

II. STORMWATER MANAGEMENT

Introduction

Stormwater management has moved into the forefront for many communities since the inception of the Federal Clean Water Act's Phase II requirements regulating stormwater runoff. (See the discussion about Phase II in the introduction to this booklet.) This new perspective on stormwater is guiding communities away from trying to capture and discharge stormwater off site as quickly as possible. Now, they are working to reduce runoff through infiltration on site, and then treat any runoff that does occur before it is discharged into streams or wetlands for improved watershed quality. Many communities have engineering guidelines that describe the minimum standards for dealing with stormwater such as calculating runoff, or sizing detention basins, but there is little discussion about the philosophy the community holds about stormwater and its role in land planning.

As mentioned in previous model ordinances, it is important to explain through the Master Plan the approach a community wants developers to take in designing stormwater systems. Results such as protection of wetlands, riparian corridors, and hydrologic patterns should be discussed in general terms to clearly communicate the connection between stormwater and the community's vision for its future water quality.



Regulatory Considerations

The community's philosophy about stormwater is translated into specific standards in the Zoning Ordinance through a stormwater management regulation. Including stormwater requirements in the Zoning Ordinance could also be supplemented by creating an Engineering Design Manual or Construction Standards that describes the technical aspects of stormwater BMPs.

The authority to regulate stormwater comes from the City and Village Zoning Act (Act 207 of 1921 as amended), and the Township Zoning Act (Act 184 of 1943 as amended). Both acts allow governmental entities to provide zoning ordinances for the regulation of land development and to facilitate efficient provision for public services and facilities.

The main emphasis of stormwater management regulations should be to minimize runoff, and then treat the runoff that does occur before it reaches a natural water body. Minimizing runoff generally equates to reducing the amount of impervious surfaces, such as roads, parking lots, and buildings, preserving existing natural features, or by applying designs that allow for greater sheet flow, or pervious surfaces. Impervious surfaces add to the amount and rate of stormwater entering surface waters. Uncontrolled runoff carries a variety of pollutants such as fertilizers, pesticides, oil, and bacteria from animal waste, degrading water quality. Uncontrolled runoff also increases the flow into the system, which increases in the magnitude and frequency of flood events, reduces fish and other aquatic species diversity, increases stream bank erosion, and decreases infiltration into the groundwater.

Example Ordinance Language

The following stormwater ordinance text incorporates approaches to stormwater management and impervious surface reduction into the same ordinance. It provides site development standards that guide developers and individuals to finding opportunities for stormwater reduction and treatment as they go through the site planning process.

STORMWATER MANAGEMENT/ IMPERVIOUS SURFACE MITIGATION

(COMMUNITY NAME), MICHIGAN
Ordinance No. _____

SECTION 1: GENERAL

1.1 Intent

It is the intent of this Ordinance to encourage the use of structural, vegetative, or managerial practices, commonly referred to as Best Management Practices (BMP's), designed to treat, prevent, or reduce degradation of water quality due to stormwater runoff. All development projects subject to review under the requirements of this Ordinance shall be designed, constructed, and maintained using BMP's to prevent flooding, protect water quality, reduce soil erosion, maintain and improve wildlife habitat, and contribute to the aesthetic values of the project. The particular facilities and measures required on-site shall reflect and incorporate existing grade, natural features, wetlands, and watercourses on the site to the maximum extent feasible.

SIDEBAR TEXT

- Best Management Practices (BMPs) include a broad range of physical structures, plantings, or management practices. The common denominator that makes them BMPs is that they either reduce stormwater runoff, reduce pollutants that could reach surface waters, or treat stormwater before it enters a natural water body. Examples of structural BMPs include sedimentation basins and wet ponds (or manufactured wetlands). Vegetated BMPs could include vegetated swales or rain gardens. Management practice BMPs include washing vehicles in commercial car washes (versus in an area where the soapy water could wash into a storm drain), and soil testing before applying fertilizers.

1.2 Stormwater Drainage/Erosion Control

All stormwater drainage and erosion control plans shall meet the standards adopted by the (Community Name) or other jurisdiction for design and construction and shall, to the maximum extent feasible, utilize nonstructural control techniques, including but not limited to:

- A. Limitation of land disturbance and grading;
- B. Maintenance of vegetated buffers and natural vegetation;
- C. Minimization of impervious surfaces;
- D. Use of terraces, contoured landscapes, runoff spreaders, grass or rock-lined swales;
- E. Use of infiltration devices;

SIDEBAR TEXT

- Engineering and construction standards are often provided for BMPs identified in stormwater regulations. The engineering information, usually provided in a separate document, ensures that the BMPs are designed and constructed properly.

1.3 General Standards

- A. Stormwater management systems shall be designed to prevent flooding and the degradation of water quality related to stormwater runoff and soil erosion from proposed development.
- B. All properties which are subject to this ordinance shall provide for on-site storage of stormwater. Facilities shall be designed to provide a volume of storage and discharge rate which meets the standards of the (Community Name) Engineering and Design Standards.
- C. Priority shall be placed on site design which maintains natural drainage patterns and watercourses. Alterations to natural drainage patterns shall not create flooding or degradation in water quality for adjacent or downstream property owners. Site designs must be approved by the Macomb County Public Works Department if it is a watercourse under their jurisdiction.
- D. The use of swales and vegetated buffer strips (containing desirable native plant materials) or other infiltration practices is encouraged as a method of stormwater conveyance so as to decrease runoff velocity, allow for biofiltration, allow suspended sediment particles to settle, and to remove pollutants. Tolerance for water saturation, sunlight, pesticides, metals, and salts, shall be required in determining appropriate plantings in these areas.

SIDEBAR TEXT

- A balance between the benefits and potential issues needs to be considered in designing any stormwater system. There are many positive benefits to managing and storing stormwater above ground rather than in underground pipes. It allows the runoff to infiltrate into the ground (filtering it of pollutants and sediments) or evaporate over time. The stormwater recharges ground water or returns to the atmosphere, and does not contribute to high stream flows which scour stream banks, adding to sedimentation. However, above-ground methods raise some issues to keep in mind, such as the safety of potential standing water on a site, or allowing certain pollutants such as motor fluids to infiltrate into the ground.

- E. Drainage systems shall be designed to be visually attractive. The integration of stormwater conveyance systems and retention and detention ponds in the overall landscape concept is recommended. Ponds with a naturally contoured, rather than square or rectangular, design and appearance shall be encouraged.

SIDEBAR TEXT

- Integrating stormwater systems into a site design is one of the major concepts in a new approach to stormwater management called Low Impact Development (or LID). This approach looks at stormwater runoff as a resource, not a waste product. It calls for managing rainfall at its source through uniformly distributed, micro-scale controls, rather than directing all stormwater to one large detention/retention basin. LID's goal is to mimic a site's pre-development hydrology through design techniques that infiltrate, filter, store, evaporate and detain runoff close to its source. For more information on these cutting-edge design ideas, go to the Low Impact Development Center's web site at www.lid-stormwater.net

- F. Where large amounts of grease and oil may accumulate, as in the case of commercial/industrial developments and large areas of pervious surfaces for parking, oil separators shall be required.
- G. For sites that store or use chemicals, a spill response plan shall be submitted and approved by the (Community Name).

SECTION 2: DEFINITIONS

Section 2.1 - Definition of Terms

Terms not specifically defined shall have the meaning customarily assigned to them.

BEST MANAGEMENT PRACTICE (BMP) means a structural, vegetative, or managerial practice that is designed to treat, prevent, or reduce degradation of water quality due to stormwater runoff, and to reduce the amount of stormwater runoff.

BUFFER STRIP means a vegetated area that treats sheet flow and/or interflow by removing sediment and other pollutants. The area may be grass-covered, forested or of mixed vegetative cover, depending on the amount of pollutants to be removed and the size of the buffer strip.

FLOODPLAIN means the area which is inundated by the base flood (or a flood having a 1 percent chance of being equaled or exceeded in any given year) and carries and discharges the floodwaters of the base flood as determined by the Federal Emergency Management Agency (FEMA) and as indicated in the flood boundary and floodway map.

IMPERVIOUS SURFACE means surfaces that do not allow water to infiltrate into the ground. Examples include buildings, pavement, and compacted soils within grassed or landscaped areas.

NATIVE PLANT means a plant species that has naturally evolved in a certain area over thousands of years under certain soil, hydrologic, and other site conditions. Where “native plant” is used in the text, this means a straight species, not a cultivar of a species.

NATURAL FEATURE means a wetland, as defined in the (Community Name) Wetland’s Ordinance, and shall mean a watercourse, including a lake, pond, river, stream, or creek.

SWALE means an open drainage channel or depression, explicitly designed to detain and promote the filtration of stormwater runoff into an underlying soil media.

WATERCOURSE means any natural or artificial watercourse, stream, channel, creek, ditch, canal, conduit, culvert, drain, waterway, gully, ravine or wash in which water flows in a definite direction or course, either continuously or intermittently, and which has a definite channel, bed and banks, and shall include any area adjacent tracts subject to inundation by reason of overflow of floodwater.

WETLAND means land characterized by the presence of water at a frequency and duration sufficient to support and that under normal circumstances does support, wetland vegetation or aquatic life, and is commonly referred to as a bog, swamp, or marsh..

SECTION 3: USE OF WETLANDS

3.1 Stormwater Management and Wetlands

Wetlands may be used for stormwater management if all the following conditions are met:

- A.** Wetlands and their current functions shall be protected from impairment due to the discharges of stormwater. Measures shall be taken to reduce erosive velocities of stormwater and remove sediment and other pollutants prior to discharge to a wetland.
- B.** Wildlife, fish or other beneficial aquatic organisms and their habitat within the wetland will not be impaired
- C.** The wetland has sufficient holding capacity for stormwater, based upon calculations prepared by the proprietor and reviewed and approved by the (Community Name), and that the additional stormwater will not impair the wetland’s current functions.
- D.** On-site erosion control shall be provided to protect the natural functioning of the wetland.

- E. Provisions approved by the (Community Name) shall be established so as to insure that the wetland is not disturbed or impaired in the future relative to the needed storage capacity.
- F. Applicable permits from the local government and the Michigan Department of Environmental Quality are obtained.

SIDEBAR TEXT

- Information provided by the Michigan Natural Features Inventory (MNFI) for Macomb County could also be used to evaluate whether it is appropriate to use a particular wetland as part of a stormwater system. Refer to the introduction of this booklet for more information on Macomb County's General MNFI.

**SECTION 4: IMPERVIOUS SURFACE REDUCTION/
INFILTRATION ENHANCEMENT**

4.1 General

The (Community Name) recognizes that, due to the specific requirements of any given development, inflexible application of the design standards may result in development with excessive paving, stormwater runoff, and a waste of space which could be left as an open space.

The (Community Name) may permit deviations from Ordinance requirements during the site plan review process to reduce impervious surfaces. These deviations can be either prescribed by Ordinance or proposed through creative land development techniques that are permitted by the Ordinance. The (Community Name) may permit deviations whenever it finds that such deviations are more likely to meet the intent and standards of this Ordinance and accommodate the specific characteristics of the use in question.

4.2 Site Plan Standards

The (Community Name) may attach conditions to the approval of a deviation that bind such approval to the specific use in question. Measures that reduce impervious surface and increase infiltration may include, but are not limited to, the following:

- A. Streets and Access.
 - 1. Design residential streets with the minimum required pavement width needed to support travel lanes, on-street parking, and emergency (as

defined by applicable emergency response agencies), maintenance, and service vehicle access and function based on traffic volumes.

2. Reduce the total length of residential streets by examining alternative street layouts to determine the best option for increasing the number of homes per unit length.
3. Design street right-of-way widths/private road easements to reflect the minimum required to accommodate the travel-way, the sidewalk, and vegetated open channels.
4. Minimize the number of street cul-de-sacs and reduce the radius of cul-de-sacs to the minimum required to accommodate emergency and maintenance vehicles. Alternative turnarounds shall be considered, including the use of mountable curbing and grass shoulders for the occasional event of access by fire trucks and other large commercial trucks. Provide landscape center islands wherever cul-de-sacs exist.

SIDEBAR TEXT

- Some of these standards may be developed in part, or in coordination with, the mandatory “cluster” options that are required by the State of Michigan for most Macomb County communities.

5. Where density, topography, soils, and slope permit, use vegetated open channels in the street right-of-way/private road easements to convey and treat stormwater runoff.
6. Use alternative driveway surfaces and shared driveways that connect two or more sites. (Use agreements should accompany any such application.)
7. Promote more flexible design standards for residential subdivision sidewalks. Where practical, consider locating sidewalks on only one side of the street and providing common walkways linking pedestrian areas.

B. Parking

1. Base parking requirements on the specific characteristics of the use, landbanking in open space parking required to satisfy Ordinance requirements.
2. Reduce the overall imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating

efficient parking lanes, depressed center islands with curb cuts, and using pervious materials in the spillover parking areas where possible.

3. Encourage shared parking between compatible users.

C. Site Design

1. Direct rooftop runoff to pervious areas such as yards, open channels, or vegetated areas and avoid routing rooftop runoff to the roadway and the stormwater conveyance system.
2. Create naturally vegetated buffer systems, which may vary in width as determined by the (Community Name) along all drainageways. Critical environmental features such as the 100-year floodplain, steep slopes, and wetlands shall be considered.
3. Minimize clearing and grading of woodlands and native vegetation to the least amount needed to build lots, allow access, and provide fire protection.
4. Conserve trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native plants.

SIDEBAR TEXT

Other standards include:

- Encourage open space design subdivisions that use smaller lot sizes. This minimizes impervious surfaces by clustering development in one area of the site. The open space allows stormwater to infiltrate into the ground.
- Link open spaces to existing wetlands, river systems, and other open spaces. This provides a buffer to the sensitive water features, allows scenic recreational opportunities, provides a wildlife movement corridor, and could provide an opportunity for non-motorized transportation/recreation such as biking and walking.
- Require that disturbed areas, to be used for infiltration, be aerated/decompacted after construction activities are complete. Heavy construction equipment compacts soils and can make them almost as impervious as asphalt. Could also require that infiltration areas be marked on site plans and roped off in the field to avoid compaction.

SECTION 5: MAINTENANCE

5.1 Stormwater Facility Maintenance

Whenever a landowner is required to provide on-site stormwater retention and/or surface drainage to wetlands, or whenever other protective environmental measures including monitoring devices are required, such measures or facilities shall be provided and maintained at the landowner's expense. The landowner shall provide assurance to the (Community Name) that the landowner will bear the responsibility of providing and maintaining such methods or facilities, by written agreement, suitable for recording at the office of the Macomb County Register of Deeds, that will act as a perpetual restriction on the land, the form and content of which shall be approved by the (Community Name) Attorney. A maintenance plan shall be provided including notation and description of maintenance requirements and timelines.

Additional Resources

- 1) **Center for Watershed Protection Website.** www.cwp.org.
- 2) **EPA Website.** Menu of Best Management Practices for Stormwater Phase II. www.epa.gov/npdes/stormwater/menuofbmps/menu.cfm.
- 3) **Center for Watershed Protection.** *Better Site Design: A Handbook for Changing Development Rules in Your Community.* August, 1998.
- 4) **Schueler, Thomas R. and Holland, Heather K.** *The Practice of Watershed Protection.* Center for Watershed Protection. 2000.
- 5) **Southeast Michigan Council of Governments (SEMCOG).** *Land Use Tools and Techniques. A Handbook for Local Communities.* March, 2003.
- 6) **Southeast Michigan Council of Governments (SEMCOG).** *Opportunities for Water Resource Protection in Local Plans, Ordinances, and Programs. A Workbook for Local Governments.* August, 2002.