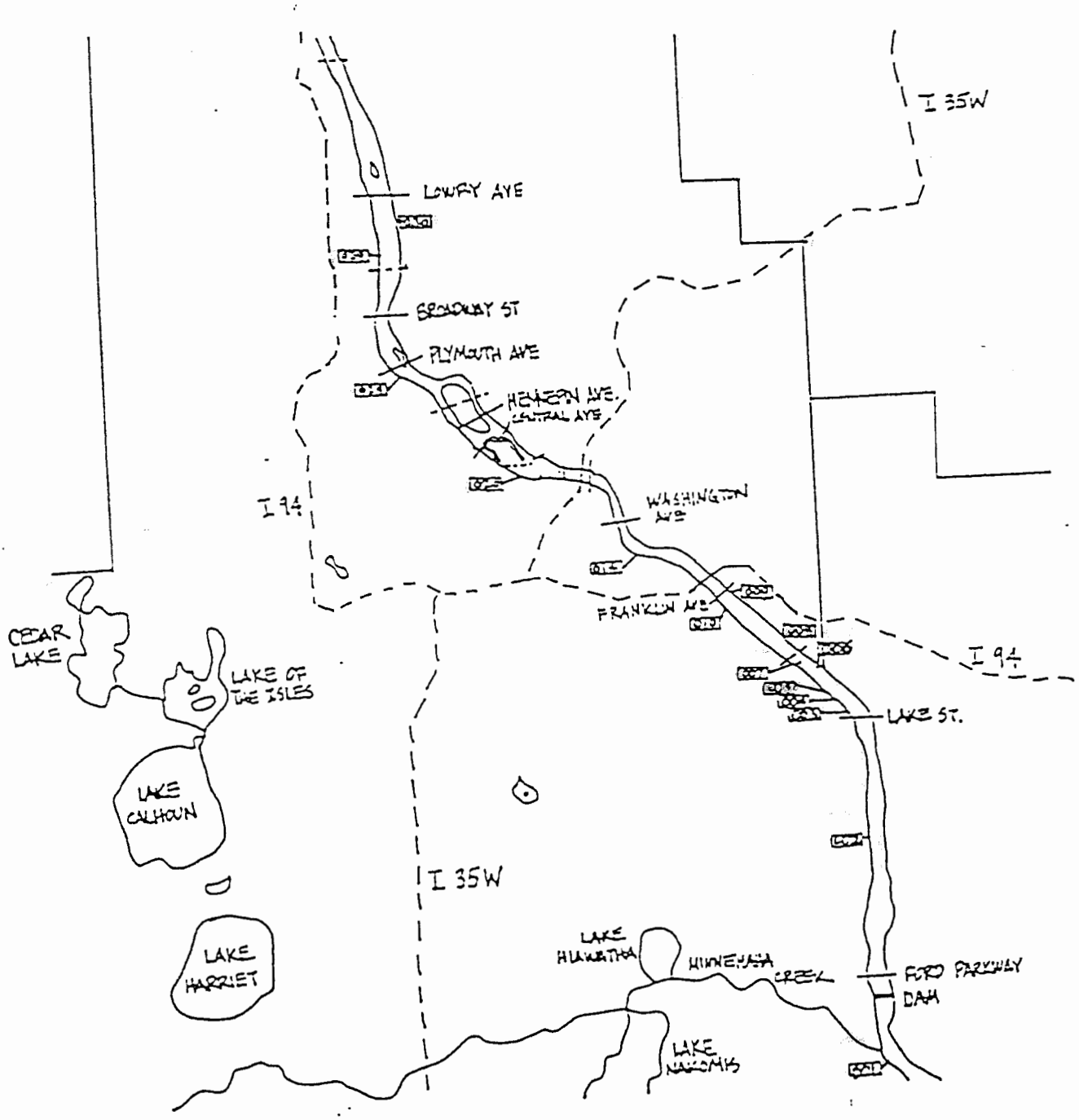
In addition and to the extent known, a petition for a contested case hearing should also include the following information:

1. A proposed list of prospective witnesses to be called, including experts, with a brief description of proposed testimony or summary of evidence to be presented at a contested case hearing;
2. A proposed list of publications, references, or studies to be introduced and relied upon at a contested case hearing; and
3. An estimate of time required for you to present the matter at a contested case hearing.

MPCA Decision

You may submit a petition to the Commissioner requesting that the MPCA Citizens' Board consider the permit issuance. To be considered timely, the petition must be received by the MPCA by 4:30 p.m. on the date the public comment period ends, identified on page 1 of this notice. Under the provisions of Minn. Stat. ch. 116.02, subd 6(4), the decision whether to issue the permit and, if so, under what terms will be presented to the Board for decision if: (1) the Commissioner grants the petition requesting the matter be presented to the Board; (2) one or more Board members request to hear the matter before the time the commissioner makes a final decision on the permit; or (3) a timely request for a contested case hearing is pending. You may participate in the activities of the MPCA Board as provided in Minn. R. 7000.0650.

Facility and Discharge Location



STATE OF MINNESOTA

Minnesota Pollution Control Agency

WATER QUALITY DIVISION

National Pollutant Discharge Elimination System (NPDES) and
State Disposal System (SDS) Permit MN 0046744

PERMITTEE: City of Minneapolis and the Metropolitan Council , Hereinafter "Joint Permittees"

FACILITY NAME: Combined Sewer System

RECEIVING WATER: Mississippi River

CITY OR TOWNSHIP: City of Minneapolis COUNTY: Hennepin

REISSUANCE DATE: EXPIRATION DATE: June 30, 2001

The State of Minnesota, on behalf of its citizens through the Minnesota Pollution Control Agency (MPCA), authorizes the Joint Permittees to operate a combined sewer system and to discharge from the bypass points identified herein, to the receiving water named above, in accordance with the requirements of this permit.

The goal of this permit is to protect water quality in accordance with Minnesota and U.S. statutes and rules, including Minn. Stat. chs. 115 and 116, Minn. R. chs. 7001, 7050, and the U.S. Clean Water Act.

This permit is a reissuance of an existing permit which was issued on January 3, 1991. This reissued permit is effective on the issuance date identified above and supersedes the previous permit issued for this facility.

This permit and the authorization to discharge shall expire June 30, 2001. The Joint Permittees are not authorized to discharge after the above date of expiration. In order to receive authorization to discharge beyond the above date of expiration, the Joint Permittees shall submit such information and forms as are required by the MPCA no later than 180 days prior to the above date of expiration pursuant to Minn. R. 7001.0040.

Signature: _____

Marvin E. Hora, Manager	*for*	Peder A. Larson
Point Source Compliance Section		Acting Commissioner
Water Quality Division		Minnesota Pollution Control Agency

If you have questions on this permit, including the specific permit requirements, permit reporting or permit compliance status, please contact:

Minnesota Pollution Control Agency
Water Quality Division, Point Source Compliance Section
520 Lafayette Road North
St. Paul, MN 55155-4194
Telephone: (612) 296-6300
Fax: (612) 297-8683
Telephone Device for Deaf (TTY): (612) 282-5332

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PART II

General Terms and Conditions 14-19

REPORT SUBMITTAL SUMMARY

Telemetered Site Monitoring Reports due by the 21st of the month. (Part I, C.1.)
Agreement Between Joint Permittees within 180 days of permit final issuance. (Part II, A.2.)
Annual Report submitted before April 30 of each year. (Part II, A.3.)

PART I

A. COMBINED SEWER BYPASS AND OVERFLOW POINT IDENTIFICATION

Serial No.	Discharge Identification (Name/Location)
001	Minnehaha Tunnel Outfall
002	East 38th ST Outfall
003	East Lake ST Outfall
004	Southwest Interceptor Outfall
005	Northwest Interceptor Outfall
006	Eastside Interceptor Outfall
007	East 26th ST Outfall
008	Cecil ST Outfall
009	Southeast Franklin AV Outfall
010	East Franklin AV Outfall
014	14th AV S & E 18th ST Storm Outfall
020	Chicago AV S & N MPLS Tunnel Outfall
025	Bassetts Creek Outfall
029	26th AV N Outfall
030	22nd AV NE Outfall

B. DISCHARGE CONDITIONS

During the period beginning on the effective date of this permit and lasting until the expiration date, the Joint Permittees are authorized to discharge combined sewage from the bypass/overflow point(s) identified under Paragraph A of this PART, until the sanitary sewer connection(s) are removed, in accordance with the conditions in this permit.

1. The discharge from any combined sewer system bypass/overflow point by the Joint Permittees is prohibited except:

   a. During periods of hydraulic overload caused by rainfall or snowmelt conditions which exceed the design hydraulic capacity of the conveyance system, only after the maximum amount of flow has been conveyed to the wastewater treatment facility; or

   b. During emergency conditions to include the following:

      i. The bypass is unavoidable to prevent loss of life, endangerment of human health, personal injury, or severe property damage. Endangerment of human health includes basement backups. "Severe property damage" means substantial damage to property of the Joint Permittees' or of others, damage that may cause the combined sewer system to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. "Severe property damage" does not mean economic loss as a result of a delay in production.

      ii. There is no feasible alternative to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or performance of maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance.

2. If a regulator listed in Attachment A with a removal status of A or B continues to bypass sewage following completion of the separation program and scheduled removal dates such bypass is not authorized by this permit notwithstanding PART I, B.1 and may be subject to enforcement action until eliminated. The provisions of PART I, B.1.b. may be raised as an affirmative defense to such enforcement action. The Joint Permittees shall, **within five days of detection**, notify the MPCA in writing of such a bypass and **within 30 days** recommend the additional corrective actions necessary to eliminate future bypasses from the regulator before it is closed. The MPCA shall review the recommendations, and may approve a schedule of compliance to implement the necessary corrective actions. Agency approval of such a schedule does not constitute an authorization under this permit to discharge from that regulator.

3. A regulator listed in Attachment A with a removal status of C or D must be equipped with an overflow monitoring device and such bypass is authorized in accordance with Part I, B.1. For the regulators not eliminated after the area tributary to it is separated according to the Facilities Plan, the Joint Permittees shall: (1) submit **within 90 days of issuance of this permit,** to the MPCA for approval, plans for the final overflow monitoring and proposed inspection frequency of any monitoring device; and (2) **within 90 days after the monitoring plan is approved** by the MPCA the Joint Permittees shall submit a report to the MPCA explaining the need for retaining the regulator.

   The monitoring shall be used to determine the likelihood of sewage being bypassed from separated areas. If it appears probable that a bypass may occur under design conditions the Joint Permittees shall recommend and, upon approval, implement additional measures that may be taken to eliminate the potential for bypassing. A summary of the monitoring results and, if necessary, recommendations for further infiltration and inflow removal and/or capacity increases shall be included in the annual report required by PART II, A.3.

C. REPORTING AND MONITORING REQUIREMENTS FOR DISCHARGE EVENTS

1. Telemetered Site Monitoring Requirements

The Metropolitan Council shall submit a monthly report to the MPCA summarizing precipitation, regulator overflow duration, and regulator overflow volume data collected through its remote telemetry system. Precipitation data shall be summarized from the Council's existing rain gauge network. Precipitation monitoring may be discontinued at all gauge locations during winter months to protect the measurement equipment from the cold weather. Overflow duration and overflow volume shall be reported for each regulator identified by an asterisk on Attachment A. If data is not available an explanation of the reasons why the data is not available, and a discussion of measures to be taken to ensure that the data will be available in the future shall be included with the report.

Each monthly report shall be submitted to the MPCA at the following address and shall be postmarked **no later than the 21st day following the month during which the monitoring was completed:**

Point Source Compliance Section
Water Quality Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

2. Bypass Notification

a. Preliminary bypass notification shall be given immediately to the MPCA (Attn: Point Source Compliance Section, Water Quality Division) when the Joint Permittees believe, based on the information then available, that a bypass to waters of the state from any segment of the combined sewer system may be necessary pursuant to conditions outlined in PART I, B.1.b. Authorized bypasses which result from hydraulic overloading in the combined sewer system are exempt from this notification requirement. The notice shall include, to the extent then available, the reasons therefore, timetables, and appropriate alternatives that may be available to minimize or abate the bypass. Any changes in the foregoing shall be immediately reported to the MPCA. The Joint Permittees shall immediately after giving of said notice implement the planning for appropriate alternatives to minimize or abate the possible bypass. Thereafter, the Joint Permittees shall implement the appropriate, reasonable alternative(s) if any, to minimize or abate the bypass. Appropriate alternatives shall include but not be limited to those alternatives described in paragraph 3 hereinafter following. The failure of the Joint Permittees to properly evaluate or interpret the information available shall not void the Joint Permittees' responsibility to comply with this section.

b. With the exception of a discharge pursuant to PART I, B.1.a., any bypass which is caused by an emergency shall be reported to the Duty Officer, 1-800-422-0798 or 612-649-5451 **within one hour of the discovery of the incident**. The Joint Permittees shall refer to the MPCA "Emergency Notification Guidance for Wastewater Treatment Facilities," dated April 1996, for information to be provided to the Duty Officer.

3. Request for Permission to Bypass for Maintenance or Repair

Scheduled bypasses due to construction and/or normal maintenance are prohibited unless authorized by the MPCA in writing. Existing or temporary collection system facilities shall be used to the maximum extent practical to ensure compliance with permit conditions. The Joint Permittees shall submit a written request for the bypass **at least ten days before the date of the bypass** or as soon as possible under the circumstances. The request shall specify the following:

a. Proposed date and estimated duration of the bypass;

b. Alternatives to bypassing; and

c. Measures to mitigate environmental harm caused by the bypass.

4. Monitoring Requirements in the Event a Bypass is Needed to Conduct Maintenance or Repairs

In the event a discharge from the remaining combined sewer system outfalls results from activities necessary to maintain or repair the combined sewer system a monitoring program as outlined in PART I, C.8. shall be conducted, and a report as required in PART I, C.6. shall be submitted.

A monitoring program that is not in accordance with PART I, C.8. will be accepted if site conditions do not probide for a safely accessible monitoring location.

5. Monitoring Procedures and Reporting Results

a. Samples and measurements required by this permit shall be representative of the monitored activity and shall be analyzed by a laboratory appropriately certified by the Minnesota Department of Health, in accordance with Minn. R. 4740.2040.

b. Test procedures for the analysis of pollutants shall conform to 40 CFR Part 136.

c. All monitoring and analytical instruments used to monitor as required by this permit shall be calibrated and maintained at a frequency necessary to ensure accuracy. The Joint Permittees shall maintain written records of all calibrations and maintenance.

d. The following information shall be recorded for each measurement taken or sample collected:

   i. The exact place, date, and time of the sampling or measurement.
   ii. The dates the analyses were performed.
   iii. The person who performed the analyses, measurement, sample collection or calculation.
   iv. The analytical techniques, procedures and methods used.
   v. The results of the analyses.

e. If a pollutant is monitored more frequently than required by this permit, the results and the frequency of monitoring shall be included in the calculation and reporting of values submitted in the report required by PART I, C.6.

f. All records required by this permit shall be retained by the Joint Permittees for three years, including any calculations or any original recordings from automatic monitoring instrumentation. These retention periods shall be automatically extended during the course of any legal or administrative proceedings or upon request by the MPCA.

g. Monitoring results shall be reported in the units specified in this permit. A report shall be submitted even if no discharge occurred during the reporting period. The Joint Permittees shall report any substantial changes in operational procedures; activities which alter the nature or frequency of the discharge; material factors affecting compliance with the conditions of this permit; and additional information requested by the MPCA.

h. Except for data determined to be confidential, all reports required by this permit shall be available for public inspection at the MPCA St. Paul office. Effluent data shall not be considered confidential. Confidential material shall be submitted according to Minn. R. 7000.1300.

i. All documents and reports submitted to the MPCA by the Joint Permittees, shall be signed by the Joint Permittees or duly authorized representative of the Joint Permittees.

j. Any person knowingly making any false statement on any report, or tampering with any monitoring device or method, is subject to the imposition of criminal and civil penalties.

6. <u>Reporting on a Discharge Event Caused by Maintenance or Repair of the Combined Sewer System</u>

a. In order to maintain an accurate record of a discharge event, its effect upon the receiving waters and the condition of or changes in the combined sewer system pursuant to PART I,C.3., a report shall be submitted to the Agency if a discharge event takes place. The report shall be submitted to the MPCA (Attn: Point Source Compliance Section, Water Quality Division) **no later than sixty (60) days following the cessation** of such a discharge and shall contain at a minimum the following information:

i. results of the sampling and monitoring required in PART I, C.8. These results shall be reported in the units specified in the permit;

ii. a summary of the impact of the discharge(s) upon the receiving waters. This summary shall be based upon water quality, flow volume, and other essential facts which may be documented from past and ongoing monitoring and/or studies, in addition to new data compiled from the sampling and monitoring program required by this permit;

iii. in the event of repairs or construction, the report shall contain a complete description of all repairs or construction completed, including any modifications in the combined sewer system, any substantial changes in the operational or maintenance procedures, and any other significant activities which will alter the nature or frequency of discharges; and

iv. any other material factors affecting compliance with the conditions of this permit and such information as the Agency may reasonably require of the Joint Permittees pursuant to Minn. R. 7001.1090, subp. 1 and Minn. Stat. chs. 115 and 116 as amended.

7. Except for data determined to be confidential under Section 308 of the Act, and Minn. Stat. § 116.075, subd. 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the MPCA. Procedures for submitting such confidential material shall be pursuant to Minn. R. 7000.1300. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report, confidential or otherwise, is subject to the imposition of criminal penalties as provided for in Section 309 of the Act and Minn. Stat. § 115.071, subd. 2 (b).

8. Monitoring Requirements

Each sample collected pursuant to PART I, C.4. above shall be analyzed for the following:

Determination	Units	Frequency	Sample Type	Notes
Discharge Flow	gal	Daily	Volume and Duration	(1)
River Flow	cfs	Daily	Volume	
Biochemical Oxygen Demand	mg/l	Daily	Composite	(1)
Chemical Oxygen Demand	mg/l	Daily	Composite	(1)
Suspended Solids	mg/l	Daily	Composite	(1)
Ammonia Nitrogen	mg/l	Daily	Composite	(1)
Kjeldahl Nitrogen	mg/l	Daily	Composite	(1)
Nitrate Nitrogen	mg/l	Daily	Composite	(1)
Total Phosphorus	mg/l	Daily	Composite	(1)
Total Cadmium	ug/l	Daily	Composite	(1)
Total Chromium	ug/l	Daily	Composite	(1)
Total Copper	ug/l	Daily	Composite	(1)
Total Cyanide	ug/l	Daily	Composite	(1)
Total Iron	ug/l	Daily	Composite	(1)
Total Lead	ug/l	Daily	Composite	(1)
Total Mercury	ug/l	Daily	Composite	(1)
Total Nickel	ug/l	Daily	Composite	(1)
Total Phenols	ug/l	Daily	Composite	(1)
Total Zinc	ug/l	Daily	Composite	(1)

Notes: (1) Representative composite sample to be collected at the discharge point.

Additional monitoring of the discharge or receiving waters may be required at the request of the Agency.

D. OPERATION OF THE COMBINED SEWER SYSTEM

General operation of the combined sewer system shall be in compliance with the following terms and conditions and the operational plan approved on May 11, 1987, and any amendments thereto.

1. Operation of the System for Control of Combined Sewer Losses

The Joint Permittees shall operate the system for control of combined sewer losses (including regulator devices, structures, systems, and programs) as efficiently as possible in order to utilize the system capacity to the maximum extent possible in order to minimize discharges from the combined sewer system.

2. Maintenance of Facilities and Systems

The Joint Permittees shall at all times maintain in good working order and operate as efficiently as possible all facilities or systems of control installed or used in the combined sewer system and shall conduct a regulator elimination program in conformance with the schedule in Attachment A.

3. System Reliability

The Joint Permittees are responsible for maintaining adequate safeguards to minimize the discharge of untreated or inadequately treated wastes at all times. The Joint Permittees are responsible for insuring system reliability.

4. Scheduling of Discharges from the Combined Sewer System for Maintenance or Repairs

Any maintenance or repair of the combined sewer system shall be scheduled as much as possible during periods of high river flow and shall be carried out in a manner approved by the MPCA as outlined in PART I, C.3.

5. Providing an Adequate Maintenance Staff

The Joint Permittees shall provide an adequate staff to carry out the operation, maintenance, repair and testing functions required to insure compliance with the conditions of this permit.

6. Removed Substances

The Joint Permittees shall not deposit sludge or other removed substances from other treatment facilities or any other source into the interceptor system at a time or in a manner that would allow these substances to enter the receiving water as a result of a discharge from bypass/overflow points(s) authorized herein. The Joint Permittees shall dispose of solids, sludges, or other pollutants removed from or resulting from treatment or control of discharges in accordance with all applicable air, water and solid waste Statutes and Rules. When requested by the MPCA, the Joint Permittees shall submit for approval an acceptable plan for such disposal and shall be responsible for obtaining MPCA approval and/or permit of such disposal plans.

7. Storm Water Inflow

No new sources of storm water inflow shall be directly connected to any portion of the sewer system that is designed to carry only sanitary sewage.

E. SCHEDULE OF COMPLIANCE

1. CSO Construction Program

The Joint Permittees shall proceed with elimination of combined sewer bypass/overflows in accordance with the schedule and requirements outlined below. Upon completion of the approved CSO control program there shall be no discharges of sanitary sewage from the separated sewer system.

2. Project Schedules

The Joint Permittees shall proceed with the elimination of regulator structures in accordance with the schedule identified in Attachment A and the provisions of Part I, B. 2, and 3..

3. Elimination of Rainleader Connections

Consistent with Minnesota Statues 116.162, Subp. 7 the city shall continue with an effective rainleader elimination program. A summary of the progress of this program shall be included in the annual report required by PART II, A.3.

4. Operational Plan

The Joint Permittees shall continue implementation of the operational plan approved on May 11, 1987, and any approved amendments thereto that provides for maximum conveyance of wet weather flows to the treatment plant during the implementation phase of the CSO control program.

F. DEFINITIONS

1. "Act" means the Clean Water Act.

2. "Bypass" means an intentional diversion of a waste stream from any portion of the treatment facility.

3. The "City" means the City of Minneapolis.

4. "Combined Sewer" means a sewer that is designed and intended to serve as a sanitary sewer and a storm sewer, or as an industrial sewer and a storm sewer. For the purposes of this permit, the combined sewer system shall include combined sewers and all portions of the separated sewer system which have a connection between the separate sanitary sewer and the separate storm sewer system via a regulator or overflow structure that will allow sanitary sewage to be discharged from the storm sewer.

5. "Combined Sewer Overflow" means a discharge of a combination of storm and sanitary wastewater or storm and industrial wastewater directly or indirectly into the waters of the state, occurring when the volume of wastewater flow exceeds the conveyance or storage capacity of a combined sewer system.

6. "Completion of Separation." For the purposes of interpreting the requirements of Part I, E. of this permit, completion of separation or similar references shall mean completion of construction of all sewer work required for separation, including punch list items followed by an inspection period to identify and correct miscellaneous sources of infiltration and inflow.

7. "Composite Sample" means: a) a series of grab samples collected at least once per hour at equally spaced intervals and proportioned according to flow; or b) grab samples of equal volume each collected after a predetermined volume of flow has passed.

8. "Duty Officer" means the Minnesota Duty Officer, Department of Public Safety, Division of Emergency Management.

9. "Emergency Incident" means all emergency bypasses, spills, or any other environmental emergency as described in the MPCA "Emergency Notification Guidance for Wastewater Treatment Facilities."

10. "Grab Sample" means an individual sample.

11. "Infiltration" means water other than wastewater that enters a sewerage system (including sewer service connections) from the ground through such means as defective pipes, pipe joints, connections, or manholes. Infiltration does not include, and is distinguished from, inflow.

12. "Inflow" means water other than wastewater that enters a sewerage system (including sewer service connections) from sources such as roof leaders, cellar drains, yard drains, area drains, foundation drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm waters, surface runoff, street wash waters, or drainage. Inflow does not include, and is distinguished from, infiltration.

13. "MPCA" means the Minnesota Pollution Control Agency as described in Minn. Stat. § 116.02.

PART II

A. MANAGEMENT REQUIREMENTS

1. Street and Collection System Cleaning Program

a. The Joint Permittees shall conduct a collection system cleaning program to reduce the amount of pollutants contributed to the river by CSO and storm water discharges.

b. The city shall conduct a street cleaning program to reduce the amount of pollutants contributed to the river by CSO and storm water discharges.

c. New storm sewer systems shall be designed and constructed to provide for reliable and efficient capture of floatables and other runoff debris, consistent with reliable and efficient conveyance of storm water.

d. A summary of the cleaning program activities shall be included in the annual report required by PART II, A.3.

2. Agreement Between the Joint Permittees Defining Responsibilities to Meet Requirements of the Permit

The Joint Permittees shall either modify the existing Agreement which expired December 31, 1995, or enter into a new Agreement to define the individual responsibilities for meeting the requirements and conditions of this permit. As a part of the above mentioned Agreement the Joint Permittees shall define individual responsibilities to assure that the regulator elimination program as outlined in Attachment A and all other maintenance and operational procedures are properly conducted. The Agreement shall include but is not limited to the following items:

a. A delineation of responsibility to assure that all studies and programs are completed and submitted to the Agency according to the schedules contained in this permit.

b. A delineation of responsibility for the maintenance and repair of the conveyance structure contained in the combined sewer system

c. A delineation of responsibility for the inspection, maintenance and elimination of all regulators, the regulator structure(s) and outfall structures(s) in the event such coordination is needed to carry out the maintenance and elimination program as outlined in Attachment A or any other maintenance or repair.

d. A condition outlining the coordination procedure between the Joint Permittees for the maintenance and elimination of the combined sewer system, regulator(s), regulator structures(s) and outfall structure(s) in the event such coordination is needed to carry out the elimination program as outlined in Attachment A or any other maintenance or repair.

e. A delineation of responsibilities for submittal of the comprehensive report required by PART II,A.3.

f. A delineation of responsibilities for conducting post-separation overflow monitoring in accordance with Part I,B.3.

g. A delineation of responsibilities for implementing the operational plan outlined in PART I, E.4.

A copy of the Agreement shall be submitted to the MPCA **within one hundred eighty (180) days** of the date of issuance of this permit.

3. Annual Report on the Combined Sewer System

The Joint Permittees shall submit an annual report to the MPCA regarding the combined sewer system, the street and collection system cleaning program, the sewer separation program, implementation of the approved operational plan, and the regulator elimination and maintenance program outlined in Attachment A. At a minimum this report shall contain information on progress accomplished pursuant to permit requirements, problems encountered in the system and locations thereof, impact of the problem upon the system, date or dates the problem occurred, past problems of a similar nature, steps taken to correct the problem areas, recommendations for permanent solutions to the problems encountered and any pertinent information that would aid in understanding these problems and the action taken to correct them. This report shall be submitted to the MPCA **before April 30 each year** and shall cover the previous calendar year.

4. Construction

This permit authorizes construction to attain compliance with the limitations and conditions of this permit.

5. Outfall Identification

The Joint Permittees shall maintain identification signs on all authorized outfalls. Such signs shall conform with the specifications outlined in the previously issued permit dated September 25, 1984. Upon elimination of the CSO discharge to an outfall, the Permittee shall remove the identification sign to the outfall and note this activity in the annual report required by PART II, A.3.

B. GENERAL TERMS AND CONDITIONS

The Joint Permittees shall comply with all requirements of 40 CFR 122.41 and 122.42, Minn. R. ch. 7040, and Minn. R. 7001.0150, subp. 3 and 7001.1090, subp. 1, including, but not limited to, the terms and conditions contained in this part.

1. Changes in Discharges from the Combined Sewer System

a. All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any wastewater not consistent with the terms and conditions herein shall constitute a violation of this permit. Such a violation may result in the imposition of civil or criminal penalties as provided for in Section 309 of the Act and Minn. Stat. § 115.071.

b. Combined sewer system modifications, additions, and/or expansions that increase the system capacity shall be reported to the MPCA (Attn: Point Source Compliance Section, Water Quality Division) prior to the changes taking place and this permit may then be modified or reissued to reflect such changes.

c. In no case are any system modifications or significant changes in system operation including regulator adjustments permitted that will cause an increase in volume or duration of overflow events.

C. PERMIT MODIFICATIONS

1. Joint Permittee Initiated

The following changes may require a permit modification and shall be reported to the MPCA for approval prior to the change:

a. anticipated changes in the combined sewer system discharge, including new significant industrial discharges or significant changes in existing industrial discharges to the sanitary sewer system.

b. the permit is not transferable to any person without the express written approval of the MPCA. The new owner must submit a permit application no later than 90 days before the scheduled change in ownership or control.

2. MPCA Initiated

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked for causes including, but not limited to, the following:

a. Violation of any terms or conditions of this permit.

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts.

c. A change in any condition that requires a change in discharge.

d. The establishment of toxic effluent standards or prohibitions more stringent than any limitations in this permit.

e. Minn. R. 7001.0170 and 7001.0190.

D. INSPECTION AND ENTRY

1. The Joint Permittees shall allow of the MPCA to:

   a. Enter the premises where the facility is located or activity conducted.

   b. Have access to and copy any records that are required under the conditions of this permit.

   c. Inspect any facilities, equipment, practices or operations regulated or required under this permit.

   d. Sample or monitor for the purposes of assuring compliance.

2. The Joint Permittees shall furnish to the MPCA, within a reasonable time, any information requested to determine compliance with this permit.

E. LIABILITY EXEMPTION

1. In issuing this permit the state and the MPCA assume no responsibility for damage to persons, property, or the environment caused by the activities of the Joint Permittees in the conduct of actions, including those activities authorized, directed, or undertaken to achieve compliance with this permit. To the extent the state and MPCA may be liable for the activities of its employees, that liability is explicitly limited to that provided in the Tort Claims Act, Minn. Stat. § 3.736.

2. The MPCA's issuance of this permit does not obligate the MPCA to enforce local laws, rules or plans beyond what is authorized by Minnesota statutes.

F. LIABILITIES

1. The MPCA's issuance of this permit does not release the Joint Permittees from any liability, penalty, or duty imposed by Minnesota or federal statutes or rules or local ordinances, except the obligation to obtain the permit.

2. Nothing in this permit shall be construed to preclude the institution of any legal or administrative proceedings or relieve the Joint Permittees from any responsibilities, liabilities, or penalties for violation of effluent and water quality limitations, or other federal regulation or state rules, not included in this permit.

3. The issuance of a permit does not prevent the future adoption of the MPCA of pollution control rules, standards, or orders more stringent than those now in existence and does not prevent the enforcement of these rules, standards, or orders against the Joint Permittees.

4. Noncompliance with the terms and conditions of this permit subjects the Joint Permittees to penalties provided by federal and state law, including monetary penalties, imprisonment or both.

G. PROPERTY RIGHTS

The issuance to this permit does not convey a property right or exclusive privilege, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

H. SEVERABILITY

The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

I. PROHIBITED WASTES

The Joint Permittees shall prohibit the discharge to its combined sewer system of the following specific prohibited pollutants:

1) pollutants which create a fire or explosion hazard, including any discharge with a flash point less than 60 degrees C (140 degrees F),

2) pollutants which will cause corrosive structural damage, but in no case less than pH 5.0,

3) solid or viscous pollutants which will cause obstruction to flow,

4) pollutants which result in the presence of toxic gases, vapors, or fumes that may cause acute worker health and safety problems,

J. COOLING WATER

New discharges into the sanitary or combined sewer system of noncontact cooling water is prohibited, unless there are no cost-effective alternatives.

Existing discharges of non-contact cooling water to the Joint Permittees' combined sewer system shall be eliminated, where elimination is cost-effective, or where an infiltration/inflow analysis and sewer system evaluation survey indicates the need for such removal.

ATTACHMENT A

Regulator Removal Schedule

NPDES Outfall No.	Regulator Code	Name and/or Location	Responsible Party	Rem Stat
001		**Minnehaha Tunnel Outfall**		
	1-37 *	Minnehaha Pkwy & 39th AV S	MCES	B
002		**East 38th ST Outfall**		
	2-35	East 38th ST & 26th AV S	MCES	C
004		**Southwest Interceptor Outfall**		
	4-34 *	Southwest Meters Bypass	MCES	D
005		**Northwest Interceptor Outfall**		
	5-34 *	Northwest Meters Bypass	MCES	D
006		**Eastside Interceptor Outfall**		
	6-48 *	East Meters Bypass	MCES	D
007		**East 26th ST Outfall**		
	7-33 *	East 26th ST & Seabury AV	MCES	D
008		**Cecil ST Outfall**		
	8-31A	East River RD & Cecil ST on E River RD	MCES	B
	8-31B	East River RD & Cecil ST on Cecil ST	MCES	B
009		**Southeast Franklin AV Outfall**		
	9-30A	E River RD & Franklin AV SE on Franklin	MCES	B
	9-30B	E River RD & Franklin AV SE on 27th AV	MCES	B
010		**East Franklin AV Outfall**		
	10-32	E Franklin AV & W River RD	MCES	B
014		**14th AV S & E 18th ST Storm Outfall**		
	14-22½h	E 26th ST & 18th AV S	MCES	B
020		**Chicago AV S & N MPLS Tunnel Outfall**		
	20-17 *	Portland AV S & Washington	MCES	D
025		**Bassetts Creek Outfall**		
	25A-13	Bassetts Creek at 5th ST N	City	B
029		**26th AV N Outfall**		
	29-8	26th AV N & Emerson AV N	MCES	B
030		**22nd AV NE Outfall**		
	30-Q	22nd AV NE at 5th ST NE from N	City	B
	30-R	22nd AV NE at 5th ST NE from S	City	B

* Indicates regulator monitored telemetrically by MCES.

Removal Status for Combined Sewer Overflow Regulators

A: To be eliminated in 1996
B: To be eliminated in 1997
C: Monitoring is required before elimination can be scheduled
D: Additional monitoring is required. May be necessary to remain as an emergency bypass.

Appendix L
NPDES Stormwater Permit

Minnesota Pollution Control Agency

December 1, 2000

Copy 4/3

CERTIFIED MAIL NO. Z 295 023 724
RETURN RECEIPT REQUESTED

Mr. David Sonnenberg
City Engineer, Director of Public Works
350 South 5th Street, Suite 203
Minneapolis, MN 55415

RE: Final NPDES/SDS Permit No. MN 0061018
Municipal Storm Sewer System
Minneapolis, Minnesota

Dear Mr. Sonnenberg:

Enclosed is a copy of the final National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) permit for the Minneapolis Storm Sewer System. All comments submitted in writing during the public notice comment period have been considered in the formulation of the terms and conditions of the permit.

It is the responsibility of the Permittee to maintain compliance with all of the terms and conditions of this permit. Please carefully review the entire permit.

If you have any questions regarding any of the terms and conditions of the permit, please contact Dave Sahli of my staff at (651) 296-8722.

Sincerely,

David Kortan, P.E.
Supervisor, Sector 3
Major Facilities Section
Metro District

DK:lh

Enclosure: Final Permit

cc: Peter Swenson, U.S. Environmental Protection Agency, Chicago (w/final permit)
Jodi Polzin, Minneapolis Public Works Department (w/final permit)
Jeff Lee, Minneapolis Park and Recreation Board (w/final permit)
Janette Brimmer, Minnesota Center for Environmental Advocacy (w/final permit)
Sol Simon, Mississippi River Revival (w/final permit)

STATE OF MINNESOTA

Minnesota Pollution Control Agency

WATER QUALITY DIVISION

National Pollutant Discharge Elimination System (NPDES) and State Disposal System (SDS) Permit MN 0061018

PERMITTEE: City of Minneapolis and the Minneapolis Park and Recreation Board, hereinafter the "Permittee" or "Joint Permittees"

FACILITY NAME: Minneapolis Storm Sewer Drainage Area

RECEIVING WATERS: Water bodies in the City of Minneapolis storm sewer system drainage area as listed in this permit.

CITY OR TOWNSHIP: City of Minneapolis **COUNTY:** Hennepin

ISSUANCE DATE: December 1, 2000 **EXPIRATION DATE:** January 1, 2004

The State of Minnesota, on behalf of its citizens through the Minnesota Pollution Control Agency (MPCA), authorizes the Permittee to operate a municipal separate storm sewer system as named above, and to discharge storm water from this facility to the receiving waters named above, in accordance with the requirements of this permit.

The goal of this permit is to protect water quality in accordance with Minnesota and U.S. statutes and rules, including Minn. Stat. chs. 115 and 116, Minn. R. chs. 7001, 7050, and the U.S. Clean Water Act.

This permit is effective on the issuance date identified above.

The Permittee is not authorized to discharge after the above date of expiration. In order to receive authorization to discharge beyond the above date of expiration, the Permittee shall submit such information and forms as are required by the MPCA no later than 180 days prior to the above date of expiration pursuant to Minn. R. 7001.0040.

Signature: Richard J. Sandberg

Richard J. Sandberg
Program Manager
Major Facilties Section
Metro District

for

Karen A. Studders
Commissioner
Minnesota Pollution Control Agency

If you have questions on this permit, including the specific permit requirements, permit reporting or permit compliance status, please contact:

Minnesota Pollution Control Agency
Metro District, Major Facilities Section
520 Lafayette Road North
St. Paul, MN 55155-4194
Telephone: (612) 296-6300
Fax: (612) 297-8683
Telephone Device for Deaf (TTY): (612) 282-5332
Printed on recycled paper containing at least 10% paper recycled by consumers

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Required Submittals, One-time Submittals

June 1, 2001	Submit a revised storm water monitoring program manual. Chapter 2, 19.2
June 1, 2001	Submit a work plan and schedule for completion of the design manual. Chapter 2, 7.3
June 1, 2001	Submit a proposed work plan and schedule for completion of the pesticides, herbicides, and fertilizers pilot project. Chapter 2, 10.3.
June 1, 2002	Submit the first report regarding coordination with other governmental entities. Chapter 2, 16.2.
June 1, 2003	Submit the second report regarding coordination with other governmental entities. Chapter 2, 16.3
January 1, 2004	Submit a pesticides, herbicides, and fertilizers pilot project final report. Chapter 2, 10.3.

Required Submittals, Annual Submittals

June 1	Submit a proposed Storm Water Management Program for the year. Chapter 2, 3.2.
June 1	Submit a Storm Water Management Annual Report. Chapter 2, 18.1

DESCRIPTION

The municipal separate storm sewer system consists of the storm sewer system and treatment works for the collection, conveyance, treatment, storage, and discharge of storm water in the City of Minneapolis.

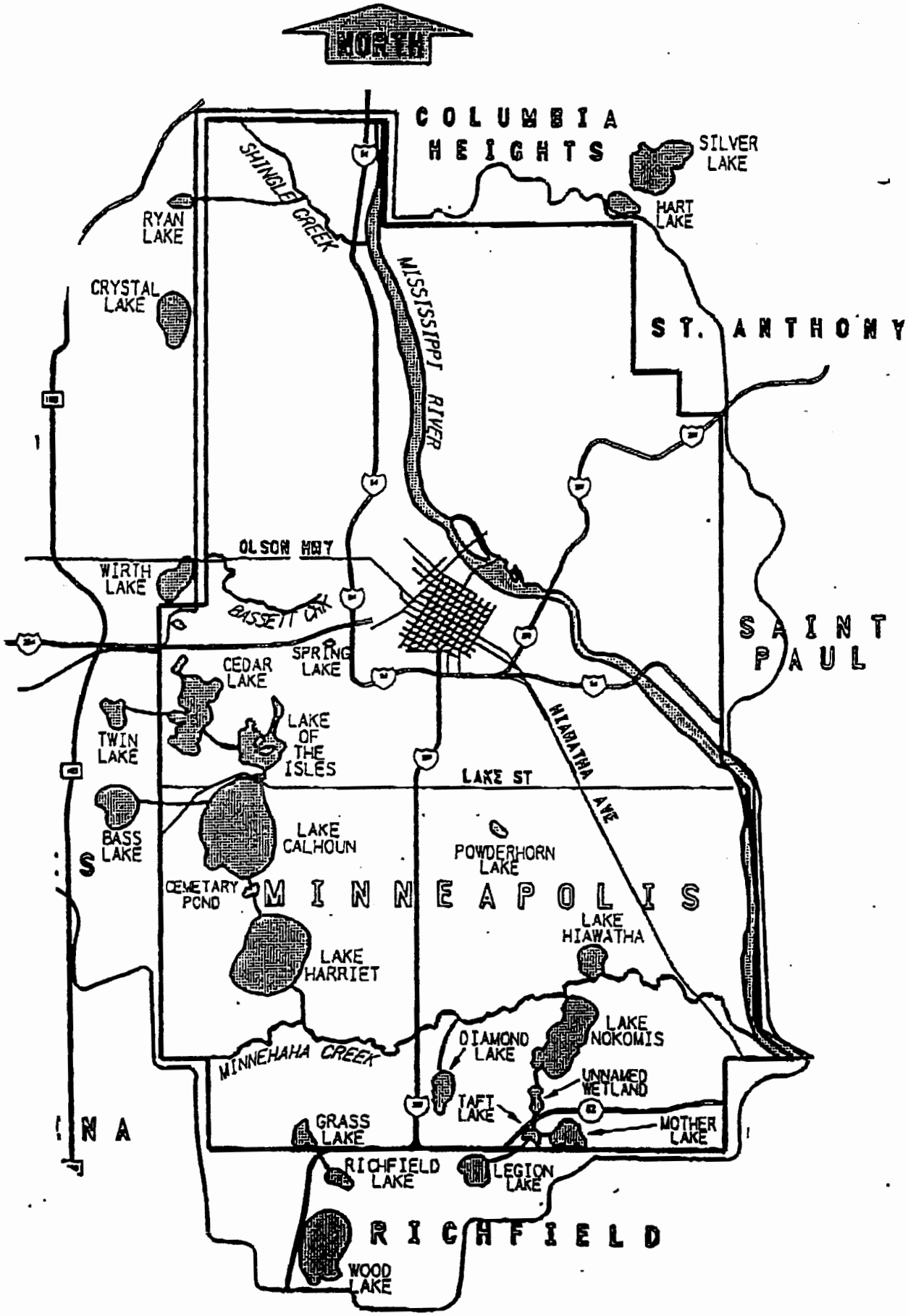
The discharge consists of storm water at a rate dependent upon precipitation and snow melt. All sanitary wastes in the affected area are conveyed to the municipal sanitary sewer or combined sewer system and their discharge is not authorized by this permit.

Storm water from the Permittees' separate storm sewer system is discharged to the following waters of the State:

Receiving Water	Total Discharge Points
Mississippi River	72
Shingle Creek	30
Ryan Lake	1
Minnehaha Creek	115
Bassett Creek	40
Brownie Lake	2
Cedar Lake	13
Lake of the Isles	19
Lake Calhoun	19
Cemetery Lake	1
Sanctuary Pond	1
Lake Harriet	16
Diamond Lake	10
Taft Lake	3
Mother Lake	2
Unnamed Wetland west of Mother Lake	5
Lake Hiawatha	4
Lake Nokomis	16
Birch Pond	1
Powderhorn Lake	4
Grass Lake	11
Legion Lake	7
Richfield Lake	2
Unnamed Wetland at Highway 62 and East 28th St.	1
Unnamed Wetland at Ewing Ave. S. and West 22nd St.	1
Hart Lake (Columbia Hgts.)	1
Silver Lake (New Brighton)	1
Crystal Lake (Robbinsdale)	2
Total Discharge Points	**400**

82
115-83 = 32
130 - 115 = 15

Watershed of Minneapolis and Joint Permittees Separate Storm Sewer System



SD 001, SD 002, SD 003, SD 004, SD 005

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
BOD, 05 Day (20 Deg C)	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Cadmium, Total (as Cd)	Monitor Only	ug/L	Single Value	Mar-Oct	Composite	1 x Month	1
Chloride, Total	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Copper, Total (as Cu)	Monitor Only	ug/L	Single Value	Mar-Oct	Composite	1 x Month	1
Fecal Coliform, MPN or Membrane Filter 44.5C	Monitor Only	#100ml	Single Value	Mar-Oct	Grab	1 x Month	1
Flow	Monitor Only	MG	Calendar Month Total	Mar-Oct	Measurement	1 x Day	1
Flow	Monitor Only	mgd	Daily Average	Mar-Oct	Measurement	1 x Day	1
Lead, Total (as Pb)	Monitor Only	ug/L	Single Value	Mar-Oct	Composite	1 x Month	1
Mercury, Total (as Hg)	Monitor Only	ng/L	Single Value	Mar-Oct	Grab	1 x Month	2
Nitrite Plus Nitrate, Total (as N)	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Nitrogen, Ammonia, Un-ionized (as N)	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Nitrogen, Kjeldahl, Total	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
pH	Monitor Only	SU	Single Value	Mar-Oct	Grab	1 x Month	1
Phosphorus, Dissolved	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Phosphorus, Total (as P)	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Precipitation	Monitor Only	in	Single Value	Jan-Dec	Measurement	1 x Day	
Solids, Total Dissolved (TDS)	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Solids, Total Suspended (TSS)	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Zinc, Total (as Zn)	Monitor Only	ug/L	Single Value	Mar-Oct	Composite	1 x Month	1

Notes:
1 -- The March sample shall be of a snow melt event and may be a grab sample.
2 -- Use EPA method 1631 and sampling method 1669. Monitoring will be completed as part of a two-year pilot project as described in Chapter 2, Section 19.9. The March sample shall be of a snow melt event and may be a grab sample

Chapter 1. Surface Discharge Station Requirements - General

1. Sampling Location

1.1 Samples for stations SD001, SD002, SD003, SD004, and SD005 shall be collected from a point in the collection system that is representative of the flow that is discharged.

Sampling will be completed as part of a joint program between the City of Minneapolis and the City of St. Paul as described in Chapter 2, Section 19.7 of this permit.

1.2 The monitoring sites shall be representative of the following land use types:

a. SD001 - Residential
b. SD002 - Residential
c. SD003 - Industrial/Commercial
d. SD004 - Industrial/Commercial
e. SD005 - Mixed or other use type

2. Surface Discharges

2.1 The Permittee shall install and maintain outlet protection measures at all discharge points to prevent erosion.

3. Discharge Monitoring Reports

3.1 The Permittee shall submit monitoring results for discharges in accordance with the limits and monitoring requirements for these stations. If no discharge occurred during the reporting period, the Permittee shall check the "No Discharge" box on the Discharge Monitoring Report (DMR) for that station.

Chapter 2. Municipal Storm Water, NPDES/SDS

1. Authorization

1.1 This permit authorizes the Permittee to discharge municipal storm water in accordance with the provisions in this chapter.

1.2 This permit does not exempt or otherwise preclude the Permittee from complying with the requirements of Watershed Districts, Watershed Management Organizations, the County or any other local, state, or federal rules and regulations.

Chapter 2. Municipal Storm Water, NPDES/SDS

2. Prohibited Discharges

2.1 This permit does not cover discharges other than storm water. Non-storm water discharges may include noncontact cooling water, sewage, wash water, scrubber water, spills, oil, hazardous substances, nor commercial equipment/vehicle cleaning and maintenance wastewaters to ditches, wetlands nor other surface waters of the state. A separate NPDES permit may be required for these discharges. The Permittee has a separate NPDES permit for combined sewer overflow discharges.

2.2 This permit does not cover the discharge of storm water associated with industrial activity or construction activity. A separate NPDES permit may be required for these activities.

2.3 This permit does not cover the discharge of storm water from any other entity located in the drainage area or outside the drainage area. Only the Permittee and the portions of the storm sewer system that are under its jurisdiction are covered by this permit.

3. Storm Water Management Program Requirements

3.1 The management of the municipal storm sewer system shall be in compliance with the Clean Water Act and with the terms and conditions of this permit. The Permittee shall manage, operate, and maintain the storm sewer system and areas drained by the storm sewer system in a manner to reduce the discharge of pollutants to the maximum extent practicable. The management may consist of a combination of Best Management Practices (BMPs), education, other control techniques, system design and engineering methods, and such other provisions as the Permittee and/or MPCA determine as appropriate.

3.2 The Permittee shall develop a Storm Water Management Program (hereinafter "Management Program") to reduce the discharge of pollutants from the storm sewer system. The Permittee shall submit a Management Program by June 1 of each year beginning in 2001 in accordance with the Annual Report requirements, for review and approval by the MPCA.

3.3 The Management Program shall, at a minimum, contain controls that address the reduction of pollutants from the sources and activities listed in this chapter. Each proposed program shall identify which sources and the pollutant that will be targeted for reduction and which category listed in items 4-16 below the program addresses. For each program there shall be a description, responsible department in charge, an estimated annual budget for the next five years and performance measures that can be used to determine the success or benefits of the activity.

4. Structural Controls

4.1 The Permittee shall operate and maintain all storm water structural controls, over which they have jurisdiction, in a manner so as to reduce the discharge of pollutants.

Chapter 2. Municipal Storm Water, NPDES/SDS

4. Structural Controls

4.2 All structural controls such as ponds and grit chambers must be inspected a minimum of two times per year. The Permittee shall keep records of inspection results, date, antecedent weather conditions, sediment storage and capacity remaining, and any maintenance performed or recommended. After two years of inspections, if patterns of maintenance become apparent the frequency of inspections may be adjusted. If maintenance or sediment removal is required as a result of both inspections the frequency of inspection shall be increased to at least three times per year or more frequent if needed to prevent carry-over or washout of pollutants from the structures and maximize pollutant removal. If maintenance or sediment removal is not required as a result of both inspections, the frequency may be reduced to one time per year.

4.3 The Permittee shall inspect 20% of the outfalls on a rotating basin at different locations during the effective period of this permit. If additional erosion protection is necessary based on an outlet inspection the protection project shall be completed during the same year as the inspection or a schedule for completion shall be submitted in the annual report. Results of outlet inspections shall be reported in the annual report and include the dates of inspection and the date of completion of additional erosion protection.

5. Facilities Operation and Quality Control

5.1 All storm water collection, conveyance, treatment, and discharge facilities shall be operated in a manner consistent with the following:

a. Maintenance of the system that results in degradation of effluent quality shall be carried out in a manner that minimizes any adverse impact to waters of the state.

b. The Permittee shall provide an adequate operating staff pursuant to Minn. Rules 7001.0150, subp. 3.F., to carry out the operation, maintenance and testing functions required to insure compliance with the conditions of this permit.

c. The Permittee shall at all times maintain in good working order and operate as efficiently as possible all facilities or systems of control installed or used in the municipal separate storm sewer system.

6. Removed Substances

6.1 The Permittee shall dispose of solids, floatables, dredgings, or other pollutants removed from or resulting from treatment or control of storm water in such a manner so as to prevent any pollutant from such materials from entering waters of the state. The Permittee, in disposing of such materials, shall comply with all applicable statutes and rules.

6.2 The Permittee shall record the quantity of all removed substances. The substances shall be divided into categories of structural controls, type of removed substances (i.e. leaves, sediment, etc.), and when possible, by seasons.

Chapter 2. Municipal Storm Water, NPDES/SDS

7. Areas of New Development or Construction

7.1 The Permittee shall implement a program to reduce the discharge of pollutants from construction sites that disturb one acre of land or more. The program shall include an ordinance or other regulatory mechanism to require erosion and sediment controls and sanctions to ensure compliance. Sanctions may include penalties, fines, bonding, other financial assurances, or permit denial for non-compliance. The program shall include planning, maintenance, and inspections to address potential water quality impacts during construction.

7.2 The Permittee shall utilize a comprehensive planning process to develop, implement, and enforce controls to reduce the discharge of pollutants from areas of new development and significant redevelopment, after construction is completed.

The program shall include requirements for long-term storm water management after construction. Long-term management shall include the use of on-site, off-site, or regional BMPs. The program shall include a process for the review of the impacts to the design capacity of existing structural BMPs from proposals to add additional drainage area to the BMPs. Inspections, maintenance, and reporting requirements must be included for structural BMPs to ensure that they will continue to provide pollutant removal as designed.

7.3 The permittee's existing storm water ordinance passed in 1999 refers to the city's storm water design manual. The design manual is the compilation of design, performance, and review criteria for storm water management practices in the city. Minimum requirements for pollutant removal, including total suspended solids removal, discharge rate control, and nutrient reduction are prescribed in the design manual.

[illegible] MCCC BMP Manual

The ordinance does not contain a schedule for adoption of a Minneapolis Storm Water Management Design Manual. The permittee shall therefore be required to develop a design manual as described in the ordinance and submit it with the permit application for reissuance of this permit.

The Permittee shall submit a workplan and schedule for completion of the design manual in the annual report due on June 1, 2001.

8. Roadways

8.1 The Permittee shall operate and maintain public streets, roads and highways under its jurisdiction in a manner so as to reduce the discharge of pollutants.

8.2 The Permittee shall operate a program of street sweeping in which all streets are swept at least two times per year; once in the spring and once in the fall. The quantity of material removed shall be reported in the annual report. If applicable, seasonal sweepings for spring sand and fall leaves shall be itemized as part of the total quantity.

8.3 The Permittee shall employ measures to ensure that deicing materials and chemicals, sand, or other materials to deice roadways are applied to minimize their runoff.

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8. Roadways

8.4 The storage of deicing materials, chemicals, and sand shall be done in such a manner to prevent the uncontrolled runoff and discharge of these materials.

8.5 The Permittee shall maintain records of the quantity of deicing materials, chemicals, and sand applied to roadways under its jurisdiction and report the quantities used each year in the annual report. The location and description of all storage facilities shall be identified in the annual report.

9. Flood Control

9.1 The Permittee shall ensure that any flood control projects it undertakes are designed to minimize the impacts on the water quality of the receiving water. When repairs, improvements, or changes are planned for existing flood control devices, the Permittee shall also evaluate the feasibility of retrofitting the existing devices to provide additional pollutant removal from storm water discharges.

9.2 The Permittee shall provide a list of existing flood control detention facilities that are primarily intended for volume control. The Permittee shall also report in each annual report the number and type of flood control projects planned and describe the pollutant removal capabilities associated with the project.

10. Pesticides and Fertilizers

10.1 The Permittee shall implement a program to reduce the discharge of pollutants related to the application of pesticides and fertilizers.

10.2 The Permittee shall implement a city wide education program regarding the proper application of pesticides and fertilizers. If another governmental entity has implemented an education program in a portion of the storm sewer drainage area, the Permittee may work with that entity to share resources and expand the program to all portions of the storm sewer drainage area.

10.3 The Permittee shall perform a pilot project to investigate the use of pesticides and fertilizers on facilities under its jurisdiction. The Permittee shall analyze soil and vegetation types to determine the need for and appropriate types and quantities of pesticides and fertilizers. In the 2001 annual report, the Permittee shall propose a schedule for completion of this project during the effective period of this permit. The Permittee shall include a detailed implementation plan and project proposal in the annual report prior to the initiation of the project.

The final pilot project must be completed with a final report submitted by January 1, 2004.

Chapter 2. Municipal Storm Water, NPDES/SDS

11. Illicit Discharges and Improper Disposal

11.1 The Permittee shall prohibit non-storm water discharges to the storm sewer system. The Permittee shall implement a program to detect, remove, or require to obtain a separate NPDES or other permit, illicit discharges and improper disposal into the storm sewer system under its jurisdiction.

11.2 The Permittee shall implement an ongoing field screening program similar to the program required in the permit application. The program shall be performed annually in 20% of the drainage areas listed in the description on page 3 of this permit.

In the annual report, the number of screening activities, the results, and responses to the results shall be reported.

11.3 The Permittee shall prohibit the discharge or disposal of all used motor vehicle fluids and household chemical wastes into the storm sewer system.

11.4 The Permittee shall take all reasonable steps to minimize any adverse impact to waters of the State resulting from all unauthorized discharges accidental or otherwise, of oil, toxic pollutants or other hazardous substances consistent with Minnesota Statutes Section 115.061 and 40 CFR PART 110 and 116.

The Permittee shall report in each annual report the number of spills and unauthorized discharges that occured and the response to those spills.

The Permittee shall implement an education program for its staff regarding the duty to notify the Department of Public Safety Duty Officer as required in Chapter 3, Section 8 of this permit. The program shall also include a notification protocol for maintenance staff or other department's staff for response and containment of materials.

Chapter 2. Municipal Storm Water, NPDES/SDS

11. Illicit Discharges and Improper Disposal

11.5 Unless identified by the Permittee or the MPCA as significant sources of pollutants to waters of the State, the following non-storm water discharges need not be prohibited from entering the storm sewer system, provided appropriate control measures, if needed, are used to minimize the impacts of such sources on the receiving water are implemented:

a. NPDES permitted non-storm water discharges,
b. dechlorinated water line flushing and other discharges from a potable water distribution system,
c. landscape irrigation and lawn watering,
d. irrigation water,
e. diverted stream flows,
f. rising ground water
g. foundation drains,
h. water from basement sump pumps,
i. air conditioning condensation,
j. springs,
k. individual residential and fund raising car washings,
l. flows from riparian habitats and wetlands,
m. dechlorinated swimming pool discharges,
n. flows from fire fighting.

The Permittee shall recommend appropriate control measures for disposal of these discharges to the storm sewer system and report them in the annual report in accordance with Chapter 2, Section 18.2 of this permit.

11.6 The Permittee shall develop a program to inform residents not to discharge non-storm water substances and that the drain discharges to a lake or stream. An example of such a program is storm drain stenciling.

12. Construction of Storm Sewers

12.1 New storm sewer systems and additions to the existing storm sewer system shall be designed and constructed to provide for reliable and efficient capture of floatables and other runoff debris, consistent with reliable and efficient conveyance of storm water. Designs may include either inlet or outlet control measures, or other BMPs.

13. Public Education Program

13.1 The Permittee shall implement a public education program to promote, publicize, and facilitate the proper management of storm water discharges to the storm sewer system by all the residents under their jurisdiction so as to reduce the discharge of pollutants.

Chapter 2. Municipal Storm Water, NPDES/SDS

13. Public Education Program

13.2 All of the storm water management requirements in this chapter shall include an education component. All education activities do not have to involve efforts to contact all residents, but may be focused to specific groups that are responsible for a management program activity.

13.3 Each year in the annual report, the Permittee shall include copies of educational materials, descriptions of the education activities, and the quantity of material destributed.

14. Public Participation

14.1 The Permittee shall implement a process to allow for public input into the development of priorities and activities necessary to maintain compliance with this permit. The Permittee shall seek input from citizen's groups, advisory groups, or others on each annual report.

14.2 A public hearing or other meeting where the opportunity for public testimoney is available shall be held for the annual report prior to submittal each year. A formal resolution from the Permittee's governing body adopting the report as the annual report as the storm water management plan shall be included with the annual report submittal. A summary of the public input and/or testimony received at the hearing or meeting and a summary of the Permittee's response to it shall be included with the formal resolution.

14.3 A notice of availability of each Storm Water Management Annual Report shall be provided to all governmental entities that have jurisdiction over activities that directly or indirectly relate to storm water management in the drainage area, prior to the date of the scheduled public hearing.

15. Pilot Program for Storm Water Management

15.1 Individual storm water management requirements may be implemented on a pilot project basis in a portion of the drainage area. Pilot programs may be considered in compliance with the management requirements despite the limited application. All pilot programs that are determined to be successful, shall be considered for implementation within the entire drainage area. The evaluation for system wide implementation shall be reported in accordance with the Annual Report requirements.

15.2 Proposals to implement individual storm water management requirements as pilot projects in only a portion of the drainage area must be submitted to the MPCA for approval prior to initiation. Proposals shall include a description of the activities to be completed, the pollutants that will be targetted, a schedule of completion, performance measures that will be used to determine the effectiveness of the project.

15.3 Upon completion of a pilot project an analysis of the project shall be included in the annual report. The analysis shall include a determination of the effectiveness of the project, a cost/benefit analysis for broader implementation, and a schedule for implementation to a large part of the drainage area if the project is determined to be an effective BMP.

Chapter 2. Municipal Storm Water, NPDES/SDS

16. Coordination with Other Governmental Entities

16.1 The Permittee shall cooperate with other city, county, state and local governmental entities in the overall storm water management efforts in the drainage area. Examples of other governmental entities and activities which may directly or indirectly relate to storm water management include the local fire departments, county household hazardous waste collection, Watershed Management Organizations, Watershed Districts, the Metropolitan Council, or the Department of Natural Resources.

16.2 The Permittee shall submit a report listing the other governmental entities that perform storm water management activities in the drainage area. The report shall include a summary of each activity performed by more than one group in a specific area, and how the activity relates to the requirements of the permit. The report shall be submitted by June 1, 2002.

16.3 The Permittee shall submit a report that describes how the different governmental entitities are cooperating and coordinating efforts in managing storm water related activities in the drainage area. The report shall include the goals for each cooperative effort, where and how the activity will be performed, and a schedule for implementing it. The report shall be submitted by June 1, 2003.

16.4 The Permittee shall report the ongoing coordinated activities and status of cooperative efforts in each subsequent Annual Report.

17. Modifications to the Management Program

17.1 The management program may be modified by the Permittee without prior approval of the MPCA provided it is in accordance with the following:

a. a BMP is added, and none subtracted, from the management program; or

b. a BMP identified in the management program has been determined to have failed and is replaced with an alternate BMP. The alternate BMP shall address the same, or similar, concerns as the failed BMP; and

c. The MPCA is notified of the modification in the annual report for the year the modification is made, or in a technical report as needed.

Chapter 2. Municipal Storm Water, NPDES/SDS

17. Modifications to the Management Program

17.2 The MPCA may require the Permittee to modify their management program as needed, in accordance with the following:

a. discharges from the storm sewer system are impacting the quality of receiving waters; or

b. more stringent requirements are necessary to comply with new State or Federal regulations; or

c. additional conditions are deemed necessary to comply with the goals and requirements of the Clean Water Act.

d. modification shall be made in writing, set forth schedules for compliance, and offer the Permittee the opportunity to propose alternative program modifications to meet the objectives of the requested modification. The requirements in Chapter 3, Sections 10 and 11 may also apply.

18. Storm Water Management Annual Report

18.1 The Permittee shall submit an annual report to the Commissioner regarding the status of the storm water management program. The report shall contain information on progress accomplished pursuant to permit requirements. The Permittee shall submit an annual report by June 1 of each year, beginning in 2001. The report shall cover the activities in the previous calendar year and the proposed storm water management for the next calendar year.

18.2 The Annual Report shall include an inventory of new, removed, or relocated outfall locations and the receiving water. The inventory contained in the Part II application shall be expanded upon and include an outfall identification number, size of outfall pipe, size of the drainage area, land use types in drainge area and their distribution, population in drainage area, percent of area that is impervious surfaces, and the number and type of structural controls in the drainage area.

The inventory of structural controls (i.e. ponds, grit chamber, etc.) shall also be identified with the size of the area tributary to it, the land use types and distribution, population, and the design capacity or size of the structure. Catch basins and other storm drain inlets do not have to be identified in the inventory

The inventory shall include a listing of any known industrial, commercial, or institutional facilities that discharge any flow other than storm water to the storm sewer system. The list shall include the name, location, discharge location to the storm sewer system, the receiving water, discharge description, and any permits issued for the discharge.

The inventory shall also include a listing and description of any "storm water hotspots" that have been identified. A "storm water hotshop" as defined in Title 3 of the Minneapolis Code of Ordinances, Chapter 54, is a land use or activity that generates higher concentrations of hydrocarbons, trace metals, or toxicant than are found in typical storm water runoff.

Chapter 2. Municipal Storm Water, NPDES/SDS

18. Storm Water Management Annual Report

18.3 The Annual Report shall include an inventory of all the individual components of the Storm Water Management Program. The inventory shall include a summary of the status of implementing the individual components. In addition to the reporting requirements listed in items 4-16 above, the summary shall include, but not be limited to, a comparison of the goals set in the previous years report to the accomplishments, proposed goals for the following year, operation and maintenance activities, performance, effectiveness, inspections, enforcement activities, and public education activities for each management program.

18.4 The Annual Report shall include a discussion of proposed changes to the Storm Water Management Program and changes made according to the Modifications to the Management Programs requirements. The discussion shall include a description of why the changes are needed. When feasible, this shall include qualitative and/or quantitative data demonstrating the effectiveness of the program elements or identifying impacts on the receiving waters.

18.5 The Annual Report shall include an assessment of the Storm Water Management Program. This shall include a discussion of the overall effectiveness of the program and accomplishment of goals. The assessment shall include an identification of improvements or degradation in storm water runoff quality and receiving water quality if possible.

18.6 The Annual Report shall include a fiscal analysis. This should include, but not be limited to, the annual expenditures for the previous year, the budget for the current year, and the source of funds. The analysis shall include a breakdown of capital, operation, maintenance and staff resource costs of each item in the program.

For individual programs, a cost/benefit analysis shall be completed. The analysis shall include a determination of the cost per unit reduction in pollutants removed, cost per acre, cost per person, or other cost per unit appropriate to describe the program activity.

18.7 The Annual Report shall include an analysis of the monitoring data that was collected during the reporting year. In addition, any changes to the location of a monitoring sites shall be requested. Changes may be necessary to correspond to a proposed pilot project, ease of sampling, safety, or other reason.

The first annual report shall include information acquired since the submittal of Part 2 of the application regarding BMP performance, receiving water quality, or other data available that characterized the quality of storm water discharges.

Chapter 2. Municipal Storm Water, NPDES/SDS

18. Storm Water Management Annual Report

18.8 The Annual Report shall include a calculation of the event mean concentration and the annual and seasonal pollutant loadings from each major outfall and the cumulative discharge of all outfalls to each receiving water. The calculation shall be made for all of the pollutants listed in the Limits and Monitoring Requirements on page 5. A description of the calcution method and calibration of any models used shall be included.

A major outfall as defined in the Code of Federal Regulation, 40 CFR Part 122.26(b)(5) is a discharge from a singe pipe:
a. with an inside diameter of 36 inches or more or its equivalent, or,
b. which is associated with a drainage area of 50 acres or more, or,
c. with an inside diameter of 12 inches or more or its equivalent and receives storm water from an area zoned for industial use, or,
d. which is assiciated with a drainage area of 2 acres or more and receives storm water from an area zoned for industrial use.

18.9 The Annual Report shall include the proposed storm water management program to be implemented for the next year in accordance with the Storm Water Management Program Requirements.

19. Storm Water Monitoring Program Manual

19.1 The Permittee's monitoring program for Part II of the permit application process was described in detail in the document titled, "Minneapolis Storm Water National Point Discharge Elimination System (NPDES), Part II Monitoring; City of Minneapolis Minnesota; Field Quality Assurance Manual," dated March 1992. The Manual contained detailed information about the monitoring program organization and responsibilities, field and laboratory quality assurance, sampling site characteristics, health and safety procedures, and site specific operating procedures.

The Permittee's individual storm water monitoring manual may be replace by the joint document required in Section 19.2.

19.2 The Manual shall be amended, rewritten, or revised to include the monitoring and reporting requirements set forth in the permit and submitted by June 1, 2001. Revisions shall be made as changes occur.

The Manual shall be completed as a joint document that covers the monitoring requirements in the city of Minneapolis and the city of St. Paul and shall be submitted as a single document.

19.3 Storm water monitoring of discharge events shall begin in March 2001.

19.4 All storm water monitoring shall be performed according to the précedures set forth in the monitoring program manual.

Chapter 2. Municipal Storm Water, NPDES/SDS

19. Storm Water Monitoring Program Manual

19.5 In the overall scope of the monitoring program, it is a higher priority to sample the required number of events than to meet all of the seasonal and antecedent condition requirements. If the total number of events for a year cannot be sampled due to lack of precipitation, freezing in the collection system, or other factor beyond the control of the Permittee, the remaining events shall be sampled the following month, or the next year, which ever is sooner.

19.6 After 2-years of monitoring in accordance with this permit, if a direct relationship between the concentration of total suspended solids and other parameters can be demonstrated, a reduction in monitoring frequency and parameters may be considered.

19.7 The city of Minneapolis, the Minneapolis Park and Recreation Board, and the city of St. Paul have agreed to complete the discharge event monitoring requirements of this permit in a joint monitoring program with includes a total of five sites and sampling for eight events. The responsibilities of each of the parties must be defined in an agreement between the parties before beginning the monitoring program. A copy of the agreement shall be submitted to the commissioner.

19.8 The results of the joint monitoring program shall be reported in accordance with the Chapter 2, Section 18.7 requirements for analysis of the monitoring data.

19.9 The city of Minneapolis, the Minneapolis Park and Recreation Board, and the city of St. Paul have agreed to perform a pilot project of mercury sampling at a minimum of two of the sampling locations identified in Chapter 1, Section 1.2 The effective period of the monitoring shall last for two years. The mercury sampling pilot program shall include the analysis of total suspended solids to determine if a relationship exists between the two parameters.

20. Alternative Sources of Monitoring Data

20.1 Alternate sources of monitoring data may be allowed to be substituted for the monitoring requirements specified in this permit. To be considered for substitution the data must be in compliance with the terms and conditions of this permit.

20.2 In-stream monitoring data will be considered for substitution with the monitoring requirements in this permit. In-stream monitoring proposed for substitution must provide information that represents the chemical and/or biological impacts of storm water discharges on the quality of the receiving water.

20.3 The substitution of alternate data sources must be approved by the Commissioner. A request for substitution must include a discussion of how the data will be utilized to demonstrate compliance with this permit and how it will characterize the impacts of storm water discharges.

Chapter 3. Total Facility Requirements

1. Definitions

1.1 "Best Management Practices (BMPs)" means water quality management practices that are the most effective and practicable means of controlling, preventing, and minimizing degradation of surface waters.

1.2 "Flow Composite" sample type is a combination of individual grab samples taken at periodic intervals over a defined time period. Either the time interval between each individual sample or the volume of each individual sample shall be proportional to the flow at the time of sampling or the total flow since the last individual sample. Flow composite samples shall be taken for the entire discharge or for the first three hours of the discharge. The samples may be taken with an automatic sampler or a combination of a minimum of three sample aloquots taken in each hour of discharage with each aloquot being separated by a minimum period of fifteen minutes.

1.3 "Grab" sample type is an individual sample collected from one location at one point in time. Grab samples shall be taken during the first thirty minutes of the discharge, or as soon as practicable thereafter.

1.4 "Municipal separate storm sewer system" means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains) owned or operated by a public body having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as sewer district, flood control district or drainage district, or similar entity; designated or used for collecting or conveying storm water; which is not a combined sewer; and with is not a part of a Publicly Owned Treatment works (POTW) as definded in 40 CFR 122.2.

1.5 "Single Value" is a reported value from a single sample or measurement for which there is no limit.

1.6 "Storm Water" means storm water runoff, snow melt runoff, and surface runoff and drainage.

2. Sampling and Analyses

2.1 Samples and measurements required by this permit shall be representative of the monitored activity and shall be analyzed by a laboratory certified by the Minnesota Department of Health for the applicable permitted parameters. Analyses of dissolved oxygen, pH, temperature and total residual chlorine do not need to be completed by a certified laboratory.

2.2 Sample preservation and test procedures for the analysis of pollutants shall conform to 40 CFR Part 136 and Minnesota Rules, part 7041.3200.

2.3 All monitoring and analytical instruments used to monitor as required by this permit shall be calibrated and maintained at a frequency necessary to ensure accuracy. The Permittee shall measure flows to ensure accuracy within plus or minus ten percent of the true flow values. The Permittee shall maintain written records of all calibrations and maintenance.

Chapter 3. Total Facility Requirements

2. Sampling and Analyses

2.4 The "sample type", "sampling frequency" and "effective period" identified in the Limits and Monitoring section of this permit together designate the minimum required monitoring frequency.

2.5 If a Permittee monitors more frequently than required by this permit, the results and the frequency of monitoring shall be reported on the Discharge Monitoring Report (DMR) or other form for that reporting period.

2.6 For bypasses, upsets, spills or any other discharge that may cause pollution of the waters of the state, the Permittee shall take at least one (1) grab sample for permitted effluent parameters two (2) times per week. If the Permittee believes that measuring these parameters is inappropriate due to known information about the discharge, the monitoring may be modified in consultation with the MPCA. Appropriate sampling shall be determined in consultation with the MPCA. Sanitary sewer overflows and combined sewer overflows may be regulated by other NPDES permits and shall be sampled in accordance with those permits.

3. Reporting

3.1 The Permittee shall report monitoring results for the completed reporting period in the units specified by this permit on a Discharge Monitoring Report (DMR) form or other report form provided by the MPCA.

3.2 The Permittee shall report values less than the level of detection as "<" the value of the level of detection. For example, if a parameter is not detected at a detection level of 0.1 mg/L, the concentration shall be reported as "<0.1 mg/L." "Non-detected", "undetected", "below detection limit" and "zero" are unacceptable reporting results, and are permit reporting violations.

3.3 A Discharge Monitoring Report (DMR) shall be submitted for each station even if no discharge occurred during the reporting period. The Permittee shall report 'No Discharge', 'No Flow' or 'No Materials Generated' on a DMR or other monitoring report form only if no discharge, flow or materials are generated during the entire reporting period. The schedule for reporting can be found on the Submittals Summary section of this permit.

3.4 The Permittee shall report the following information on the Discharge Monitoring Report (DMR):

a. any substantial changes in operational procedures;

b. activities which alter the nature or frequency of the discharge; and

c. material factors affecting compliance with the conditions of this permit.

3.5 The Permittee or the duly authorized representative of the Permittee shall sign the reports and documents submitted to the MPCA by the Permittee. (Minnesota Rules, pt. 7001.0150, subp. 2.D)

Chapter 3. Total Facility Requirements

3. Reporting

3.6 A person who falsifies, tampers with, or knowingly renders inaccurate a monitoring device or method required to be maintained under this permit is subject to penalties provided by federal and state law. (Minnesota Rules, pt. 7001.1090, subp. 1.G)

3.7 The Permittee shall report noncompliance with the permit not reported under Minnesota Rules, part 7001.0150, subpart 3, item K as a part of the next report which the Permittee is required to submit under this permit. If no reports are required within 30 days of the discovery of the noncompliance, the Permittee shall submit the information listed in Minnesota Rules, part 7001.0150, subpart 3, item K within 30 days of the discovery of the noncompliance. (Minnesota Rules, pt. 7001.0150, subp. 3.L)

3.8 A person who knowingly makes a false statement, representation, or certification in a record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance is subject to penalties provided by federal and state law set forth. (Minnesota Rules, pt. 7001.1090, subp. 1.H)

4. Records

4.1 The Permittee shall maintain records for each sample and measurement. The records shall include the following information:

a. the exact place, date and time of the sample or measurement;

b. the date of analysis;

c. the name of the person who performed the sample collection, measurement, analysis, or calculation;

d. the analytical techniques, procedures and methods used; and

e. the results of the analysis.

4.2 The Permittee shall keep the records required by this permit for at least three (3) years, including any calculations, original recordings from automatic monitoring instruments, and laboratory sheets. The Permittee shall extend these record retention periods upon request of the MPCA and/or during the course of an unresolved enforcement action. (Minnesota Rules, pt. 7001.0150, subp. 2.C)

4.3 Except for data determined to be confidential according to Minnesota Statutes, ch. 116.075, subd. 2, all reports required by this permit shall be available for public inspection at the MPCA St. Paul office. Effluent data shall not be considered confidential. Confidential material shall be submitted according to Minnesota Rules, pt. 7000.1300.

Chapter 3. Total Facility Requirements

4. Records

4.4 The Permittee shall, when requested by the commissioner, submit within a reasonable time the information and reports that are relevant to the control of pollution regarding the construction, modification, or operation of the facility covered by the permit or regarding the conduct of the activity covered by the permit. (Minnesota Rules, pt. 7001.0150, subp. 3.H)

5. Compliance Responsibility

5.1 The Permittee shall perform the actions or conduct the activity authorized by the permit in accordance with the plans and reports approved by the agency and in compliance with the conditions of the permit. (Minnesota Rules, pt. 7001.0150, subp. 3.E)

5.2 Whether or not this permit includes effluent limitations for toxic pollutants, the Permittee shall not discharge a toxic pollutant except according to Code of Federal Regulations, title 40, sections 400 to 460 and Minnesota Rules, parts 7050.0100 to 7050.0220 and 7055.0010 to 7055.0120 and any other applicable MPCA rules. (Minnesota Rules, pt. 7001.0190, subp. 1.A)

6. Noncompliance

6.1 Noncompliance with the requirements of this permit subjects the Permittee to penalties provided by federal and state law including monetary penalties, imprisonment, or both. (Minnesota Rules, pt. 7001.1090, subp. 1.B.; U.S.C. title 33, sect. 1319; Minn. Stat. sect. 115.071)

6.2 If the Permittee discovers that noncompliance with a condition of the permit has occurred, the Permittee shall:

a. take all reasonable steps to minimize the adverse impacts to human health, public drinking water supplies, or the environment resulting from a permit violation.

b. notify the Minnesota Department of Public Safety Duty Officer at 1(800)422-0798 or (651)649-5451 within 24 hours of becoming aware of a permit violation that may endanger human health, public drinking water supplies or the environment. The Permittee shall submit a written description of the exceedance to the MPCA within five (5) days of discovery of the exceedance.

Nothing in this requirement relieves the Permittee from immediately notifying the MPCA of any release to surface waters of the state. (Minnesota Rules, pt. 7001.0150, subp. 3. J, K)

Chapter 3. Total Facility Requirements

6. Noncompliance

6.3 The Permittee shall submit a written description of any bypass, spill, upset or permit violation during the reporting period to the MPCA with its Discharge Monitoring Report (DMR). If no DMR is required within 30 days, the Permittee shall submit a written report within 30 days of the discovery of the noncompliance. This description shall include the following information:

a. a description of the event including volume, duration, monitoring results and receiving waters;

b. the cause of the event;

c. the steps taken to reduce, eliminate and prevent reoccurrence of the event;

d. the exact dates and times of the event; and

e. steps taken to reduce any adverse impact resulting from the event. (Minnesota Rules, pt. 7001.0150, subp. 3.K)

7. Upset Defense

7.1 In the event of temporary noncompliance by the Permittee with an applicable effluent limitation resulting from an upset at the Permittee's facility due to factors beyond the control of the Permittee, the Permittee has an affirmative defense to an enforcement action brought by the agency as a result of the noncompliance if the Permittee demonstrates by a preponderance of competent evidence:

a. the specific cause of the upset;

b. that the upset was unintentional;

c. that the upset resulted from factors beyond the control of the Permittee and did not result from operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or increases in production which are beyond the design capability of the treatment facilities;

d. that at the time of the upset the facility was being properly operated;

e. that the Permittee properly notified the commissioner of the upset in accordance with Minnesota Rules, part 7001.0150, subpart 3, item I; and

f. that the Permittee implemented the remedial measures required by Minnesota Rules, part 7001.0150, subpart 3, item J. (Minnesota Rules, pt. 7001.1090, subp. 1.L)

Chapter 3. Total Facility Requirements

8. Duty to Notify and Avoid Water Pollution

8.1 The Permittee shall notify the Minnesota Department of Public Safety Duty Officer at (800)422-0798 or (651)649-5451 immediately of the discharge, accidental or otherwise, of any substance or material under its control which, if not recovered, may cause pollution of waters of the state. Notification is not required for a discharge of five (5) gallons or less of petroleum. (Minnesota Statutes, section 115.061)

8.2 The Permittee shall report to the Duty Officer all pertinent information regarding the discharge. Refer to the MPCA "Emergency Notification Guidance for Wastewater Treatment Systems" for further information.

8.3 The Permittee shall take all reasonable steps to minimize the adverse impacts to human health, public drinking water supplies or to the environment resulting from the discharge. This may include restricting or preventing untreated or partially treated wastewater, plant chemicals or feedlot materials from entering waterways, containing spilled materials, recycling by-passed wastewater through the plant, or using auxiliary treatment methods. (Minnesota Statutes, section 115.061)

8.4 The Permittee shall maintain a plan designed to adequately notify the public of potential health threats due to discharges of untreated or partially treated wastewater. The Permittee shall notify the public in accordance with the plan.

9. Inspection And Entry

9.1 The Permittee shall allow a representative of the MPCA, in accordance with Section 308 of the Act and Minnesota Statutes, section 115.04, (1992), and upon presentation of proper credentials, to:

a. enter the premises where the facility is located or activity conducted;

b. review and copy the records required by this permit;

c. inspect the facilities, systems, equipment, practices or operations regulated or required by this permit;

d. sample or monitor to determine compliance; and

e. bring equipment upon the Permittee's premises necessary to conduct surveys and investigations. (Minnesota Rules, pt. 7001.0150, subp. 3.I)

Chapter 3. Total Facility Requirements

10. Permit Modifications

10.1 Changes to the facility or operation of the facility may require a permit modification. The Permittee shall submit an application describing the changes to the facility or operation to the MPCA and receive a permit modification prior to implementing the changes. The Permittee must submit the permit modification application fee in accordance with Minnesota Rules, part 7002.0250 with the application.

10.2 The procedures as set forth in Minnesota Rules, pt. 7001.0100 through 7001.0130, including public notice, apply to applications for permit modifications, with the following exceptions:

a. Modifications solely as to ownership or control as described in Minnesota Rules, pt. 7001.0190, subp. 2.

b. Minor modifications as described in Minnesota Rules, pt. 7001.0190, subp. 3.

10.3 No permit may be assigned or transferred by the holder without the approval of the MPCA. A person to whom the permit has been transferred shall comply with the conditions of the permit. (Minnesota Rules, pt. 7001.0150, subp. 3.N)

11. Permit Modification, Suspension or Revocation

11.1 This permit may be modified, suspended, or revoked for the following reasons:

a. A violation of permit requirements.

b. Misrepresentation or failure to disclose fully all relevant information to obtain the permit.

c. A change in a condition that alters the discharge.

d. The establishment of a new or amended pollution standard, limitation or effluent guideline that is applicable to the permitted facility or activity.

e. Failure to pay permit fees.

f. Other reasons listed in Minnesota Rules, pt. 7001.0170.

12. Permit Reissuance

12.1 The Permittee shall submit an application for reissuance at least 180 days before permit expiration. (Minnesota Rules, pt. 7001.0040, subp. 3)

Chapter 3. Total Facility Requirements

12. Permit Reissuance

12.2 If the Permittee has submitted a timely application for permit reissuance, the Permittee may continue to conduct the activities authorized by this permit, in compliance with the requirements of this permit, until the MPCA takes final action on the application, unless the MPCA determines one of the following:

a. The Permittee is not in substantial compliance with the requirements of this permit, or with a stipulation agreement or compliance schedule designed to bring the Permittee into compliance with this permit.

b. The MPCA, as a result of an action or failure to act by the Permittee, has been unable to take final action on the application on or before the expiration date of the permit.

c. The Permittee has submitted an application with major deficiencies or has failed to properly supplement the application in a timely manner after being informed of deficiencies. (Minnesota Rules, pt. 7001.0160)

12.3 If the Permittee does not intend to continue the activities authorized by this permit after the expiration date of this permit, the Permittee shall notify the MPCA. The MPCA may require the Permittee to apply for reissuance or a major modification of this permit to authorize facility closure.

13. Property Rights

13.1 The permit does not convey a property right or an exclusive privilege. (Minnesota Rules, pt. 7001.0150, subp. 3.C)

14. Special Requirements

Joint Permittees

14.1 The following entities are Joint Permittees to this permit. The titles " Joint Permittee" and "Permittee" shall be considered to be same and both refer to these entities and are use interchangeably:

a. City of Minneapolis

b. Minneapolis Parks and Recreation Board

Chapter 3. Total Facility Requirements

14. Special Requirements

14.2 Each Joint Permittee is individually liable for:

a. permit compliance for the discharges from portions of the storm sewer system which it is the owner and/or operator;

b. storm water management for discharges from portion of the storm sewer system which it is the owner and/or operator;

14.3 Each Joint Permittee is jointly liable for:

a. compliance with annual reporting requirements;

b. ensuring funding for representative monitoring according to established agreements;

c. ensuring implementation of any system-wide management program elements;

d. compliance on portions of the storm sewer system where operation, maintenance, or other authority has been transferred from one Joint Permittee to another in accordance with legally binding interagency agreements; and

e. compliance on portions of the storm sewer system where the Joint Permittees jointly own or operate the system.

14.4 The Joint Permittees shall enter into and agreement to define the individual responsibilities for meeting the requirements and conditions of this permit. As part of the agreement, the Joint Permittees shall define individual responsibilities to assure that the operation, maintenance, monitoring, and management of this permit are completed. The agreement shall include, but not be limited to the following items:

a. a delineation of an Authorized Representative to serve as the coordinator of the Joint Permittees.

b.a delineation of responsibilities to assure all storm water management programs are implemented and managed according to the conditions of this permit.

c. a deliniation of responsibilities for submittal of the annual report.

14.5 A copy of the Agreement shall be submitted to the Commissioner within one hundred-eighty (180) days of the date of issuance of this permit. Any changes to the agreement shall be submitted to the Commissioner within thirty (30) days of the final execution of the changes.

Chapter 3. Total Facility Requirements

15. Liability Exemption

15.1 In issuing this permit, the state and the MPCA assume no responsibility for damage to persons, property, or the environment caused by the activities of the Permittee in the conduct of actions, including those activities authorized, directed, or undertaken to achieve compliance with this permit. To the extent the state and MPCA may be liable for the activities of its employees, that liability is explicitly limited to that provided in the Tort Claims Act, Minnesota Statutes, section 3.736. (Minnesota Rules, pt. 7001.0150, subp. 3.O)

15.2 The MPCA's issuance of this permit does not obligate the MPCA to enforce local laws, rules or plans beyond what is authorized by Minnesota Statutes. (Minnesota Rules, pt. 7001.0150, subp. 3.D)

16. Liabilities

16.1 The MPCA's issuance of this permit does not release the Permittee from any liability, penalty or duty imposed by Minnesota or federal statutes or rules or local ordinances, except the obligation to obtain the permit. (Minnesota Rules, pt. 7001.0150, subp. 3.A)

16.2 The issuance of a permit does not prevent the future adoption by the MPCA of pollution control rules, standards or orders more stringent than those now in existence and does not prevent the enforcement of these rules, standards or orders against the Permittee. (Minnesota Rules, pt. 7001.0150, subp. 3.B)

17. Severability

17.1 The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

18. Incorporation By Reference

18.1 The Permittee shall comply with the provisions of 40 CFR Parts 122.41 and 122.42, Minnesota Rules, pt. 7001.0150, subp. 3, and pt. 7001.1090, which are incorporated into this permit by reference, and are enforceable parts of this permit.

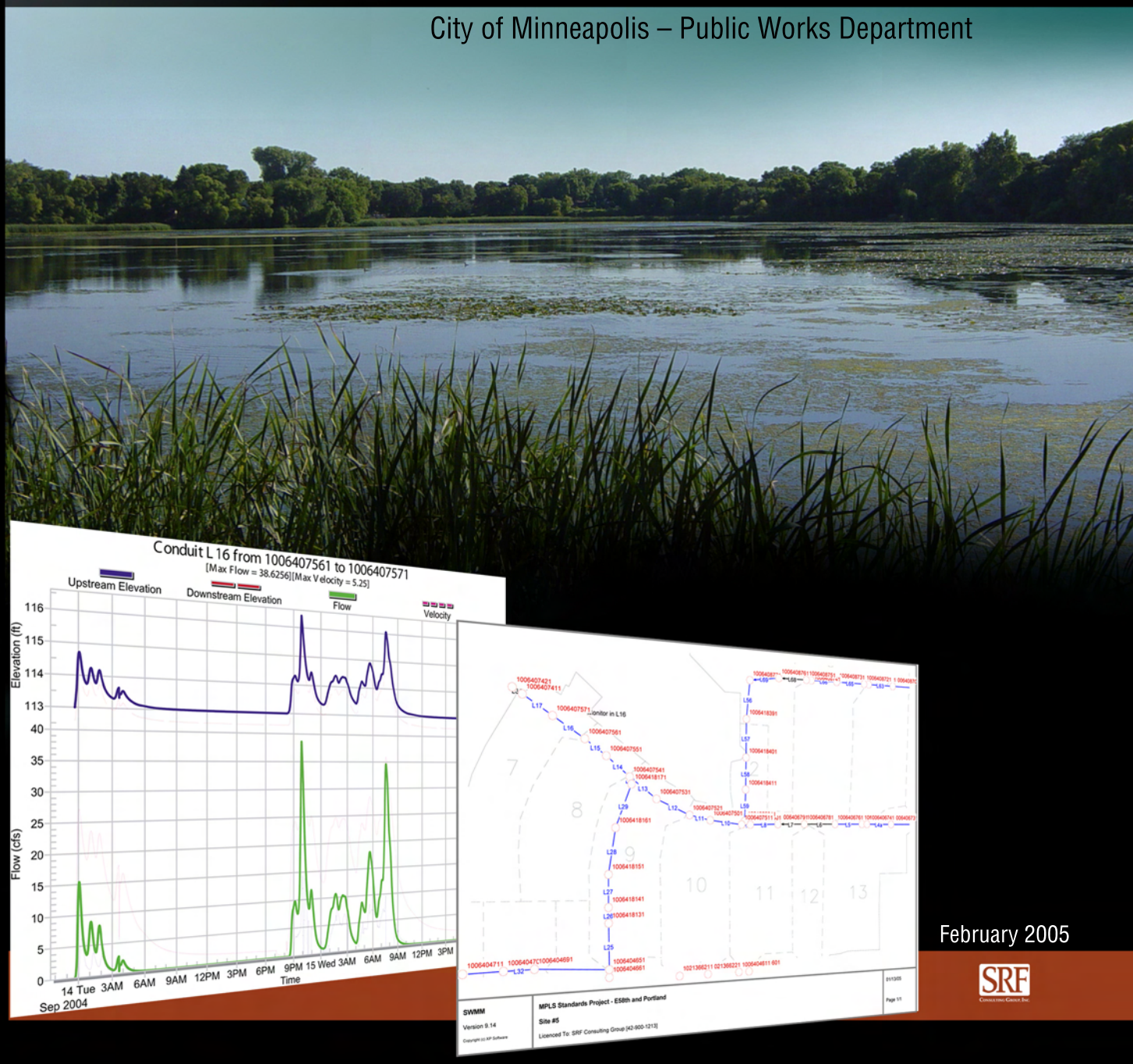
Appendix M
XP-SWMM Modeling Guidance

XP-SWMM

Hydrology & Hydraulics

Model Development Guidance Manual

City of Minneapolis – Public Works Department



February 2005

SRF Consulting Group, Inc.

XP-SWMM Model Development Guidance Manual

I. Introduction

Welcome to the *XP-SWMM Hydrology and Hydraulics Model Development Guidance Manual!* Hydrologic and hydraulic modeling using XP-SWMM can be simple or complex, easy or challenging, quick or time consuming. For all models, however simple or complex, the City of Minneapolis has established basic criteria, standards, and data that should be used to ensure that models developed by a variety of professionals are of the same quality and consistency. Standardizing parameters and reporting model results will greatly assist City staff in reviewing and accepting final hydrologic and hydraulic models.

This manual is intended to provide XP-SWMM modelers with information, data sources and processing requirements, and modeling standards for all SWMM models developed for the City of Minneapolis. The City of Minneapolis Local Surface Water Management Plan should be consulted for more specific design related standards and guidance. (see Appendix E for modeling methods). In addition, Table 5.5 in Appendix E, may be used if lot sizes are known to be consistent. Discrete modeling parameters for one rainfall event (whether synthetic or actual) or perhaps multiple events over a relatively short period of time (typically one week or less) are the focus of this manual.

II. How to Use This Manual

This manual is intended for experienced XP-SWMM modelers who are well versed in the RUNOFF (Runoff and SCS methods) and HYDRAULICS modules and their operation. A great deal of information on specific hydrologic and hydraulic parameters and processes are presented for use by modelers depending on the purpose, site, and product. It is understood that not all parameters or data contained in this manual will be used in any given model. Indeed, some parameters and processes used by modelers may be outside the scope of this manual and will require discussions with City staff as model development proceeds. It is the discretion of the modeler to determine which parameters and data are applicable and should be used.

The manual follows a simple two-step model development procedure:

1. Data collection and model construction
2. Reporting of results

For the data collection and model construction step, relevant tables, figures, and sources of data are presented with recommendations on certain processes. The modeler should follow the development process beginning at data collection and proceed into model construction, importing or entering data as needed until the model is complete. It is left to the modeler to determine model inputs or parameters that are not presented in this manual and, of course, to determine areas, slopes, impervious percentages, and the like that are unique to the specific watersheds or pipesheds being analyzed. Following the process outlined in this manual does not preclude the modeler from carefully checking all specific watershed related hydrologic and hydraulic input data for accuracy before presenting it to the City for review.

III. Overview of XP-SWMM Modeling

Purpose of Modeling

Hydrologic and hydraulic modeling typically falls into two categories:

- Modeling for research or studies that may include data collection and calibration
- Modeling for watershed analysis or design

Determining runoff volumes and mass loading of pollutants associated with surface water runoff is one example of a model developed for analysis purposes. Modeling can also be conducted to determine specific flows from a watershed for design purposes that may include analysis of storm sewer design, combined sewer operation and separation projects or the analysis and design of storm water treatment facilities. This manual addresses both of these modeling scenarios.

Hydrology

Several hydrologic modeling methods are available in XP-SWMM, including the Runoff, SCS, and Rational methods. The City of Minneapolis accepts both the Runoff and SCS methods as their standard for modeling. According to the City of Minneapolis Local Surface Water Management Plan, the Runoff method of hydrograph generation is preferred for hydrologic/hydraulic analysis.

Hydraulics

XP-SWMM contains a great variety of hydraulic conditions that can be modeled from simple pipe networks to complex, multi-staged outlet structures to natural channels. Those commonly used parameters, such as pipe entry and exit loses and pipe Manning's *n*, are easily subject to standardization where more esoteric parameters, such as those related to natural channel geometrics or to weirs and pumps, are more difficult to standardize and will be left to the individual modeler to determine. Only three hydraulic parameters (Manning's *n* as well as exit and entry losses) are subject to standardization.

All other hydraulic parameters, including contraction-expansion loss coefficient, weir coefficients, culvert inlet type, low flow roughness factor, sediment depth, and pipe extension factor, cannot be standardized across all models. Except for the pipe extension factor, these parameters are related to physical characteristics of the pipe system and must either be determined based on system layout and operation or simply left at their default values. These adjustments are the responsibility of the individual modeler to determine and must be based on sound engineering judgment. If the modeler does not find a standard parameter or procedure that relates to the particular model under development in this manual and, furthermore, feels that a default parameter should not be used, she or he should contact City staff to obtain their advice and agreement prior to model finalization.

IV. Data Collection and Model Construction

Overall Standards

All models constructed for the City of Minneapolis must:

- Be georeferenced using the City's GIS database.
- Use the 10-digit "UDI" field as the node naming convention.

- Use a unique, descriptive alpha-numeric with an "L" placed before the number as the link naming convention (10-digit maximum).
- Use street channel overflow sections to provide surface connectivity under flooding conditions.
- Use the Green-Ampt infiltration option with the Runoff method.

Data sources range from the City Engineering Services Department to construction and as-built plan sets, record drawings, and field investigations. The City's Engineering Services Department has standardized infrastructure data, which is comprised of an extensive GIS database and plat maps of storm sewer and sanitary systems. Appendices B, C, and D of this manual cover how to use the GIS database and the plat maps to build a georeferenced storm sewer network. City contact information is presented in Appendix B.

Non-GIS Infrastructure and Hydraulic Data

While the City is constantly updating the GIS database, there may be links with no invert or top of casting information. However, plat maps have been prepared and converted to electronic format for nearly all existing storm and sanitary sewer within the City. They consist of pipe profiles that contain the following information:

- Pipe invert elevation
- Pipe material
- Top of casting elevation
- Other utilities (if any)
- Pipe diameter

In order to obtain either the required information in the case of small projects or the plat map database and software in the case of larger projects, contact the Engineering Services Department. Elevations shown on City plots are local. In order to adjust for true mean sea level (1929), a factor of 710.3 must be added to the plat elevation.

Rainfall Data

Runoff is generated when rainfall is applied to a watershed or pipeshed. Two methods of generating rainfall—synthetic or actual—are acceptable to the City but depend upon the intent of the model. If a model is being developed for analyzing watershed characteristics or response to various inputs or changes in land use, then actual rainfall may be used. On the other hand, if the model is primarily being developed for design purposes that would include analysis of storm sewer and storm water treatment facilities under large event simulations, synthetic hydrographs based on design events would most likely be used.

Synthetic Hydrograph Method

The City typically uses the following standards for synthetic unit hydrographs for design purposes. Standards for using synthetic hydrographs are outlined in the Design Storm section on page 9.

Actual Rainfall

The City maintains three rain gauges that are located at:

- Top of the City of Lakes building in downtown Minneapolis (309 2nd Avenue South)
- Public Works Sewer Maintenance Yard (1911 26th Street East)
- Minneapolis Parks and Recreation Board Building (3800 Bryant Avenue South)

Rainfall data from these three sites comes in an electronic format and is reported in five-minute intervals. The modeler can obtain rainfall data from the Engineering Services Department for specific time periods, and the data can easily be imported into XP-SWMM. Details on this procedure are presented in Appendix D.

Hydrologic Standards

The following standards were developed from two recent studies and the Local Surface Water Management Plan. The studies were:

- XP-SWMM Calibration and Standards Study (2005)
- I-35W Tunnel Hydrology and Hydraulics Study (2005)

Both study reports can be obtained from Engineering Services.

Runoff Method

Directly Connected Impervious Area (DCIA)
As not all impervious surfaces are directly connected, an adjustment can be made to compensate for the change in hydrologic characteristics associated with indirectly connected impervious surfaces. The term Directly Connected Impervious Area (DCIA) is defined as impervious surfaces that are directly connected to an outlet—either via surface drainage along ditches, streets, and alleys or via storm sewer. Table 1 contains a value for the reduction that can be applied to the total impervious surface area by land use. For example, if the modeler is working with a five-acre single family land use site and measures an impervious surface area of three acres, then 60% of the total area is impervious surface. According to Table 2, a DCIA multiplier of 0.60 (representing a 40% reduction to compensate for the indirectly connected impervious surfaces) can be applied to the 60%. The resulting value of 36% can then be entered directly into XP-SWMM as Imp (%) in the RUNOFF module in the Sub-Catchments data entry window. Both the Runoff and SCS methods use this value.

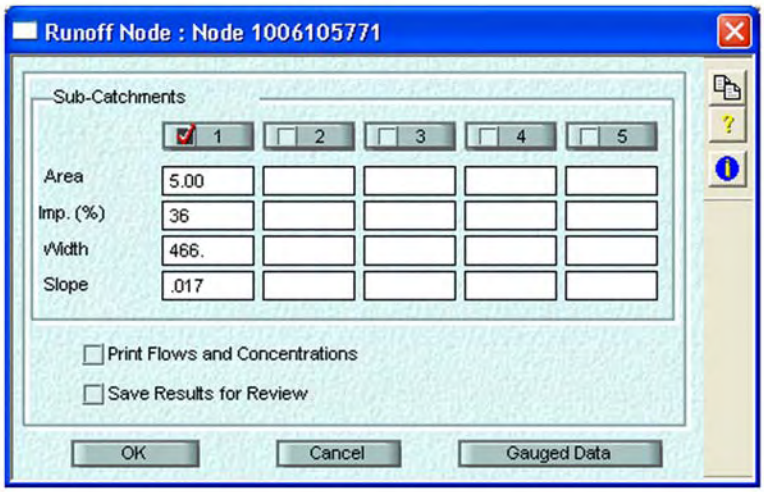


Table 1 – Land Use Consolidation

	Consolidated Land Use	Commercial/ Industrial	Multi-Family Residential	Recreational	Mixed Urban	Single Family Residential	Transportation Related
	Average % Impervious	95%	70%	5%	85%	50%	95%
Land Use	**Class**						
Bar, Restaurant, Club	CBRE				✔		
Common Area	RCMS						✔
Garage or Misc Residential Structure	GMRS		✔		✔ parking ramps		
Group Residence	GRES		✔				
IND Warehouse Factory	IWFW	✔					
Institutions: School, College	CSCH				✔		
Miscellaneous	MISC	Determined on case-by-case basis					
Mixed Office, Retail, Residential	CMXD				✔		
Multi-Family Apartment	MFAP				✔ Incl.high rise		
Multi-Family Residential	MFRS		✔				
Office Structure	COFF	✔					
Public Accommodations	HMTL	✔					
Retail	CRET	✔					
Single-Family Attached	SFAD					✔	
Single-Family Detached	SFDD					✔	
Sport or Recreation Facility	SPRC			✔ see note			
Vacant	VLND	Determined on case-by-case basis					
Vehicle Related Use	CAUT						✔ Streets/Roads
Utility Related Use	CUTL				✔		
Mn/DOT	N/A						✔ Highways

NOTE: Many parking lots within the Land Use database are identified as Sport or Recreation Facilities. Parking lots should be assigned either a 100% impervious cover if paved or a 55% impervious cover if gravel per guidance provided in Table 5.4 of the Local Surface Water Management Plan (See Appendix E). A DCIA multiplier of 1.0 should be used in either case.

The modeler should determine what land uses are being modeled and then find the corresponding consolidated land use in Table 1. Once the consolidated land uses are selected, the modeler should determine percent impervious surface using one of two methods:

- **Preferred Method –** Measure impervious surfaces using a CADD or GIS application.
- **Acceptable Method –** Use the percent impervious values presented in Table 1.

Because the percent impervious values found in Table 1 are averages, the City prefers that modelers measure all impervious surfaces as closely as possible using either CADD or GIS, since this will provide the most accurate value to which the DCIA reduction multiplier can be applied. When using the percent impervious values in Table 1, they become less representative as smaller areas are modeled. Small areas of a few blocks are best modeled using the preferred method. It is left to the modeler and City staff to agree on what method will be used for larger models prior development.

When there are a multiple land uses associated with a particular drainage area, two methods for determining a composite DCIA can be used:

1. **Preferred Method** – Once impervious surfaces have been determined for each land use, apply the DCIA multipliers found in Table 1 to each land use and then determine a composite DCIA that would be entered into the Runoff Node.
2. **Acceptable Method** – Once impervious surfaces have been determined for each land use and if a single land use predominates (say, greater than 80% of the drainage area), the modeler may apply the DCIA multiplier in Table 1 associated with that land use to the entire drainage area.

As noted in Table 1, many parking lots have been assigned to the Sport or Recreation Facility land use, which, if simply taken as such and consolidated into the Recreational land use, would provide a DCIA that is too low. Parking lots should be removed from the Recreational consolidated land use and their respective DCIA applied prior to applying the DCIA multiplier for the remainder of the Recreational land use. Further, if the modeler determines that the assigned land use is not hydrologically appropriate (for example, a high rise apartment building complex that, according to Table 1, would be consolidated into Multi-Family but may better be consolidated into Mixed Urban), then the modeler may use a more appropriate consolidated land use. Great care, however, should be exercised in this regard.

Green-Ampt Infiltration Parameters

Infiltration significantly affects model results when small rainfall events (< 0.5 inches) that are combined with land uses exhibiting high pervious percentages (for example, recreation) are analyzed. The City prefers that soil samples are taken and the soil type is determined so that accurate Green-Ampt parameters can be selected. If soils information is known, then the Green-Ampt values presented in Appendix A should be used instead of the value in Table 2. Where no soils data is available, the values in Table 2 may be used, but with caution. If large rainfall events (> 0.5 inches) are to be analyzed, the affect of infiltration is minimized, and Table 2 parameters can be used.

Other recommended runoff method parameters by land use are also presented in Table 2.

Table 2 – Runoff Method Parameters

Hydrologic Parameter	Consolidated Land Use						
	Commercial/ Industrial	Multi-Family Residential	Recreational	Mixed Urban	Single Family Residential	Transportation Related	Remarks
Percent Impervious	95%	70%	5%	85%	50%	95%	
DCIA Multiplier	1.0	0.6	0.0	0.9	0.6	1.0	
Width	measured or calculated	measured or calculated	measured or calculated	measured or calculated	measured or calculated	measured or calculated	See EPA SWMM Version 4 User's Manual
Impervious Depression Storage	0.094	0.02	0.02	0.02	0.02	0.094	
Pervious Depression Storage	0.1	0.1	0.1	0.1	0.1	0.1	
Impervious Manning's *n*	0.014	0.014	0.014	0.014	0.014	0.014	
Pervious Manning's *n*	0.2	0.35	0.35	0.2	0.2	0.2	
Average Capillary Suction	10	12	7	10	10	10	Use only if soil types are not known. Use Appendix A if soil types are known.
Saturated Hydraulic Conductivity	0.25	0.3	0.08	0.25	0.25	0.25	
Initial Moisture Deficit	0.32	0.32	0.16	0.32	0.32	0.32	
Zero % Detention	25%	60%	100%	100%	25%	25%	

Width

Width may either be measured or computed using the following formula. Refer to SWMM Version 4 documentation provided by the EPA to determine if a skew factor is required.

$W = (2 - Sk)*l$ where:

W = subcatchment width
l = length of main drainage channel

$$Sk = \frac{A2 - A1}{A}$$

Where:

Sk = skew factor, $0 < Sk < 1$,
$A1$ = area to one side of channel,
$A2$ = area to other side of channel
A = total area

SCS Method

Parameters

The recommended SCS method parameters by land use are provided in Table 3.

Table 3 – SCS Method Parameters

Hydrologic Parameter	Consolidated Land Use					
	Commercial/ Industrial	Multi-Family Residential	Recreational	Mixed Urban	Single Family Residential	Transportation Related
Percent Impervious	95%	70%	5%	85%	50%	95%
DCIA Multiplier	1.0	0.6	0.0	0.9	0.6	1.0
Composite Pervious Curve Number	72	69	69	72	69	72
Initial Abstraction (as a fraction)	0.20	0.20	0.10	0.10	0.20	0.10
Shape Factor	484	484	484	484	484	484

Time of Concentration

Time of concentration is defined by the NRCS as "the time it takes for runoff to travel from the hydraulically most distant part of the [drainage] area to the watershed outlet" (NEH Section 4, Chapter 15). The watershed outlet, in this case, is where runoff enters a pipe or channel network. Time of concentration, or T_C, is strictly related to surface flow in an XP-SWMM pipe and channel network modeling situation. The NRCS suggests that T_C can be divided into two surface flow components – overland or sheet flow time (t_O) and channelized flow time (t_T) (TR-55 2nd Edition, 1986). Typically, T_C will be computed for overland sheet flow, which, after 300 feet becomes overland channelized flow, from the most distant point of a drainage area associated with a runoff node to the entrance of a pipe or channel network. Once flow reaches the node, XP-SWMM computes T_C within pipes and channels. Overland flow can be calculated using the following equation (following equation and Table 4 taken from Minnesota Department of Transportation Drainage Manual):

$T_C = t_O + t_T$ where:

$$t_O = \frac{0.42(nL)^{0.8}}{P^{0.5} s^{0.4}}$$

Where: t_O = overland flow time (min)
n = Manning's roughness coefficient (see Table 4)
L = length of flow (ft) $L \leq 300$ ft
P = 2-year, 24-hour storm (2.8 inches)
s = average land slope along flow path (ft/ft)

$$t_T = \frac{L}{60V}$$

Where: t_T = channelized flow time (min)

Table 4 – Roughness Coefficients (Manning's *n*) for Sheet Flow

Surface Description		*n*[1]
Smooth Surfaces (concrete, asphalt, gravel, or bare soil)		0.011
Fallow (no residue)		0.05
Cultivated Soils	Residue cover ≤ 20%	0.06
	Residue cover > 20%	0.17
Grass	Short grass prairie	0.15
	Dense grasses[2]	0.24
	Bermuda grass	0.41
Range (natural)		0.13
Woods[3]	Light underbrush	0.40
	Dense underbrush	0.80

1 The *n* values are a composite of information compiled by Engman (1986).

2 Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.

3 When selecting *n*, consider cover to a height of about 0.1 ft, which is the only part of the plant cover that will obstruct sheet flow.

Design Storm

Standards for using synthetic hydrographs for design purposes are as follows:

- Design Storms: Typically 2, 10, 50, and 100 year events (See Local Surface Water Management Plan in Appendix E for application of the various storm events.)
- Storm Duration: 24 hours
- Rainfall Distribution: SCS Type II, either 0.25 or 0.10 time intervals

Table 5 provides design storm event rainfall depth multipliers that should be used when synthetic hydrographs are selected.

Table 5 – Rainfall Frequency Depth (24 hr storm event)

Return Period (Years)	Depth Multiplier (Inches)
1	2.3
2	2.8
5	3.5
10	4.2
25	4.8
50	5.3
100	5.9

Hydraulic Standards

Typically, catch basins or drop inlets are not modeled, because, for hydraulic purposes, a number of inlets (catch basins, drop inlets, etc.) can be modeled as one node. Therefore, inlet capacity is usually not used and all surface water is assumed to get to the storm sewer pipe. If the modeler is modeling actual catch basins or drop inlets and wants to provide inlet capacity values, then she or he must determine what these values would be based on the type of inlet and potential plugging. This parameter can be modified under the node properties in the HYDRAULICS module. It should also be noted that the node must have storage associated with it to provide a way to store and release runoff at the inlet capacity rate. If the Inlet Capacity check box is not selected, XP-SWMM assumes all runoff enters the node unhindered. Recommended hydraulic parameters are presented in Table 6.

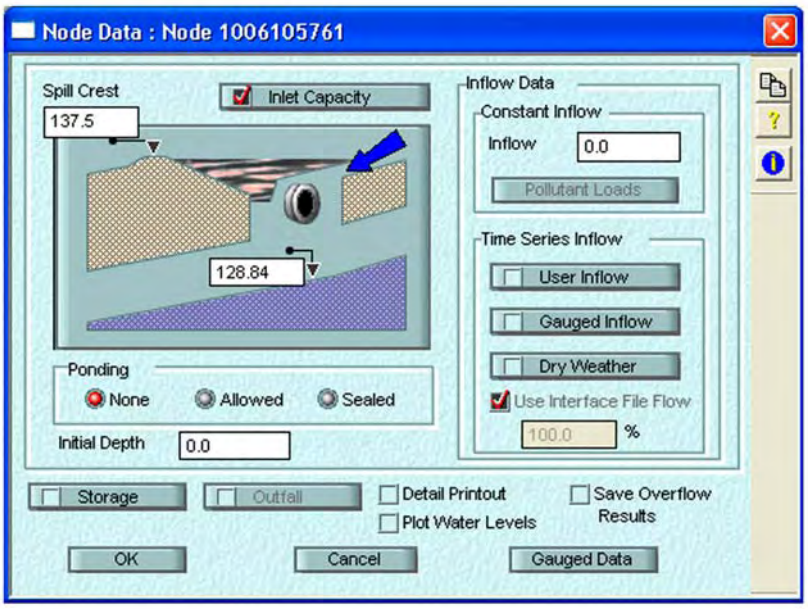


Table 6 – Hydraulic Parameters

Parameter	XP-SWMM Default	Recommended
Entrance Loss Coefficient	0	0.5
Exit Loss Coefficient	0	0.5 for manhole outlet 1.0 for external outlet or outfall
Manning's *n* (conduit roughness)	0.014	0.010 – Smooth wall plastic/HDPE 0.012-0.014 – RCP (typical = 0.013) 0.024 – CMP, CPP

The City prefers modelers use multi-links that represent storm sewer (lower links) and street or overland flow (upper link). Appendix F provides information on using multi-links for to model street flow.

V. Preparing a Model for Review

In this section, the standards and formats are presented for preparing a model for the City to thoroughly review.

Electronic

When submitting a model to the City, provide a CD-ROM with all model runs, including those run for various storm events, if appropriate. All files associated with the model should be provided on the CD-ROM so that City staff do not need to run the model again.

In addition, all files on the CD-ROM should have short but descriptive names as shown in the following examples:

- 14_PARK91404.xp refers to the 14th and Park pipeshed using the September 14, 2004, actual rainfall event.
- 14_PARK10YR.xp refers to the 14th and Park pipeshed with the synthetic 10-year Type II storm simulated.

Print Copies

The City also requires that a drainage area map, including drainage boundaries and pipe networks (both existing and proposed if appropriate), is submitted for review. In addition, all computations of calculated parameters, such as area, weighted curve numbers, times of concentration, and any assumptions used to determine other values (for example, land use related pervious and impervious percentages), are provided.

VI. Final Model Submittal

When submitting the final model to the City, include all documentation used during the review as well as all comments provided by the City and the modeler's responses. Typically, a report is submitted with the model that, at a minimum, should include:

- Details of the modeling process
- Tables of input parameters and assumptions used to determine them
- Tables and hydrographs of results and a discussion of the impacts of the results on downstream conditions
- Recommendations (if appropriate)
- Any correspondence with the City (either by phone, letter, e-mail, or meeting minutes) that supports decisions that were made during the modeling process

(SWMM RUNOFF Variables SUCT, HYDCON, SMDMAX)
Provisional Values Suitable for Design Storm Events Where More Detailed Soils Data Is Not Available

USDA Soil Texture Classification	SUCT Avg. Capillary Suction		HYDCON Saturated Hydraulic Conductivity		SMDMAX Initial Moisture Deficit for Soil (Vol. of Air / Vol. of Voids, expressed as a fraction)	
	(in)	(mm)	(in/hr)	(mm/hr)	Moist Soil Climates (Eastern US)	Dry Soil Climates (Western US)
Sand	**1.95**	**49.5**	**9.27**	**235.6**	**.346**	**.404**
Loamy Sand	**2.41**	**61.3**	**2.35**	**59.8**	**.312**	**.382**
Sandy Loam	**4.33**	**110.1**	**0.86**	**21.8**	**.246**	**.358**
Loam	**3.50**	**88.9**	**0.52**	**13.2**	**.193**	**.346**
Silt Loam	**6.57**	**166.8**	**0.27**	**6.8**	**.171**	**.368**
Sandy Clay Loam	**8.60**	**218.5**	**0.12**	**3.0**	**.143**	**.250**
Clay Loam	**8.22**	**208.8**	**0.08**	**2.0**	**.146**	**.267**
Silty Clay Loam	**10.75**	**273.0**	**0.08**	**2.0**	**.105**	**.263**
Sandy Clay	**9.41**	**239.0**	**0.05**	**1.2**	**.091**	**.191**
Silty Clay	**11.50**	**292.2**	**0.04**	**1.0**	**.092**	**.229**
Clay	**12.45**	**316.3**	**0.02**	**0.6**	**.079**	**.203**

Notes:

1. These values are provisional and are offered as reasonable parameter estimates for SWMM applications where more detailed soils information is not available. There is significant variance in these values; laboratory and field testing, sensitivity analysis, and calibration may be employed to improve upon these estimates.
2. Typically use USDA SCS (now NRCS) Soil Survey to determine Soil Texture. In these surveys, Saturated Hydraulic Conductivity is reported as Permeability. Use the values reported in the soil survey for permeability for **HYDCON**, rather than the **HYDCON** values listed in the table above. In the absence of a soil survey or more reliable information, the values listed above may be used.
3. Synthesized from *Handbook of Hydrology*, D.R. Maidment, Editor in Chief, McGraw-Hill, Inc., 1993, pp 5.1-5.39.

Appendix B – Obtaining, Preparing, and Using GIS Data

XP-SWMM is capable of using the City's GIS data, but it must be processed before it is imported into the model (in the case of utilities) or used by the modeler to determine hydrologic characteristics (in the case of land use, contours, or planimetrics). To obtain GIS data from the City, contact:

City Engineering Services Department
309-2nd Avenue South
Minneapolis, Minnesota 55401-2268
612.673.3609

The Engineering Services Department can provide the following files:

- StormPoints.dbf (storm sewer nodes)
- StormDrain.dbf (storm sewer links)
- DTM_GRD.dbf (digital terrain model from which contours can be generated)
- Land_Use.dbf (land use information)
- Plainmetric.dbf (surface features including streets, buildings, trees, and forest)

Node and Link Data

Note: For small models that may only contain a few nodes, the following procedure can be skipped if the modeler wishes to manually enter all data, including X and Y coordinates, directly into XP-SWMM. However, it is recommended that larger models follow this procedure to assure accurate data transfer.

Two flat database (dbf) files—StormPoints.dbf and StormDrain.dbf—represent all City storm sewer in a georeferenced point and link (arc) form. The City will supply these files for the watershed or pipeshed under study. However, the City's GIS database does not inherently contain the required connectivity of nodes and links (arcs) that XP-SWMM needs to create a pipe network. Before the City database information is imported into XP-SWMM, a topologically correct coverage must first be created from the raw node and link databases. This preprocessing must be completed using ArcInfo and spreadsheet software.

The GIS process for creating a topologically correct ArcInfo Coverage (Geometric Network) of storm sewer nodes and arcs for the City of Minneapolis enables the following capabilities:

- Connectivity tracing
- Establishment of network connection rules
- Definition of specialized junction behavior (if any)

Topological connectivity in a network feature class is based on geometric coincidence. If a junction (node) is associated along an edge of an arc or one arc is connected to another, they become topologically connected to one another. The Snapping and Spatial Join tools must be used to create this connectivity.

Nodes must be added to arcs, which allows for every arc to have one and only one "from node" (FNode_) and one and only one "to node" (TNode_). The newly created nodes are then associated with nodes in the StormPoints.dbf database using the Spatial Join tool. This process builds a topologically correct ArcInfo Coverage, and it essentially joins the two databases together. Upon completing the process, the resulting coverage will feature FNode_ and TNode_ data for each and every arc in the study area. A single georeferenced flat database file (dbf) that is compatible for input into the XP-SWMM model is thus created.

The modeler should be aware that:

- Some arcs may not have nodes associated with them if, for some reason, the City GIS database is incomplete. Under this condition, the modeler must obtain this data either from the City or through construction plans or physical surveys.
- Some links may not have invert information associated with them. This information will need to be obtained by the modeler from the plat maps, construction plans, or surveys.

These hydrologic data files are used to determine watershed or pipeshed specific characteristics:

- **DTM_GRD.dbf.** The modeler is responsible for creating a contour file and delineating watershed/pipeshed boundaries using the DTM file. If the modeler has obtained contours, either in DTM or TIN form, that are more precise than what the City can provide, these may also be used.
- **Land_Use.dbf.** As many as 19 land uses are identified in the City database. They have been consolidated into six land uses, based on hydrologic response characteristics. Table 1, in Section IV. Data Collection and Model Construction provides information on this consolidation. The land use file is used to determine the relative percentages of each land use for the watershed or pipeshed being studied.
- **Planimetric.dbf.** This file is used to assist the modeler in determining existing locations of streets, alleys and other surface features. It is left to the modeler to use this file appropriately.

Appendix C – XP-SWMM Model Input File Summary

The following discussion presents one method for creating the link between GIS and XP-SWMM without using the XP-SWMM GIS add-on. The modeler should create and import the following files:

1. **NODE DATA.csv**: This file contains data processed so that a node is placed and named at the end of each pipe segment included in the GIS storm sewer layer provided by the City of Minneapolis. It should be noted that all nodes may not represent an actual structure (that is, a node may represent the start of a bend, and these may need to be edited or deleted).
2. **LINK DATA.csv:** This file contains the FNODE_ and TNODE_ data used to establish and name links.
3. **MULTILINK (1).csv:** This file activates the first multilink and provides the conduit names. Conduit names for the first multilink were established by placing a "-1" suffix on the multilink name.
4. **PIPE CHARACTERISTICS.csv:** This file contains all information in the GIS storm sewer data layer provided by the City of Minneapolis, including pipe size, material, invert elevations, length, and so on. Other parameters, such as Manning's *n*, time weighting factors, and entrance and exit losses, are also included.
5. **RUNOFF.csv:** This file contains four parameters pertinent to the Runoff method – catchment area, percent impervious, and catchment width—and activates the first catchment of each node in the Runoff Module. EPA documentation (SWMM Version 4 User's Manual) should be used to establish catchment width. Percent impervious is determined through GIS analysis using land use data provided by the City of Minneapolis and generalized impervious fractions. The catchment area can be summarized using GIS analysis or by direct measurement. Catchment slope is determined manually.
6. **MULTILINK (2).csv:** This file activates the second multilink and provides the channel (street flow section) names. Channel names for the second multilink are established by placing a "-2" suffix on the multilink name.
7. **CHN CHARACTERISTICS.csv:** This file defines all parameters necessary for implementing channel overflow sections. Top of casting elevations obtained from the City of Minneapolis plat maps represent the upstream and downstream inverts of the channel sections. Manning's *n* was left at the default value of 0.014, but it may need to be altered as necessary to represent street roughness.

Appendix D – Importing Data

Creating and Importing GIS Infrastructure Data

Once a topologically correct coverage is created with all links and nodes connected, a number of import files must then be created for XP-SWMM. These files must be in Comma Separated Value (.csv) format. Appendix C contains input file summary information that can be used to prepare and input data required by the City for all models. Other than the RUNOFF.csv file, all other files relate to hydraulics and storm sewer networks.

Once the various import files are created, use the File → Import Data → Import XPX/EPA Data command to read each import file. Importing should be completed in the order that is outlined in Appendix C.

Preparing an XP-SWMM Rainfall Import File

Raw rainfall data provided by the City must be processed so that XP-SWMM can import and use it. The City provides the data in a spreadsheet form. In raw form, the date and time stamp are combined into one column and the corresponding rainfall depth (inches) is shown in the next column. This data can be imported into XP-SWMM in one of two ways:

- Using the User Input menu (Configuration → Global Data → Rainfall → Edit → User Input menu), which will not associate a date and time stamp with the data.
- Using the rainfall interface file (Configuration → Global Data → Rainfall → Edit → RAIN interface file), which will associate a time and date stamp with the data. A rainfall interface file must first be created using the utilities function in XP-SWMM.

The City prefers that modelers use the rainfall interface file format as it maintains date and time with the rainfall data.

Entering Infrastructure Data

If the modeler finds that the GIS infrastructure data is incomplete, then either the plat maps, construction drawings, or surveys should be used to fill the gaps. After this data is obtained, it is easiest to enter the data directly through the HYDRAULICS module data windows in XP-SWMM. While the data could be entered into the GIS database or XP-SWMM import files, this may be just as time consuming as simply using the data entry windows in XP-SWMM.

Methods

1) XP-SWMM model using the Runoff method of hydrograph generation is the City's preferred model for hydrologic/hydraulic analysis for development and redevelopment work. The City's calibrated hydraulic and hydrologic modeling parameters should be used for XP-SWMM modeling. In certain instances, other models may be accepted by the City. The Rational Method may be used for the design of storm sewers.

2) All off-site runoff that drains through proposed developments or redevelopment must be accounted for in the proposed stormwater system design.

3) Post-development peak flow rates should not exceed existing peak flow rates for the 2-year, 10-year and 100-year storm events, defined as follows:
   a) 2-year: 2.8 inches in 24 hours, SCS Type II distribution
   b) 10-year: 4.2 inches in 24 hours, SCS Type II distribution
   c) 100-year: 5.9 inches in 24 hours, SCS Type II distribution

4) In some instances, more restrictive peak flow requirements may be imposed by the City. These are primarily: (1) in or upstream of designated flood areas within the City, (2) in storm sewers tributary to downstream under-capacity facilities, and (3) in areas where trunk and/or tunnel surcharging and resulting flood damage is occurring. The City's 1997 Flood Report (and updates) identifies the designated flood areas. The City's 2004 Tunnel Management Plan identifies under-capacity tunnels.

5) Except in designated flood areas, conveyance facilities should be designed to convey the 10-year storm event (in accordance with Rational Method procedures) without surcharging. In designated flood areas, storm sewer and other conveyance should be designed to prevent boulevard flooding for the critical 100-year event:
   a) The 100-year, 24-hour storm event (5.9 inches in 24 hours)
   b) The 100-year, 1-hour storm event (3.0 inches in 1 hour)

6) A Manning's roughness coefficient (n) of 0.013 should be used for concrete pipe and 0.024 for corrugated metal pipe.

7) Typically for parking lots and large paved areas, impervious cover percent as listed in Table 5.4 should be used.

Table 5.4 – Percent Impervious Cover to be Used for Parking Lots and Driveways

Land Cover	Impervious Cover (%)
Paved parking lots, roofs, paved driveways	100
Gravel parking lots and driveways	55

For single family residential areas, impervious cover as listed in Table 5.5 should be used:

Table 5.5 – Percent Impervious Cover to be Used for Residential Uses

Average Lot Size	Impervious Cover (%)
1/8 acre or less	65
1/4	38
1/3	30
1/2	25
1	20

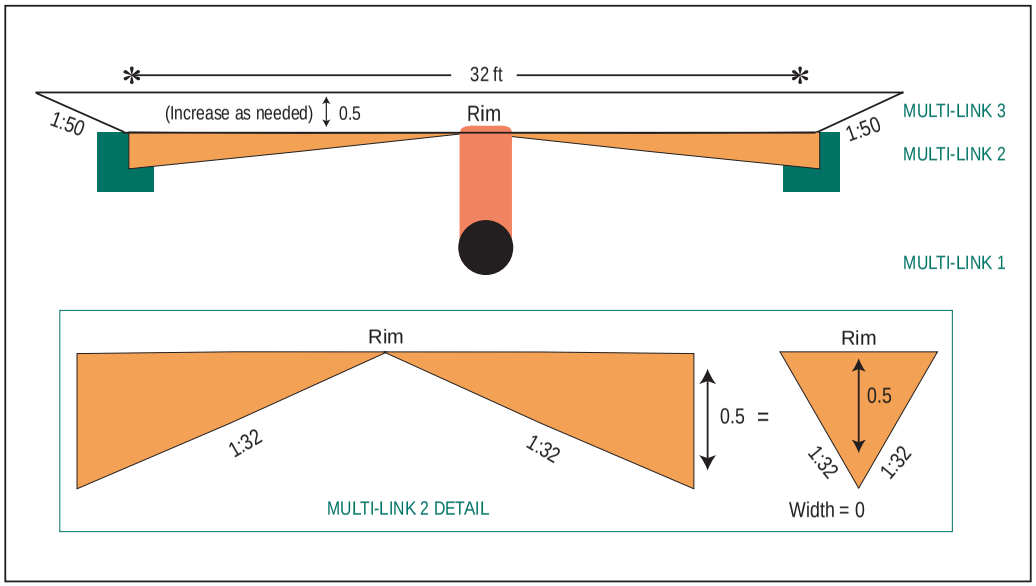
Table 5.5 pertains to off-site areas analyzed in conjunction with a development project. The actual area of the proposal should be explicitly delineated for impervious area.

Table 5.6 lists curve numbers (CN), Ra tional Method runoff coefficients (C), and impervious cover for the three rate control events.

Table 5.6 - Curve Numbers (CN) and Rational Method Runoff Coefficients (C) Associated with Impervious Cover

Impervious Cover (%)	Curve Number, CN	Runoff Coefficient, C		
		100-year	10-year	2-year
0	60	0.32	0.20	0.10
5	62	0.35	0.23	0.12
10	64	0.38	0.26	0.14
15	66	0.41	0.29	0.17
20	68	0.44	0.32	0.19
25	70	0.47	0.35	0.22
30	72	0.50	0.38	0.25
35	74	0.53	0.42	0.28
40	76	0.56	0.45	0.32
45	78	0.60	0.49	0.36
50	80	0.63	0.53	0.40
55	82	0.67	0.57	0.44
60	83	0.68	0.59	0.46
65	85	0.72	0.63	0.51
70	87	0.75	0.67	0.58
75	89	0.79	0.72	0.62
80	91	0.83	0.77	0.68
85	93	0.87	0.82	0.74
90	94	0.88	0.84	0.77
95	96	0.92	0.89	0.84
100	98	0.96	0.95	0.92

Note: The above table is based on National Resource Conservation Service (NRCS) methodology



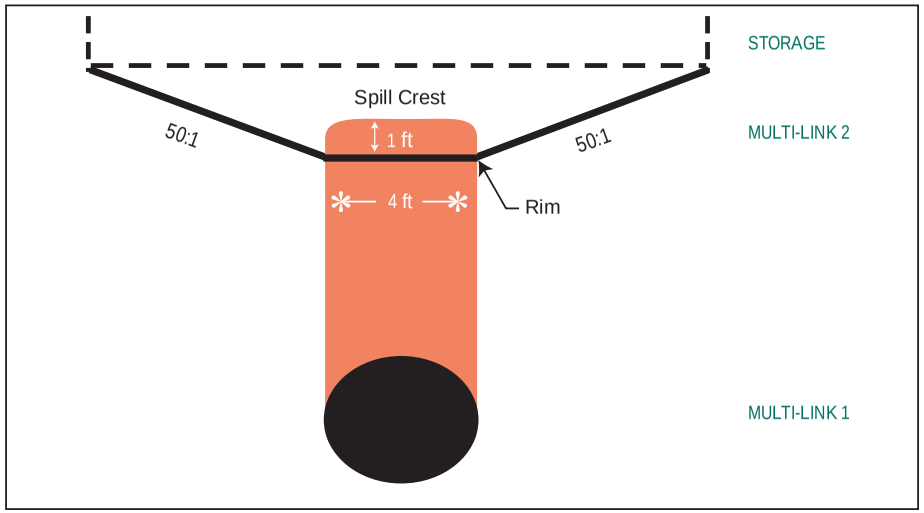
Three multi-link option

Represents two stages of flooding – in-street and over back of curb – and provides channelization for both.

First multi-link = storm sewer. Spill crest = Rim elevation

Second Multi-link = trapezoidal channel representing street section. Channel width = 0 ft, channel side slopes = 1:32, channel depth = 0.5 ft, channel bottom = Rim – 0.5 ft

Third multi-link = trapezoidal channel representing flow over top of curb. Channel width = 32 ft, side slope = 1:50, channel depth = variable but 0.5 ft typical, channel invert = Rim + 0.5 ft



Two multi-link option

Represents one stage of flooding and assumes that in-street flooding below curb and above curb are both represented in one trapezoidal channel.

First multi-link = storm sewer. Spill crest = Rim elevation plus one foot

Second multi-link = trapezoidal channel representing gutter flow. Channel width = 4 ft, channel side slopes = 1:50, channel depth = variable but 1 foot typical, channel invert = Rim.

At low points, include storage in node to represent severe flooding.

Appendix N
Water Resources Management Guiding Principles – Gap Analysis and Summary of Recommended Additional Activities

As part of the LSWMP development, City staff compared existing water resources activities against current Minneapolis goals and impending regulatory requirements. A summary of the gaps that were identified between existing activities and the City goals and impending regulatory requirements follows.

Protect people, property and the environment (Guiding Principle #1)

Construct improvements to sanitary sewer and storm drainage systems that provide protection

Existing Regulations, Ordinances, and Policies

- Minneapolis: Recommendations in the 1997 Flood Report.
- Minneapolis Zoning Code: Designation of Floodplain Overlay District (Title 20, Chapters 551.540-650) established to comply with rules and regulations of National Flood Insurance Programs codified as 44 Code of Federal Regulations Parts 59-78.
- Minneapolis: NPDES Permit No. MN 0046744, Minneapolis Combined Sewer Overflow Permit (expired).
- Minneapolis: Eliminate CSOs by 2014 (Sustainability Target)
- Minneapolis: Protect and sustain water resources (Minneapolis Plan, Policy 7.5).
- Minneapolis: Enhance the safety and appearance of our built environment through education, inspection and enforcement (Minneapolis Plan, Policy 7.10).
- Minneapolis: Take measures to reduce water consumption and encourage water conservation (Minneapolis Plan, Policy 7.6).
- DNR: Adoption of MNDNR floodplain & shoreland regulations (Minnesota Rules Chapter 6120.) (MCWD Water Resource Management Plan, Section IX.B.1.b)
- BCWMC: Implement (with BCWMC) water quality improvement options contained in BCWMC Watershed Management Plan (Section 4.2.2.1, policy D). Projects identified in Minneapolis are: 1) BC-11112-12 Detention Basin in Bryn Mawr Meadows Park; and 2) BC-111152 Detention Basin near intersection of Xerxes Ave N and 16^{the} Ave N.

- BCWMC: Identify any proposed capital improvement projects beyond those listed in Table 12-2 and Table 12-3, and/or the proposed movement of a water quality improvement project from Table 12-3 to Table 12-2 (Section 4.2.2.1, Policy J).
- BCWMC: Identify any proposed changes to the BCWMC flood control project system (Section 5.2.2.1).
- BCWMC: Incorporate the BCWMC's adopted 100-year floodplain elevations for the BCWMC trunk system (Section 5.2.2.2, policy F).
- BCWMC: Meet the BCWMC's requirement that the lowest floor of all permanent structures be at least 2 feet above the established 100-year floodplain elevation and incorporate this requirement into city ordinances (Section 5.2.2.2, policy J).
- BCWMC: Comply with the BCWMC Plan's goals and policies regarding flooding and rate control (contained in Section 5.0 of the Plan) (Section 5.2.2.2, policy N).
- BCWMC: Identify local flooding problems, potential solutions, and if the BCWMC participation is anticipated (Section 12.4.1).
- MCWD: local plans must include floodplain management strategies which must conform to MCWD Rule C.
- MWMO: stormwater hydraulic design standards will be based on ability of design to reduce the probability of flooding rather than on hydraulic design standards (Watershed Management Plan, Section 5, Goal 1).
- MWMO: monitor and engage water supply planning efforts, develop drought response plan (if appropriate), monitor water demand and address wasteful processes, and promote water conservation projects/policies (Watershed Management Plan, Section 5, Goal 2).
- SCWMC: city must demonstrate that key flood storage areas, wetlands, ditches, and drainage ways are protected and channel capacity is maintained (Second Generation Watershed Management Plan, Section 5).
- SCWMC: member cities must demonstrate that runoff rates do not exceed discharge rates established in Section 3. Total additional flow in Shingle Creek, from Minneapolis sources during a 100-year flood condition should decrease from 1310 cfs (2000) to 815 cfs (2020). (Second Generation Watershed Management Plan, Section 6, Policy 1.1.2)
- SCWMC: cities must establish 1-foot freeboard above the 100-year flood profile (Second Generation Watershed Management Plan, Section 6, Goal 1, Policy 1.1)

Existing Minneapolis Programs

- Flood mitigation fund established to correct problems identified in Flood '97 and amendments.
- Construct projects that remove inflow and infiltration from sanitary sewers to improve hydraulic deficiencies, reduce overflows, and reduce extraneous flows at Metro WWTP.
- Construct stormwater quality and quantity controls to meet requirements of City ordinances, and to meet recommendations of water quality studies.
- Multipurpose stormwater quality and quantity structures constructed in cooperation with other public agencies, including BCWMC, MCWD, MWMO, and MN/DOT.
- Beaches monitored by MPRB.

Gaps

- Funding for flood mitigation capital improvements to be phased out by 2007. Need to re-evaluate methods to reduce volume of stormwater runoff tributary to remaining flood areas, as recommended by CLIC.
- Removing inflow sources from sanitary sewers usually results in new connection to storm drain, resulting in increased rates and volumes of runoff to existing storm drains. If not infiltrated, the need assessment of potential downstream problems.
- Foundation drain connections to sanitary sewers not inventoried.
- Lack of complete documentation of inflow to sanitary sewer system prevents accurate calibration of storm drainage system simulation models.
- Prioritization system gives preference to large projects intended to solve single problem. Smaller projects that accomplish multiple goals often not included in Capital Improvement Program (CIP).
- MCWD and BCWMC require flood protection to 2 feet above Base Flood Elevation – Mpls ordinance requires protection to 1 foot above BFE.
- Certain storm drains are subject to extreme surcharging during storm events that exceed design capacity.

Recommended Additional Activities

1. Implement capital improvement projects which create integrated solutions to multiple wet weather problems of excessive infiltration, inflow, flood mitigation and/or stormwater quality. Evaluate green initiative techniques for stormwater runoff volume control as alternatives to flood mitigation projects recommended in Flood '97 report.

2. Update prioritization system for capital improvement projects that incorporates life-cycle considerations, multiple objectives, and cooperating partnerships.

3. Expand existing hydraulic and water quality models, including tunnel model and MCWD H&H model to create predictable backbone model that establishes baseline flow rates, and is linked to sanitary model. Model should be able to be expanded to assess impact of specific proposed improvement, and measure baseline stormwater volumes for sustainability targets.

4. Work with BCWMC and MCWD to resolve differences between Minneapolis Floodplain Ordinance and watershed rules.

5. Accelerate program to inspect for and remove rainleader and foundation drain connections to sanitary sewers to meet requirements of MCES I/I Surcharge Program.

6. Investigate feasibility of redesign or limiting access to manholes subject to frequent surcharging during storm events that exceed design capacity of storm drain.

Maintain and enhance infrastructure (Guiding Principle #2)

Maintain condition of sanitary sewer and stormwater drainage systems

Existing Regulations, Ordinances, and Policies

- MCES: CSO Study, 2002
- MCES: I/I Surcharge Policy
- Minneapolis: 1997 Infrastructure Inventory
- Minneapolis: NPDES Permit No. MN 0046744, Minneapolis Combined Sewer Overflow Permit (expired).
- Minneapolis: NPDES/SDS Permit No. MN 0061018, Municipal Storm Sewer System (expired).
- BCWMC: Acknowledge city's responsibility for maintaining its stormwater management system, for cleaning the BCWMC flood control project features, and for stream maintenance and repairs that are primarily aesthetic improvements (Section 5.2.2.1, policy F; Section 7.2.2, policy J; and Section 12.4.1).
- BCWMC: Watershed management plan assumes responsibility for inspection, maintenance and repair of components of flood control project (Section 5.2.2.1, Table 5-2 and table 12-4 of BCWMC Watershed Management Plan).
- MCWD: municipalities are responsible for performing all maintenance activities addressed in the LSWMP (MCWD Water Resource Management Plan, Section IX.B.1.b) (MN Rules Chapter 8410.0100, Subpart 6)
- SCWMC: cities must follow asset management practices (Second Generation Watershed Management Plan, Section 6, Goal 1, Policy 1.3, Strategy 1.3.2)

Existing Minneapolis Programs

- Dedicated source of revenue established for maintenance activities
- Infrastructure maintained in accordance with NPDES permits. Activities summarized in annual NPDES Stormwater and CSO reports.
- Bassett Creek Tunnel inspected and maintained in accordance with cooperative agreements established prior to construction.

Gaps

- Maintenance inspection schedules not updated to schedules recommended in 2005 Minnesota Stormwater Manual

- MCES I/I Surcharge policy could necessitate increased length of annual sanitary sewer inspections
- Asset management system is not linked to GIS or accounting systems.
- Cooperative agreements between Minneapolis, MN/DOT and BCWMC not updated to reflect responsibilities assumed in BCWMC Watershed Management Plan.

Recommended Additional Activities

1. Expand sanitary sewer preventive maintenance inspections to storm drainage system. Consider inspection schedules recommended in 2005 Minnesota Stormwater Manual.
2. Increase length of sanitary sewers that are visually inspected to locate areas of excessive infiltration in order to meet requirements of MCES I/I Surcharge Program.
3. Renegotiate and amend cooperative agreements between Minneapolis, MN/DOT and BCWMC that govern the operation, maintenance and repair of Bassett Creek Tunnel and Culvert to be consistent with current policies of BCWMC.

Maintain capacity of sanitary sewer and stormwater drainage systems

Existing Regulations, Ordinances, and Policies

- Minneapolis: Flood Report, 1997
- Minneapolis: NPDES Permit No. MN 0046744, Minneapolis Combined Sewer Overflow Permit (expired).
- Minneapolis: NPDES/SDS Permit No. MN 0061018, Municipal Storm Sewer System (expired).
- Minneapolis: Manage the use of the City's environmental resources to meet present needs while considering future concerns (Minneapolis Plan, Policy 7.2).
- Minneapolis: Pervious surface sustainability targets
- Minneapolis: prohibition of inflow sources from sanitary or combined sewer (Code of Ordinances, Chapter 56, Prohibited Discharges to Sanitary or Combined Sewer).
- MCES: CSO Study, 2002
- MCES: I/I Surcharge Policy
- BCWMC: member cities are required to provide information to BCWMC regarding proposed changes to the flood control system, including the old and new Bassett

Creek culvert and tunnels. BCWMC must review and approve before changes are made (Section 5.2.2.1, BCWMC Watershed Management Plan).

- SCWMC: city must restrict runoff to peak rates established by SCWMC (Second Generation Watershed Management Plan, Section 5).

Existing Minneapolis Programs

- Peak flow rates from new construction projects are restricted if downstream hydraulic deficiencies, including flooding, exist (Code of Ordinances, Chapter 54).
- Storage in existing and future stormwater quality controls is maximized
- Sanitary sewers are lined to seal out extraneous infiltration when identified by sewer inspection program.
- Sources of inflow connections from public and private buildings are investigated

Gaps

- Storm drain models not complete for entire City. Sanitary sewer models not integrated with storm drain models.
- Definition of emergency CSO overflow condition outdated.
- Sanitary sewers with capacity for in-line storage to prevent CSOs not identified, as recommended in 2002 CSO Study.
- Additional stormwater volume monitoring necessary to measure future success of pervious surface sustainability targets.
- Hydraulic design standards for stormwater drainage system not updated or formally adopted by City.

Recommended Additional Activities

1. Expand existing hydraulic and water quality models, including tunnel model and MCWD H&H model to create predictable backbone model that establishes baseline flow rates, and is linked to sanitary model. Model should be able to be expanded to assess impact of specific proposed improvement, and measure baseline stormwater volumes for sustainability targets.
2. Define allowable emergency CSO overflow conditions for renewal of NPDES CSO Permit.
3. Investigate use of in-line storage in sanitary sewers to minimize overflows.
4. Continue to assess opportunities to remove excessive infiltration and inflow from sanitary sewers.

5. Institute CMOM (Capacity Management Operation and Maintenance) practices as basis of asset management system.

6. Measure actual stormwater outflow at selected outfalls to determine if sustainability goals are being met.

7. Fully investigate impacts on stormwater drainage system prior to disconnection of inflow sources from sanitary sewers

8. Investigate techniques and policies to decrease area of impervious surfaces in public construction projects.

9. Formalize design parameters for stormwater infiltration systems.

10. Investigate methods to incorporate stormwater runoff volume controls into Minneapolis Code of Ordinances, Chapter 54 (Stormwater Management) and Title 20 (Minneapolis Zoning Code).

Provide cost-effective services in a sustainable manner (Guiding Principle #3)

Optimize enhancements to sanitary sewer and stormwater drainage systems

Existing Regulations, Ordinances, and Policies

- Minneapolis: projects recommended in Flood Report (1997).
- MCES: I/I Surcharge policy
- Minneapolis: NPDES Permit No. MN 0046744, Minneapolis Combined Sewer Overflow Permit (expired).
- Minneapolis: NPDES/SDS Permit No. MN 0061018, Municipal Storm Sewer System (expired).
- Minneapolis: Enhance the safety and appearance of our built environment through education, inspection and enforcement (Minneapolis Plan, Policy 7.10).
- Minneapolis: Support pollution prevention programs as an important first step in maintaining a health physical environment (Minneapolis Plan, Policy 7.8).
- BCWMC: Comply with BCWMC requirement that all regulated stormwater be treated to Level I standards throughout the watershed (Section 4.2.2.2, policy A).
- MWMO: Adopt Metropolitan Council's "Interim Strategy for Non-point Source Pollution Reduction". Must use MPCA best management practices and National Urban Runoff Pollution (NURP) or similar criteria for all new wet detention basins (Watershed Management Plan, Section 7).
- MWMO: cities and MWMO work together to install grit chambers and detention basins for treatment of stormwater runoff. (Watershed Management Plan, Section 5, Goal 3).
- MWMO: Local plans should include provisions for compliance with Clean Water Act standards and NPDES permits. (Watershed Management Plan, Section 5, Goal 3).

Existing Minneapolis Programs

- Life cycle costs are analyzed for all capital improvement projects
- Public and private stormwater BMPs are inspected during construction and periodically after construction
- Priority is given to projects which are multi-functional or which solve multiple problems
- Priority is given to cooperative projects with multiple funding partners

Gaps

- Flood mitigation and sanitary inflow removal capital improvement projects not fully integrated.

- Prioritization system not set to compare flood mitigation against CSO or other water resources protection project.

- Hydraulic and water quality (BMP) design standards and minimum site area differ for each of 4 watersheds in Minneapolis.

Recommended Additional Activities

1. Implement capital improvement projects which create integrated solutions to multiple wet weather problems of excessive infiltration, inflow, flood mitigation and/or stormwater quality.

2. Update prioritization system for capital improvement projects that incorporates life-cycle considerations, multiple objectives, and cooperating partnerships.

3. Create unified City-wide stormwater runoff hydraulic and water quality design standards that meet regulatory requirements. Work with watersheds, other public agencies, and private property representatives to resolve conflicting standards.

Meet or surpass regulatory requirements (Guiding Principle #4)

Operate and maintain public lands consistent with best current practices and Minneapolis's NPDES permits

Existing Regulations, Ordinances, and Policies

- Minneapolis: minimize negative impacts of stormwater runoff rates, volumes, and quality on Minneapolis surface waters (Code of Ordinances, Chapter 54, Stormwater Management).
- Minneapolis: control of land disturbance activities to control or eliminate soil erosion and sedimentation (Code of Ordinances, Chapter 52, Erosion & Sediment Control).
- Minneapolis: Pesticide ordinance (230.10-60).
- Minneapolis: Play a leadership role in setting up examples and pilot projects (The Minneapolis Plan, Policy 7.2)
- Minneapolis: Protect and sustain water resources (Minneapolis Plan, Policy 7.5).
- Minneapolis: Support pollution prevention programs as an important first step in maintaining a health physical environment (Minneapolis Plan, Policy 7.8).
- Minneapolis: Increase large area stormwater facilities to 30 by 2015 (Sustainability Target).
- Minneapolis: Increase large area treatment chambers to 150 by 2015 (Sustainability Target)
- Minneapolis: Plant 2500 trees on public lands every year through 2015 (Sustainability Target)
- Minneapolis: Street sweeping (NPDES stormwater permit).
- Minneapolis: Staff training (NPDES stormwater permit).
- Minneapolis: Controlled sand and salt application in winter (NPDES stormwater permit).
- Minneapolis: Chapter 56 (PROHIBITED DISCHARGES TO SANITARY OR COMBINED SEWER)
- MCWD: street projects that create one or more acre of new impervious surface must comply with stormwater management requirements of Rule N.

- MCWD: city must adopt MPCA best management practices and enforce requirements of erosion and sediment control plans. City must also document that project has received MPCA NPDES construction site permit, if required (Rule B).
- MCWD: street and utility crossing of waterbodies is discouraged. Projects must meet criteria set in Rule G.
- MWRO: Stormwater management plans required for city street, parking lots, transportation and building construction projects.
- SCWMC: Shingle Creek Final Draft TMDL Implementation Plan

Existing Minneapolis Programs

- Systems maintained in accordance with NPDES permits
- Good-housekeeping practiced on City-owned land
- Erosion and sedimentation controlled on City-owned construction projects
- Roadways maintained consistent with requirements of NPDES Stormwater Permit.
- Emergency preparedness is maintained, including spill response and flood response capabilities
- Inflow sources from public properties is identified and removed from sanitary sewers
- MPRB golf courses maintained in accordance with Audubon Society standards
- Integrated Pest Management practiced on MPRB properties

Gaps

- Inadequate funding for removal of inflow sources from public properties
- Not all public parking facilities swept at same frequency of streets
- Need to assess whether Minneapolis winter road maintenance activities meet recommendations contained in Shingle Creek Chloride TMDL Implementation Plan.
- Mpls code of ordinances requires BMP design to be in compliance with City Council resolution 2000R-043 which sets pollutant loading reduction goals and sets designs to be in accordance with MPCA manual Protecting Water Quality in Urban Areas, Best management Practices for Minnesota, October, 1989. Hydraulic and water quality design standards differ for each of 4 watersheds in Minneapolis. Unified criteria should be created.

Recommended Additional Activities

1. Continue funding for removal of inflow sources from public properties.

2. Investigate whether existing street maintenance practices comply with recommendations of TMDL implementation studies, including the Shingle Creek Chloride TMDL Implementation Plan.

3. Expand sweeping program to include public owned parking lots and parking ramps.

4. Continue to train staff on best current practices such as construction site erosion control and lawn care management.

5. Apply unified stormwater hydraulic and water quality design standards, erosion and sediment control requirements and stormwater management requirements to all public projects.

6. Use City funds to leverage stormwater BMP improvements on non-City public projects, including Minneapolis School Board and Library Board properties.

Provide on-going assessments of sanitary sewer and storm drainage systems

Existing Regulations, Ordinances, and Policies

- Minneapolis: NPDES Permit No. MN 0046744, Minneapolis Combined Sewer Overflow Permit (expired).

- Minneapolis: NPDES/SDS Permit No. MN 0061018, Municipal Storm Sewer System (expired).

- Minneapolis: Measure baseline stormwater volumes (Sustainability Target).

- MCES I/I Surcharge Policy

- BCWMC: Comply with BCWMC requirement that all regulated stormwater be treated to Level I standards throughout the watershed (Section 4.2.2.2, policy A).

- BCWMC: Identify the water bodies where water quality monitoring is undertaken by City and others (Section 4.2.2.1, Policy I)

- MCWD: municipalities are encouraged to collect water quality and quantity monitoring data. Data should be consistent with state compatibility guidelines and submitted to the MCWD and other appropriate agencies for entry into public database (MCWD Water Resource Management Plan, Section IX.B.1.d)

Existing Minneapolis Programs

- Stormwater runoff and BMP effectiveness monitored in accordance with NPDES Stormwater Permit.

- Sanitary sewers monitored in accordance with NPDES CSO Permit
- Lakes and beaches monitored by Minneapolis Park and Recreation Board.
- Monitoring coordinated with public agencies.

Gaps

- Water quality standards differ for each of the 4 watershed organizations. Minneapolis water quality standards set in City Council Resolution 2000R-042.
- No clearinghouse for all assessment studies conducted in City, including TMDL, lake, stormwater, CSO, and stream monitoring efforts.
- No clear line of responsibility for coordination with TMDL projects being conducted by other public agencies.

Recommended Additional Activities

1. Create a clearinghouse for all assessment studies conducted in City, including TMDL, lake, stormwater, CSO, and stream monitoring efforts.
2. Establish coordinator as central contact point for all Minneapolis based TMDL projects and other monitoring studies.
3. Consider revisions to water quality standards for new construction projects (Minneapolis City Council Resolution 2000R-042) after new water quality standards are formally approved by a watershed district/organization or after TMDL implementation plans are formally approved.

Implement effective water quality improvement programs

Existing Regulations, Ordinances, and Policies

- Minneapolis: NPDES Permit No. MN 0046744, Minneapolis Combined Sewer Overflow Permit (expired).
- Minneapolis: NPDES/SDS Permit No. MN 0061018, Municipal Storm Sewer System (expired).
- Minneapolis: Enhance the safety and appearance of our built environment through education, inspection and enforcement (Minneapolis Plan, Policy 7.10).
- MCES I/I Surcharge Policy
- BCWMC: List impaired waters in BCWMC that affect the city, acknowledge the need for a TMDL study, identify city's role in completing and/or implementing TMDL studies (Section 4.2.2.1, Policy G)

Existing Minneapolis Programs

- Stormwater runoff and BMP effectiveness monitored in accordance with NPDES Stormwater Permit
- Sanitary sewers monitored in accordance with NPDES CSO Permit

Gaps

- Projects and programs not identified which could offset the $7.2 Million annual MCES I/I surcharge.
- Future TMDL implementation plans may require new stormwater management practices in areas of the City

Recommended Additional Activities

1. Negotiate implementation of TMDL based projects in a manner that is consistent with City goals and objectives

Enforce required rules and regulations

Existing Regulations, Ordinances, and Policies

- Minneapolis: NPDES Permit No. MN 0046744, Minneapolis Combined Sewer Overflow Permit (expired).
- Minneapolis: NPDES/SDS Permit No. MN 0061018, Municipal Storm Sewer System (expired).
- BCWMC: Describe city responsibilities set by the Plan policies, the BCWMC joint powers agreement, or the BCWMC board action, and other responsibilities related to flood control, rate control, stream restoration, wetlands management,, groundwater, etc (Section 12.1.2).
- MCWD: municipalities may obtain permit authority to enforce one or more MCWD Rules and to enforce water management provisions contained in their LSWMPs. MCWD maintains ultimate enforcement authority for their rules (Rule H).
- MCWD: MCWD maintains jurisdiction for all variance requests of MCWD Rules (Rule I).
- MCWD: Local plans must meet or exceed MCWD rules. If different, local government must describe how the local choice is equivalent to or more stringent than MCWD rule (MCWD Water Resource Management Plan, Section IX.B.1.b).
- MCWD: approved LSWMP should address responsibilities involved in carrying out MCWD rules (MCWD Water Resource Management Plan, Section IX.B.1.b).

Existing Minneapolis Programs

- Draft Local Surface Water Management Plan

- Ongoing inspection and enforcement activities to ensure compliance with Minneapolis permits and ordinances

Gaps

- NPDES Stormwater and NPDES CSO permits expired. City operating under conditions of expired permits.

Recommended Additional Activities

1. Work with MPCA to negotiate NPDES permits that are consistent with City goals and objectives.

Educate, engage the public and stakeholders and improve compliance and use of BMPs (Guiding Principle #5)

Enhance quality and minimize quantity of runoff from redevelopment sites

Existing Regulations, Ordinances, and Policies

- Minneapolis: minimize negative impacts of stormwater runoff rates, volumes, and quality on Minneapolis surface waters (Code of Ordinances, Chapter 54, Stormwater Management).
- Minneapolis: control of land disturbance activities to control or eliminate soil erosion and sedimentation (Code of Ordinances, Chapter 52, Erosion & Sediment Control).
- Minneapolis Zoning Code: Protection of Natural Features (Title 20, Article IV, Chapter 535).
- Minneapolis: Public education (NPDES Stormwater Permit).
- Minneapolis: Increase number of green roofs to 100 by 2015 (Sustainability Target).
- Minneapolis: Increase small area stormwater facilities to 500 by 2015 (Sustainability Target).
- Minneapolis: Increase small area treatment chambers to 100 by 2015 (Sustainability Target).
- Minneapolis: Support pollution prevention programs as an important first step in maintaining a health physical environment (Minneapolis Plan, Policy 7.8).
- BCWMC: Comply with BCWMC requirement of non-degradation of stormwater runoff for all new developments (Section 4.2.2.4, Policy A).
- BCWMC: Comply with BCWMC requirement that all regulated stormwater be treated to Level I standards throughout the watershed (Section 4.2.2.2, policy A).
- BCWMC: Describe existing and proposed city ordinance, permits and procedures addressing erosion and sediment control and preparation of erosion control plans (Section 6.2.2, policy G).
- BCWMC: Comply with the BCWMC Plan's goals and policies regarding erosion and sediment control (contained in Section 6.0 of the Plan) (Section 6.2.2, policy H).
- MCWD: Local plan must demonstrate how in-lake nutrient concentrations will be maintained with development/redevelopment.

- MCWD: projects must create stormwater management plans according to requirements contained in Rule N.
- MCWD: city must adopt MPCA best management practices and enforce requirements of erosion and sediment control plans. City must also document that project has received MPCA NPDES construction site permit, if required. City ordinance must require establishment of permanent vegetative cover, and installation of structural controls in accordance with manufacturer's recommendations (Rule B).
- MCWD: recommends that city obtain surety to ensure developer adequately carries out stormwater management plan (Rule B).
- MCWD: recommends that local plans include MCWD requirement for performance bond or letter of credit for activities regulated under Rule E (Rule K).
- MWMO: contractors must follow MPCA guidelines or other document created by member cities, in order to achieve no adverse impact to receiving water bodies (Watershed Management Plan, Section 5, Goal 4).
- MWMO: municipalities must adopt an erosion and sediment control ordinance that are consistent with MPCA documents (Watershed Management Plan, Section 5, Goal 13).
- SCWMC: require infiltration of a portion of runoff generated by development or redevelopment. Discharge rates must be in compliance with Section 3 of SWMCW Watershed Management Plan. BMPs must be in accordance with Appendix B (Second Generation Watershed Management Plan, Section 6, Goal 1).
- SCWMC: member cities must advise and solicit comments from SCWMC of land use amendments in city's Comprehensive Plan prior to adoption (Second Generation Watershed Management Plan, Section 6, Goal 1, Policy 1.1, Strategy 1.1.4)
- SCWMC: member cities are encouraged to create development strategies that minimize impervious surfaces, disconnect impervious surfaces and encourage infiltration (Second Generational Watershed Management Plan, Section 6, Goal 6, Policy 6.2).
- SCWMC: member cities must adopt erosion control ordinance (Second Generation Watershed Management Plan, Section 6, Goal 8, Policy 8.1).

Existing Minneapolis Programs

- Redevelopment properties inspected for sources of inflow

- Site plans are reviewed for compliance with Minneapolis Code of Ordinances Chapter 52 (Erosion and Sediment Control) and Chapter 54 (Stormwater Management)
- Use or preservation of natural site characteristics in development/redevelopment sites is required in Minneapolis Zoning Code.
- Developers and contractors are educated as component of public education program.
- Financial credits provided against monthly stormwater utility fee for properties that incorporate quality and quantity controls

Gaps

- Not all rehabilitated buildings are required to remove inflow source to sanitary sewer
- Runoff volume controls not considered in Chapter 54
- Water body load reduction targets not updated to proposed watershed standards/goals/targets.
- Impervious surface requirements of Zoning Code conflicts with pervious surface goals of Sustainability Goals
- Minimum site size requiring stormwater management contained in Chapter 52 and Chapter 54 of the Minneapolis Code of Ordinances is too large to capture all projects subject to BCWMC non-degradation policy.
- Snowmelt not included in hydraulic design standards
- No incentives for natural area preservation or restoration in stormwater utility fee structure
- Inconsistent compliance of Erosion and Sediment Control Ordinance
- Results of BMP pilot projects not always available for incorporation into future BMP projects

Recommended Additional Activities

1. Require disconnection of sources of inflow to the sanitary sewers as a condition of rehabilitation-type building permits
2. Investigate incorporation of stormwater runoff volume controls into Chapter 54.

3. Investigate reduction of impervious surface requirements in the Minneapolis Zoning Code.

4. Update stormwater hydraulic design standards to incorporate storage for purposes of flood mitigation and storage of snowmelt.

5. Investigate financial or water quality sizing based credit system for redevelopment projects that preserve natural site characteristics, such as buffers and native vegetation.

6. Improve compliance of Erosion and Sediment Control Ordinance.

7. Track and disseminate results and successes of pilot BMP projects. Use as model for new projects.

8. Update Chapter 54 to revise water quality standards after new standards are formally approved by watershed.

9. Work with BCWMC to ensure that new construction and redevelopment projects in Minneapolis comply with BCWMC non-degradation policy.

Maintain or enhance quality and minimize quantity of runoff from existing private properties

Existing Regulations, Ordinances, and Policies

- Minneapolis: NPDES/SDS Permit No. MN 0061018, Municipal Storm Sewer System (expired).

- Minneapolis: minimize negative impacts of stormwater runoff rates, volumes, and quality on Minneapolis surface waters (Code of Ordinances, Chapter 54, Stormwater Management).

- Minneapolis: control of land disturbance activities to control or eliminate soil erosion and sedimentation (Code of Ordinances, Chapter 52, Erosion & Sediment Control).

- Minneapolis: prohibition of dumping (Code of Ordinances, Chapter 48, Watershed Management Authority).

- Minneapolis: Enhance the safety and appearance of our built environment through education, inspection and enforcement (Minneapolis Plan, Policy 7.10).

- Minneapolis: Support pollution prevention programs as an important first step in maintaining a health physical environment (Minneapolis Plan, Policy 7.8).

- Minneapolis: Take measures to reduce water consumption and encourage water conservation (Minneapolis Plan, Policy 7.6).

- Minneapolis: Reduce number of unhealthy air quality days by 10% by 2021 (Sustainability Target).
- Minneapolis: No net loss of tree canopy cover (Sustainability Target).
- MCWD: municipalities are responsible for developing educational programs that encourage local residents to adopt BMPs (MCWD Water Resource Management Plan, Section IX.B.1.c).
- SCWMC: member cities are encouraged to adopt SCWMC education and public outreach program which was developed to be compliant with requirements of NPDES Phase II MS4 Permit requirements (Second Generation Watershed Management Plan, Section 6, Goal 4, Policy 4.6).

Existing Minneapolis Programs

- Private properties inspected for sources of inflow to sanitary sewers
- Homeowners educated about organic yard waste in gutters and other property maintenance practices
- Financial credits in stormwater utility applied for properties that incorporate quality and quantity controls
- Public engaged in advising on aspects of water resources programs and projects
- Illicit discharges and illegal dumping violations enforced in accordance with City ordinance.
- Mercury ordinance adopted and programs being established.

Gaps

- Enforce ordinance requirements to eliminate inflow sources from private properties
- Heavy pollutant loading from landscape businesses and retailers not regulated
- No requirements for sweeping or deicing chemical usage of existing surface parking lots
- Public education not strategic. Minimal coordination with other agencies which provide on-going water resources education.

Recommended Additional Activities

1. Enforce ordinance requirements to eliminate inflow sources from private properties.
2. Investigate financial or water quality sizing credit based system for properties which recreate natural vegetation systems.

3. Investigate additional maintenance requirements for privately owned parking lots, including sweeping and use of deicing chemicals.

4. Educate the public on environmental degradation caused by excessive use of deicing chemicals.

5. Reassess education activities to identify audiences not targeted and to maximize coordination with existing education efforts where feasible. Educate landscape businesses about hazards of improper disposal into curb & gutters and control of stormwater runoff from plant nurseries.

Enhance Livability and Safety (Guiding Principle #6)

Preserve, maintain and enhance the City's natural and recreational resources

Existing Regulations, Ordinances and Policies

- Minneapolis: control of pollutants and contamination sources, including storage tanks and wells in accordance with Code of Ordinances, Chapter 48, Minneapolis Watershed Management Authority.
- Minneapolis Zoning Code: Mississippi River Critical Area Overlay (Title 20, Chapters 551.660-680).
- Minneapolis Zoning Code: Designation of Floodplain Overlay District (Title 20, Chapters 551.540-650) established to comply with rules and regulations of National Flood Insurance Programs codified as 44 Code of Federal Regulations Parts 59-78.
- Minneapolis Zoning Code: Shoreland Overlay District (Title 20, Chapters 551.440-530).
- Minneapolis Zoning Code: Protection of Natural Features (Title 20, Article IV, Chapter 535).
- Minneapolis: Manage the use of the City's environmental resources to meet present needs while considering future concerns (Minneapolis Plan, Policy 7.2).
- Minneapolis: Encourage the planting and preservation of trees and other vegetation (Minneapolis Plan, Policy 7.4).
- Minneapolis Park and Recreation Board: regulations (PB12, 13).
- Minnesota: Wetland Conservation Act
- BCWMC: Include a buffer policy for land adjacent to water resources (including wetlands) (Section 4.2.2.3, policy A; and Section 8.2.2, policy D).
- BCWMC: Acknowledge control and responsibility for shoreland regulation (Section 4.2.2.3, policy G).
- BCWMC: Show a schedule to complete wetland inventories (if proposed) and to develop wetland protection ordinance, where they are not already in place (Section 8.2.2, policy A and policy B).
- BCWMC: Complete and update inventories of significant erosion and sedimentation areas along the Bassett Creek trunk system, prepare a cost estimate for these repairs, and share this information with BCWMC. Only those areas identified in such an inventory are eligible for BCWMC funding (Section 7.2.2, Policy F).

- BCWMC: Acknowledge city or BCWMC as LGU for the Wetland Conservation Act (Section 8.2.2, policy F).
- BCWMC: Comply with the BCWMC Plan's goals and policies regarding wetland management (contained in Section 8.0 of Plan) (Section 8.2.2, policy H).
- BCWMC: Describe status of wellhead protection planning, if applicable (Section 9.2.2, policy C).
- MCWD: local plans must incorporate requirements of Rule D or continue to allow the District to regulate wetland protections (Rule D).
- MCWD: cities must catalog and maintain a wetland inventory of all wetlands in their city. Must assess functions and values by utilizing a methodology listed in the Wetland Conservation Act (Rule D).
- MWMO: work with Minneapolis Park and Recreation Board to provide opportunities for public outdoor recreation that preserves and enhances the environment (Watershed Management Plan, Section 5, Goal 6).
- MWMO: cities are encouraged to adopt and administer a well-sealing policy (Watershed Management Plan, Section 5, Goal 11).
- SCWMC: member cities must take protective actions to minimize impacts to floodplain during maintenance activities (Second Generation Watershed Management Plan, Section 6, Goal 1, Policy 1.3, Strategy 1.3.3).
- SCWMC: member cities must adopt shoreland management ordinance in accordance with DNR requirements (Second Generation Watershed Management Plan, Section 6, Goal 2, Policy 2.7, Strategy 2.8.1).
- SCWMC: member cities must establish policy to protect endangered species or areas of significant natural resources as identified by DNR (Second Generation Watershed Management Plan, Section 6, Goal 3, Policy 3.3).
- SCWMC: member cities encouraged to promote development of Shingle Creek corridor as greenway (Second Generation Watershed Management Plan, Section 6, Goal 3, Policy 3.4, Strategy 3.4.1).
- SCWMC: member cities abutting Mississippi River are encouraged to achieve the MNRAA Tier II voluntary management standards (Second Generation Watershed Management Plan, Section 6, Goal 3, Policy 3.4, Strategy 3.4.2).

Existing Minneapolis Programs

- Shoreline buffers maintained by Minneapolis Park and Recreation Board (as primary property owner)

- Floodplains protected in accordance with Floodplain Overlay District requirements of the Minneapolis Zoning Code
- Shoreland zones protected in accordance with Shoreland Overlay District and Mississippi River Critical Overlay District requirements of the Minneapolis Zoning Code
- Wetland requirements are administered in accordance with requirements of the Minnesota Wetland Conservation Act.
- Wells, storage tanks, and other pollutant sources controlled in accordance with Minneapolis Code of Ordinance, Chapter 48.
- Opportunities to optimize buffers are incorporated into park planning efforts by Minneapolis Park and Recreation Board.

Gaps

- Inventory of all wetlands in City not complete; no schedule for completion
- Inventory natural and riparian corridors not complete; no schedule for completion
- Shoreline and streambank condition assessment not comprehensive; no schedule for completion
- One size fits all buffer policies difficult to manage in heavily used public facilities
- No wetland buffer policy or ordinance for privately owned shoreline properties.
- No comprehensive streambank restoration program for privately owned shoreline properties.
- Establishment of natural buffers dependent on MPRB projects and programs.
- Mpls floodplain zoning ordinance not consistent with BCWMC and MCWD requirements.

Recommended Additional Activities

1. Complete MPRB inventory of wetlands in City. Initiate inventory of non-MPRB wetlands.
2. Complete MPRB inventory of natural and riparian corridors. Initiate inventory of non-MPRB natural and riparian corridors.
3. Complete comprehensive shoreline and streambank condition assessment for MPRB properties. Initiate inventory of non-MPRB shorelines.
4. Evaluate need for wetland ordinance for privately owned shoreline.

5. Evaluate need for shoreline stabilization program in cooperation with watershed district/organizations.

Maintain and/or improve the quality of the City's surface waters

Existing Regulations, Ordinances, and Policies

- Minneapolis Zoning Code: Mississippi River Critical Area Overlay District (Title 20, Chapters 551.660-680).
- Minneapolis Zoning Code: Shoreland Overlay District (Title 20, Chapters 551.540-650).
- Park Board regulations (PB12 and 13).
- Minneapolis: Take measures to reduce water consumption and encourage water conservation (Minneapolis Plan, Policy 7.6).
- Minneapolis: Protect and sustain water resources (Minneapolis Plan, Policy 7.5).
- Minneapolis: Consistently maintain low TSI levels in lakes (Sustainability Target).
- BCWMC: Classify water bodies into one of four BCWMC categories (Section 4.2.2.1, Policy B).
- BCWMC: Comply with the BCWMC Plan's goals and policies regarding water quality (contained in Section 4.0 of the BCWMC Plan) (Section 4.2.2.4, policy C).
- BCMWO: Comply with the BCWMC Plan's goals and policies regarding stream restoration (contained in Section 7.0 of the Plan) (Section 7.2.2, policy N).
- MCWD: MCWD maintains jurisdiction for dredging (Rule E and DNR/MCWD general permit).
- MCWD: cities are encouraged to adopt shoreland ordinances in accordance with 1989 DNR "Statewide Standards for Management of Shoreland Areas" (Rule F).
- MCWD: shoreline improvement projects must comply with design and construction standards contained in Rule F.
- MWMO: local plans must address water quality improvement goals of natural surface water storage and retention systems. Specific reductions must be addressed (Watershed Management Plan, Section 5, Goal 4).

Existing Minneapolis Programs

- Innovative lake management approaches utilized (e.g. barley straw, in-lake wetland planting at deltas)

- Stormwater outfalls inspected for erosion and repair in accordance with NPDES Stormwater Permit

- Bridges inspected for scour

Gaps

- Classification of waterbodies not consistent with watershed based classifications. Watershed organization/district classifications not consistent.

- Excessive deltas of sediment at some outfalls.

- Responsibility for maintenance aspects of surface water management not defined between City, MPRB and watershed district/organizations.

Recommended Additional Activities

1. Include inspection of sediment deltas as part of outfall inspection programs. Remove excessive sediment in accordance with DNR requirements.

2. Establish agreements on responsibilities for surface water systems Operation and Maintenance where none currently exist.

Appendix O
List of Acronyms

BCWMC	Bassett Creek Watershed Management Commission
BMP	Best Management Practice
CCTV	Closed Circuit Television
cfs	Cubic Feet per Second
CIP	Capital Improvement Program
CLIC	Capital Long Range Improvement Committee
CPED	Department of Community Planning and Economic Development
CSO	Combined Sewer Overflow
CUE	Committee on Urban Environment
DP	Dissolved Phosphorus
GIS	Geographic Information System
I/I	Inflow/Infiltration
LGU	Local Government Unit
LSWMP	Local Surface Water Management Plan
MCES	Metropolitan Council Environmental Services
MCWD	Minnehaha Creek Watershed District
MDH	Minnesota Department of Health
MEP	Maximum Extent Practicable
MNDNR	Minnesota Department of Natural Resources
MNDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MPRB	Minneapolis Park and Recreation Board

MS4	Municipal Separate Storm Sewer Systems
MWMO	Mississippi Watershed Management Organization
NFIP	National Flood Insurance Program
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NAWQA	National Water Quality Assessment Program
PW/ES	Public Works – Engineering Services
PW/FS	Public Works – Field Services
RS/EM	Regulatory Services – Environmental Management
SCWMC	Shingle Creek Watershed Management Commission
SWPPP	Stormwater Pollution Prevention Plans
SSO	Sanitary Sewer Overflow
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSI	Trophic State Index
TSS	Total Suspended Solids
UMRSWPP	Upper Mississippi River Source Water Protection Project
USACE	US Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VSS	Volatile Suspended Solids
WCA	Minnesota Wetland Conservation Act
WHEP	Hennepin County Wetland Health Evaluation Project
WOMP	Watershed Outlet Monitoring Program
WQS	Water Quality Standard

Appendix P
List of Web Links

Link Name	Link Address	Host Organization	Page
2006 Final List of Impaired Waters - MPCA	http://www.pca.state.mn.us/publications/wq-iw1-03.xls	Minnesota Pollution Control Agency	1-11
303(d) list	http://www.pca.state.mn.us/water/tmdl/index.html	Minnesota Pollution Control Agency	3-23
305.B Assessment of Stream Conditions	http://www.pca.state.mn.us/water/basins/305briver.html	Minnesota Pollution Control Agency	3-10, H-13
305b lake listings (2000-2002)	http://www.pca.state.mn.us/water/basins/305blake.html	Minnesota Pollution Control Agency	H-13
Adopted Budget (City of Minneapolis)	http://www.ci.minneapolis.mn.us/city-budget/2006adopted/index.asp	City of Minneapolis	5-6
Analysis of Snow Climatology	http://climate.umn.edu/snow_fence/	University of Minnesota	3-5
Average Depth of Snow	http://climate.umn.edu/pdf/climate_of_minnesota/comXIII.pdf	University of Minnesota	3-5
Average Snow Water Equivalent	http://climate.umn.edu/snow_fence/Components/SWE/marswe.htm	University of Minnesota	3-5
2003 and 2004 Water Quality Study of Wirth Lake and Bassett Creek	http://www.bassettcreekwmo.org/Wirth%20Lake%20Feasibility%20report.pdf	Bassett Creek Watershed Management Commission	H-16
Bassett Creek 2005 Lake Water Quality Study	http://www.bassettcreekwmo.org/2005%20Bassett's%20Lakes%20Report.pdf	Bassett Creek Watershed Management Commission	H-16
Bassett Creek Biotic Index Evaluation	http://www.bassettcreekwmo.org/2000%20Biotic%20Index%20Figure.pdf	Bassett Creek Watershed Management Commission	H-16
Bassett Creek Capital Improvement Plan	http://www.bassettcreekwmo.org/2006_Budget_BCWMC.pdf	Bassett Creek Watershed Management Commission	3-14, H-23
Bassett Creek Main Stem Watershed Management Plan	http://www.bassettcreekwmo.org/2nd%20Generation%20Plan/Final%20Plan%20September%202004/TOC.htm	Bassett Creek Watershed Management Commission	H-7
Bassett Creek Monitoring (2001)	http://www.metrocouncil.org/environment/RiversLakes/Streams/Reports/Bassett.pdf	Bassett Creek Watershed Management Commission	H-10
Bassett Creek Watershed Management Commission Requirements for Improvements and Development Proposals	http://www.bassettcreekwmo.org/require/97reptab.htm	Bassett Creek Watershed Management Commission	H-22
Bassett Creek Watershed Management Commission Water Quality Management Policy	http://www.bassettcreekwmo.org/require/98policytab.htm	Bassett Creek Watershed Management Commission	H-22

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