Table of Contents

CHAPTER I

I. Introduction

On November 16, 1990, the U.S. EPA published a new set of rules that will impact future development and redevelopment in the City of Milwaukee. These rules, known as the National Pollutant Discharge Elimination System Permit Application Regulations for Storm Water Discharges (or NPDES Storm Water Permit Regulations), require many businesses and municipalities to apply for a storm water discharge permit for any untreated storm water discharged into lakes, rivers, and streams of the United States. Polluted storm water which enters a watercourse can cause fish kills, increase turbidity, contaminate drinking water supplies and seriously affect public health.

In response to the EPA Regulations, the City of Milwaukee passed an ordinance on November 16, 1992. This ordinance, Chapter 120 in the City of Milwaukee Code of Ordinances, is titled "Storm Water Management Regulations." Proponents of new development or redevelopment subject to the regulations in Ordinance 120 may be required to submit a storm water management plan to identify potential storm water impacts and to propose practices to reduce them. This manual addresses who must submit a plan and what is required in the submittal. The Ordinance also provides legal remedies if a required storm water management plan is not submitted or implemented as approved, or if it is not adhered to during the life of the project.

CHAPTER II

II. Activities Which Require a Storm Water Management Plan

A storm water management plan must be submitted prior to any residential, commercial, industrial, or institutional development or improvement project. Chapter 120 specifies the following activities as exceptions:

1. Developments of less than five acres which are not part of a larger common plan of development or sale.
2. Agricultural activities not associated with a development.
3. Maintenance, alteration, use, or improvement to an existing structure which does not significantly change or affect the water quality and hydrologic conditions of the surface water discharge.
4. Maintenance activities undertaken by any municipal, state, or federal governmental agency.
5. Storm water management measures to be undertaken by the City on an outfall in a specific watershed, when the City Engineer has determined that preparation of a storm water management plan is not required.

Requests to waive the storm water management plan requirements are allowed. They must be submitted to the City Engineer for approval. A narrative description and drawings of the proposed development or improvement should be included with the waiver request. The City Engineer may grant a waiver if the development is not likely to:

1. Increase or decrease the rate or volume of storm water runoff;
2. Have an adverse impact on a wetland, watercourse, or receiving body of water;
3. Contribute to the degradation of water quality;
4. Otherwise impair attainment of the storm water management objectives.

The Storm Water Management Plan Application Form includes a section to request a waiver of the requirements.

CHAPTER III

III. Storm Water Management Plan Submittal, Review and Approval

The storm water management plan must be prepared by a licensed professional engineer and approved prior to the start of any site work. The plan review by the City Engineer will require a minimum of fifteen working days. The Division will either ask for additional information, reject or approve the plan. The plan will be submitted in conjunction with either a building permit plan or a request for a zoning change, a plan development, or a subdivision plat. Appendix B contains the City's review processes for the above mentioned submittal. Figure 1 shows the review process when the storm water management plan is submitted with a building permit plan. Figure 2 shows the process when the property is subject to a zoning change, a plan development, or a subdivision plat. The property owner or the owner's agent is responsible for the preparation and implementation of the plan.

CHAPTER IV

IV. Contents of Storm Water Management Plan

Project development information, including an assessment of the potential and predicted calculated impacts on watercourses, the effectiveness and acceptability of the proposed measures for reducing adverse impacts, and a maintenance program must be furnished to the City Engineer's office. This information, described in detail below, will be used to assess the practicality of the proposed storm water management plan.

A. Required Forms

The storm water management plan must include a completed Storm Water Management Plan Application Form. A copy of all forms are provided for reference in Appendix G.

B. Existing Site Conditions Map(s)

The storm water management plan must include a map or maps at a scale of 1"=100' or larger indicating the following site information:

1. Vegetation types;
2. Topography (ground contours);
3. Impervious areas;
4. Structures and buildings;
5. Floodplain boundaries as delineated by the Federal Emergency Management Agency (FEMA) (available in the Department of Building Inspection);
6. Surface waters;
7. Land use based on the following categories:
   - High Density Residential (less than 1/8 acre per lot)
   - Medium Density Residential (1/8 to 1/2 acre per lot)
   - Low Density Residential (greater than 1/2 acre per lot)
   - Commercial
   - Light Industrial
   - Heavy Industrial
   - Parks/Open Space

- Institutional (Schools/Hospitals/Government facilities)

8. Areas of storage, loading/unloading, vehicle maintenance, and fueling operations with outdoor exposure.

C. Existing Drainage Conditions Map(s)

The storm water management plan must include map or maps at a scale of 1"=100' or larger indicating the existing drainage conditions, including:

1. Areas of storm water ponding and/or percolation;
2. Locations of storm water discharge to the site from adjacent tributary areas;
3. Storm sewer systems;
4. Locations of storm water discharge from the site;
5. Drainage area boundaries;
6. Surface waters or storm sewer systems receiving storm water discharge from the site;
7. The overflow path for on-site storm water conveyance systems;
8. Areas of historic drainage problems nearby.

D. Proposed Site Alterations Map(s)

The storm water management plan must include a map or maps at a scale of 1"=100' or larger indicating alterations to any of the existing site conditions noted above.

E. Proposed Drainage Conditions Map(s)

The storm water management plan must include a map or maps at a scale of 1"=100' or larger indicating alterations to any of the existing drainage conditions noted above.

F. Hydrologic/Hydraulic Calculations

A hydrologic/hydraulic analysis must be performed to determine peak storm water discharge rates from the site under both existing and proposed conditions, for the 2-, 10-, and 100-year storm frequencies. Rainfall data for the City of Milwaukee is located in Appendix F. The accepted

hydrologic/hydraulic analysis methods are: (1) U.S. Soil Conservation Services TR-55, (2) U.S. Army Corps of Engineers HEC-1, (3) Rational Method, and (4) Storm Water Management Model-SWMM. Any pertinent information developed for the hydrologic/hydraulic analysis including, but not limited to, drainage area identification codes and time of concentration flow paths must be shown on the existing and proposed drainage conditions maps described above. Computation sheets and computer analysis input/output must be prepared and arranged in a neat and orderly fashion and submitted with the storm water management plan.

After review by the City Engineer a determination will be made concerning required limitations on storm water discharge rates under the proposed conditions. In most cases storm water discharge rates from the site must be limited to existing rates. However, more stringent reductions may be required. If a reduction in peak storm water discharge rates under proposed conditions is required, then computation sheets and computer analysis input/output for detention storage analysis must be provided.

G. Best Management Practices

Best Management Practices (BMPs) must be proposed for protection of water quality. Under special circumstances, it may be possible to discharge unacceptable storm water (in terms of quality or quantity) into off-site drainage facilities. BMPs can be structural (require construction) or non-structural (procedures or practices implemented to reduce storm water pollution). BMPs can be either site-specific or activity-specific. They encompass a wide range of measures including processes, procedures, schedules of activities, prohibitions on practices and other management activities to prevent or reduce adverse impacts or storm water runoff. Acceptable structural and non-structural BMPs are set forth in Chapters VII and VIII, respectively. Design of BMPs is discussed in Chapter IX. Certain BMPs are required for a certain type of development. However, other site-specific or activity-specific BMPs may be needed. The BMPs proposed for the project must be described in the application form.

H. Maintenance Plan

A maintenance plan is required to assure proper functioning of the storm water management system and related facilities, including all structural and non-structural best management practices utilized

on the site. For example, maintenance planning for a wet detention basin might specify the frequency of cleaning or limits of operational efficiency that trigger cleaning activities. Maintenance of waste minimization practices may specify in-house procedural reviews or audits at specific intervals or on a specified schedule. This results in a summary report of the audit.

Because the maintenance plan for a particular site is generally specific to the storm water management facilities and BMPs used at that site, it is essential that Maintenance Costs are developed for each of the plan's components. The Maintenance Plan and Maintenance Costs must be recertified each five years throughout the life of the project, beginning upon acceptance of the improvements by the City.

Specifically, the following Maintenance Plan information is required:

a. List storm water management practices (structural and nonstructural)

b. For each component, identify maintenance activities required and appropriate schedule (annual visual inspection of pipes, semi-annual inlet cleaning, training etc.)

c. Estimate cost of maintenance activity required per (a) and (b) above, and,

d. Annually report the above activities and provide a summary of costs incurred.

I. Assurances

The owner of a site must provide reasonable assurances to the City that the storm water management plan will be implemented as approved and maintained to operate as designed. The required assurances are described in Chapter 120 of the code as follows:

a. The Completion Guarantee

Section 120-9.6.a, titled Guarantee, requires that the storm water facilities included in the approved plan are constructed. Accordingly, the plan shall be accompanied by:

1) an Irrevocable Letter of Credit;
2) a Certified Check, or;
3) a Surety Bond,

conditioned that the owner will perform and sufficiently complete all work in the approved storm water management plan. The guarantee will be subject to approval as to form and execution by the Office of the City Attorney.

On satisfactory completion of all work required under the plan, the unused portion of the guarantee shall be released or returned. If the work is not satisfactorily completed in accordance with the approved plan, the City shall give notice to the owner or the owner's agent specifically describing the deficiencies. If the work is not subsequently completed in accordance with the approved plan, the City shall have the work completed using the funds provided by the guarantee.

The amount of the completion guarantee is based only on the storm water management related portions of the project, and not other facilities nor obligations related to the project.

b. The Maintenance Guarantee

Section 120-9.6.b, titled Guarantee, requires that the storm water facilities included in the plan are maintained in effective working condition throughout the period between initial acceptance and subsequent recertification. The plan shall be accompanied by:

1) an Irrevocable Letter of Credit;
2) a Certified Check, or;
3) a Surety Bond.

The guarantee is further conditioned certifying that the owner will perform maintenance activities described in storm water management plan, and additional work as necessary, to maintain the facilities in good working condition. The amount shall be based on the Maintenance Costs as established in the plan through the five year certification period. The guarantee will be subject to approval as to form and execution by the Office of the City Attorney.

If maintenance deficiencies develop that impair the effectiveness of the facility's performance with respect to the approved plan, and are not corrected by the owner, the City will give notice to the owner to correct the deficiency. If such correction is not completed after the expiration of the notice, the City may proceed pursuant to Chapter 120 to maintain the facility or correct the deficiencies, using funds provided by the guarantee.

Each periodic request for recertification of the maintenance plan and the maintenance cost pursuant to Chapter IV.H and Chapter X hereof shall be accompanied by the appropriate guarantee. Upon approval of the maintenance plan recertification, any unused portion of the maintenance guarantee for the prior period shall be released or returned.

CHAPTER V

V. Enforcement Actions

Any person whose development has commenced without an approved storm water management plan may be issued a notice of violation, citation or stop-work order. In addition, any person who commences activity without an approved plan may be required to restore the land to its original condition within 10 days.

If the person fails to take corrective action after receiving a notice, the Department of Building Inspection may take whatever steps necessary to correct the violation, including but not limited to, using City forces or engaging contractors. The property owner shall be responsible for all costs associated with restoring the site or alleviating the condition. Failure to pay for all costs shall result in a lien being attached to the real property. Fines and imprisonment are additional possible enforcement actions.

CHAPTER VI

VI. Illicit Discharges and Illegal Connections

The City of Milwaukee Ordinance 120 prohibits illicit discharges and illegal connections to a drainage system. Illicit discharges are defined as "any discharge to the drainage system which is not composed entirely of storm water unless a permit has been obtained from the appropriate regulatory agencies". Illegal connections are defined as "any unpermitted connection to the drainage system".

The following are accepted methods to check for illicit discharges and illegal connections:

A. Visual Inspection - Required

Observation of all discharge points during dry weather on at least three separate occasions can detect illicit discharges and or illegal connections. However, the following two factors must be considered:

1. Discharge from a rain event can continue in a storm sewer for several days.
2. Infiltration from groundwater into a storm sewer system is common.

A copy of the sample Visual Inspection Form for Illicit Discharges is included in Appendix G.

B. Sewer Map - Required

A review of all available plumbing drawings or pipe schematics may identify potential cross-connections. These schematics show existing pipes and drainage systems used to carry process wastewater, non-contact cooling water, air conditioner condensate and sanitary wastes (restrooms, sinks, etc). If an accurate schematic is unavailable, the pathways of the water circuits shall be examined individually to determine that no illicit discharges or illegal connections exist.

C. Testing - One of the following required

1. Smoke Testing

Some illicit discharges and illegal connections can be identified by blowing an anhydrous mist made especially for this purpose through the sanitary or storm sewer systems, and observing specific locations where the mist is vented. A systematic approach is necessary to assure that the proper conclusions are reached.

2. Dye Testing or Dye Water Flooding

The most conclusive method, dye testing, can identify illicit discharges and illegal connections by tracing the route of sanitary or storm sewers using a non-toxic (usually fluorescent) dye. Dye or discoloration at the storm sewer discharge point(s) can signify one or more illicit discharges or illegal connections. A systematic approach is necessary to assure that the proper conclusions are reached.

3. Other Accepted Physical/Mechanical Verification Methods

There are many other physical and mechanical methods which can be used to detect illicit discharges and illegal connections. For example, rodding with a plumber's snake and lamping are both valid means of verification.

CHAPTER VII

VII. Structural BMPs

A. Storm Water Detention Areas

Detention areas improve water quality by providing an opportunity for suspended sediment to settle out of the storm water discharge. In addition, infiltration of storm water into the ground can reduce runoff volumes and reduce peak flow rates. The detention area can be either wet (always containing water) or dry (only containing water during a storm). Safety precautions such as fences and buffer strips should be considered for wet detention basins which are governed by other regulations. Maintenance activities including removal of accumulated sediment should be considered when designing detention basins.

B. Percolation Areas

Percolation areas reduce discharge of pollutants in storm water by allowing storm water to percolate through the soil. Ditch check dams, berms and grass-lined swales can increase percolation on-site.

C. Oil and Grease Separators

Oil and grease separators remove oil from the surface of storm water prior to discharge. Oil/water separators or grease traps can be installed at catch basins. These devices must be properly installed, cleaned and inspected on a regular basis.

D. Artificial Wetlands

Artificial wetlands remove many of the conventional pollutants such as Biochemical Oxygen Demand (BOD), nitrogen and phosphorus from the storm water discharge. Artificial wetlands can also be used for storm water detention, wildlife habitat restoration, and groundwater recharge.

E. Relevant Source Controls

Relevant source controls prevent contact of precipitation with contaminants, and consequently contamination of storm water runoff. A storage building for materials is an example of a structural source control. Source controls can also be in non-structural BMPs as described in Chapter VIII.

F. Relevant Volume Controls

Volume controls regulate the volume of the storm water runoff into a receiving stream. Replacement of impervious areas with pervious areas, grass-lined swales, and porous pavement (see Section L) are examples of volume controls.

G. Overfill Prevention Equipment

Overfill prevention equipment minimizes storm water runoff contamination during fueling or other similar activities. This equipment typically consists of a float-activated switch that automatically turns off the filling device at a pre-determined level. These devices prevent potential spillage underneath storage tanks from contaminating storm water. Use of this BMP does not relieve all/any other requirements.

H. Roofs Over Loading/Unloading Areas Storage Areas and Waste Bins

Roofs over loading/unloading areas, storage areas and waste bins reduce the chance of outside weather contact. Similarly, waterproofed waste bins prevent the escape of contaminated water from the bin. Proper disposal of this water is necessary.

I. Bermed Containment Systems

Containment systems around outside storage areas contain spills or storm water runoff within a defined space. These areas are designed to contain and capture any spill or storm water runoff, facilitating clean-up and minimizing dispersion of the contaminant.

J. Flow Diversion Structures

Flow diversion structures divert storm water runoff to prevent contamination from pollutants. For example:

1. Storm water conveyances, channels, gutters, and drains accomplish three functions:

   a. They direct storm water flow away from developed areas;
   b. They separate and convey contaminated runoff to on-site or off-site treatment facilities (Section K);
   c. They intercept discharge from neighboring sites so that it does not become mixed with on-site discharge.

2. Containment dikes capture and hold on-site storm water runoff. Diversion dikes redirect off-site discharge away from a developed area.

3. Graded areas or pavements direct runoff away from a developed area.

K. Existing Sanitary Wastewater Discharge System

An existing sanitary wastewater discharge system may be used to convey storm water runoff, upon the coordination and approval of the Milwaukee Metropolitan Sewerage District.

L. Porous Pavement

Porous pavements reduce the volume of storm water runoff by allowing storm water to seep through. This BMP is only applicable to new developments. Maintenance activities, such as vacuum sweeping, are required to assure proper functioning of the pavement.

CHAPTER VIII

VIII. Non-structural BMPs

A. Source Elimination/Waste Minimization

Source elimination/waste minimization reduces the impact of contaminants on storm water runoff. Recycling materials, eliminating material and hazardous waste, keeping a current material inventory to avoid overstocking, and storing all materials possible under cover are examples of this BMP. Employee education is an important consideration for these actions.

B. Paved Surface Sweeping

Regularly-scheduled sweeping of paved areas reduces large particulate storm water pollutants. To increase the efficiency of this BMP, additional sweeping activities before a rain event may be considered.

C. Housekeeping

Housekeeping reduces material exposure to storm water runoff by providing a clean, orderly site. Examples include ensuring that all equipment is in good working conditions, regular inspections of equipment, maintenance of facilities and grounds, and tracking materials on-site.

D. Spill Prevention and Response

Spill prevention and proper clean-up of spills reduce the probability of contaminating storm water runoff. A spill response plan and team shall be developed, employees shall be educated on proper spill prevention techniques, likely spill locations shall be identified, and proper spill clean up equipment shall be stored on-site. If a spill occurs, dry clean up using rags for small spills, a damp mop for general clean up, and dry absorbent materials for larger clean up is preferable to hosing.

E. Use of Non-Toxic Solvents and Cleaners

Non-toxic solvents and cleaners reduce the load of contaminants on the environment. Many non-hazardous substances can be substituted for hazardous substances, such as non-caustic cleaners, detergent-based or water-based cleaners or non-chlorinated organic solvents.

F. Storage of Materials Off-Site

Material storage off-site prevents contamination by eliminating the source of storm water contamination. Raw, waste, or final materials may be stored off-site, reducing the risk of storm water pollution.

CHAPTER IX

IX. Design of BMPs

A. Site Suitability

The design of BMPs first requires determination of the physical characteristics of the site as they relate to specific improvements. This enables identification of feasible and effective BMPs. The following site characteristics, as listed in the American Public Works Association (APWA) Research Foundation publication titled Water Quality: Urban Runoff Solutions (May 1991), should be considered when designing BMPs:

1. Topography
   a. Soil type - defines permeability of an area;
   b. Slopes - may preclude the use of some BMPs;
3. High water table - can affect infiltration ability;
4. Shallow bedrock elevation - can affect infiltration ability;
5. Locations of foundations and wells - may define areas to avoid with infiltration schemes;
6. Available space;
7. Available depth - limits detention volumes and can affect holding times;
8. Land use restrictions (zoning);
9. Sediment input - will affect design and maintenance;
10. Thermal influences - may affect surrounding wildlife.

B. Design Criteria References

Specific design criteria for structural and non-structural BMPs can be found in several publications. Please refer to Appendix E for a list of BMP design criteria documents.

C. Construction Plans

The structural BMPs to be utilized on the project must be shown on the construction documents, including the plans to be reviewed by the various City departments.

CHAPTER X

X. Maintenance Plan Recertification Procedures

The storm water management plan requires recertification of the maintenance plan every five years, starting from when the original improvements are accepted by the City. This written recertification confirms that the drainage facilities are operating and being maintained as originally designed. Additional or alternative BMPs may be proposed and must be submitted for approval along with the recertification form. An updated irrevocable letter of credit, certified check or surety bond must accompany the certification. This recertification must be drafted by a licensed professional engineer. A copy of the recertification form is in Appendix G.