

**RESOLUTION**

**No. 2006-1114B**

By Commissioner Boike and Co-sponsored by Commissioner Varga

RESOLVED, by the Wayne County Commission this 19<sup>th</sup> day of December, 2006 that approval be, and is hereby granted authorizing amendments to the Administrative Rules for the Wayne County Storm Water Management Ordinance, as recommended by the Chief Executive Officer.

[Administrative Rules Attached]

(2007-70-009B)

**WAYNE COUNTY STORM WATER MANAGEMENT ADMINISTRATIVE RULES****TABLE OF CONTENTS**

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**Chapter 1 GENERAL PROVISIONS****Rule 101 Purpose**

These administrative rules are declared necessary for the protection of the health, safety, and welfare of the citizens of Wayne County and to protect the environment against pollution and other adverse effects from storm water runoff. The purpose of these rules is to provide for the administration and implementation of a storm water management program in Wayne County; and to provide performance and design standards for storm water management systems.

**Rule 102 Title**

These administrative rules shall be known and may be cited as the "Wayne County Storm Water Management Administrative Rules."

**Rule 103 Effective Date**

These administrative rules became effective October 23, 2000.

**Chapter 2 DEFINITIONS****Rule 201 General**

All terms in these administrative rules shall have the meaning ascribed to them in the Wayne County Storm Water Management Ordinance, unless otherwise specified herein.

**Rule 202 Terms**

As used in these rules:

*Bank full flood* means the storm water generated by the 1.5-year storm.

*Best management practice*, or BMP, means a practice or combination of practices that have been determined by the County to be the preferred method of preventing, minimizing, or reducing pollution and other effects of storm water and storm water runoff.

*Bioretention area* means a component of a storm water management system that is comprised of a depressed land area that contains specific soil, plant materials, and other features and is used as a pretreatment system.

*Bridge* means a structure, including supports, built to carry a feature over a surface water or watercourse, with a clear span of more than 20 feet measured along the center of feature being carried.

*Buffer strip* means a zone that is used for filtering direct storm water and storm water runoff into a

storm water management system and for providing maintenance access to a storm water management system.

*Catch basin* means a belowground structure designed to collect and convey water into a storm sewer system.

*CFS* means cubic feet per second.

*Closed conduit* means an enclosed conveyance designed to carry storm water runoff such that the surface of the water is not exposed to the atmosphere, including without limitation storm sewers, culverts, closed County drains, and pipes.

*Constructed wetland* means an open detention basin that uses a variety of water depths and wetland plants to provide pollutant removal.

*County Road* shall include roads and road rights-of-way within the jurisdiction of the County.

*Culvert* means a structure, including supports, built to carry a feature over a surface water or watercourse, with a clear span of less than 20 feet measured along the center of the feature being carried.

*Design storm* means a rainfall event of specified size and return interval that is used to calculate the water volume and peak flow rate that must be handled by a storm water management system.

*Design water level* means the water surface elevation in a detention system at which the storage volume in the system (above the permanent pool water level, if any) equals the required flood control storage volume.

*Detention* or *detain* means the temporary storage of storm water and storm water runoff to control peak flow rates and/or provide pollutant removal before discharging the water to a surface water or closed conduit.

*Detention system* means a component of a storm water management system, either aboveground or below ground, that detains storm water and storm water runoff. Detention systems may include, without limitation, open detention basins and underground detention systems.

*Detention time* means the amount of time that a volume of water will be detained in a detention system.

*Drainage area* means the entire upstream land area from which storm water runoff drains to a

particular location, including any off-site drainage area.

*Emergency spillway* means a depression in the embankment of an open detention basin or retention basin that is used to pass flows in excess of the overflow structure capacity.

*First flush* means storm water runoff that occurs during the early stages of a storm as a result of the washing effect of storm water runoff on pollutants that have accumulated on the surface of the drainage area. For purposes of these rules, the first flush at a particular location within a storm water management system consists of runoff from the first 0.5 inch of precipitation over the entire drainage area upstream of that location.

*Floodplain* means for a given flood event, that area of land adjoining a continuous watercourse that has been covered temporarily by water.

*Flow restrictor* means a structure, feature, or device in a detention system or pretreatment system that is used to restrict the discharge from the system for specified design storm(s).

*Forebay* means a component of a storm water management system that is comprised of a surface water that is used as a pretreatment system.

*Freeboard* means the vertical distance from the design water level to the top of the embankment of an open detention basin or retention basin.

*Manhole* means a structure that allows access into a closed conduit.

*Manning's Formula* means a technique for estimating the hydraulic capacity of a closed conduit, watercourse, or other means of conveyance of storm water and storm water runoff.

*Manning's Roughness Coefficient ("n")* means a coefficient used in Manning's Formula to describe the resistance to flow due to the roughness of a conveyance.

*Manufactured treatment system* means a component of a storm water management system that is comprised of a manmade device or structure that is used as a pretreatment system.

*Open detention basin* means a component of a storm water management system that is comprised of a surface water that is used as a detention system.

*Ordinance* means the Wayne County Storm Water Management Ordinance.

*Outflow rate* means the rate of discharge in volume per unit time.

*Overflow structure* means a structure designed to allow unrestricted discharge from a component

of a storm water management system when the water level exceeds the design water level.

*Peak flow rate* means the maximum instantaneous rate of flow at a particular location within a storm water management system, usually in reference to a specific design storm event.

*Permanent pool* means a pool in an open detention system or forebay that provides additional removal of pollutants through settling and biological uptake.

*Pollutant* means any substance introduced into the environment that may adversely affect the public health, safety, welfare, or the environment, or the usefulness of a resource.

*Pretreatment system* means a structure, feature, or appurtenance, or combination thereof, either aboveground or belowground, that is used as a component of a storm water management system to remove incoming pollutants from storm water and storm water runoff. Pretreatment systems may include, without limitation, forebays, manufactured treatment systems, and bioretention areas.

*Regulated wetland* means any wetland protected by federal, state, or local laws or regulations.

*Rational Method Formula* means a technique for estimating peak flow rates at a particular location within a storm water management system, based on the rainfall intensity, watershed time of concentration, and a runoff coefficient.

*Retention or retain* means the temporary storage of storm water and storm water runoff to provide gravity settling of pollutants and to promote infiltration into the soil, rather than to discharge the storm water or storm water runoff to a surface water or closed conduit.

*Retention basin* means a component of a storm water management system that is comprised of a surface water that retains storm water and storm water runoff.

*Return interval* means the average expected time interval between events of some kind.

*Riprap* means a combination of large stone, cobbles, and boulders used to line watercourses, stabilize banks, reduce runoff velocities, or filter out sediment.

*Runoff coefficient* means the ratio of the volume of storm water runoff from a given drainage area over a given time period, to the total volume of precipitation that falls on the same drainage area over the same time period.

*Time of concentration* means the time duration (typically in minutes) that is required for storm water runoff from the most remote area of the watershed to reach a given location in a storm water

management system.

*Total suspended solids* means particles or other solid material suspended in storm water or storm water runoff. "Total suspended solids" is commonly expressed in concentration (mg/l).

*Underground detention system* means one or more underground pipes and/or other structures that are utilized as a detention system.

*Watershed* means the complete area or region draining into a watercourse, surface water, or closed conduit.

*Weir* means a structure that extends across the width of a surface water, watercourse or closed conduit and is used to impound or restrict the flow of water.

*Wetted perimeter* means the length of the perimeter of a watercourse or closed conduit cross-section that is submerged and thereby causes resistance to flow.

### **Chapter 3 GENERAL REQUIREMENTS FOR STORM WATER MANAGEMENT SYSTEMS**

#### **Rule 301 General**

Except as provided in Rule 302, a person who applies for a storm water construction approval shall

(A) Incorporate the minimum performance and design standards prescribed by Chapters 5, 6 and 7 of these rules into the selection and design of a storm water management system;

(B) Demonstrate that the storm water management system shall be maintained in perpetuity pursuant to Chapter 10 of these rules; and

(C) Incorporate such other requirements as may be deemed necessary by the County to satisfy the requirements of the Ordinance.

#### **Rule 302 Alternative Performance and Design Standards**

(A) Notwithstanding any other provision in these rules, the County may approve a storm water management system that does not satisfy the performance or design standards set forth in Chapters 5, 6 and 7 of these rules if the following conditions are met:

(1) request for approval of a storm water management system that incorporates alternative performance or design standards is submitted to the County in conjunction with an application for storm water construction approval;

(2) the applicant demonstrates to the satisfaction of the County that the alternative performance or design standards are adequate to control and prevent flooding, erosion, pollution, and other effects of storm water runoff, consistent with the Ordinance; and

(3) the alternative performance or design standards are sufficiently described and documented to enable the County to assess their effectiveness.

(B) Notwithstanding any other provision in these rules, when necessary to address unique flood control or water resources protection issues at a development site, on adjacent properties, or downstream of a development site, the County may require additional or more stringent performance or design standards than set forth in these rules as a condition of granting a storm water construction approval. Such additional or more stringent requirements may be required when necessary to satisfy the requirements of the Ordinance or to ensure that storm water runoff from the development site does not create excessive adverse impacts to downstream property owners or water resources.

(C) Approval of a storm water management system that incorporates alternative performance or design standards pursuant to this rule is within the sole reasonable discretion of the County.

(D) The approval by the County of a storm water management system that meets alternative performance or design standards according to the requirements of this rule shall not reduce, abate, alter, modify, amend, or affect the applicant's responsibility to comply with other provisions of the Ordinance, these rules, or an approval issued hereunder.

(E) The County shall approve alternative performance or design standards pursuant to this rule only if the alternative performance or design standards meet or exceed applicable requirements for storm water management systems that are imposed by the state or a political subdivision within the County.

### **Rule 303 Best Management Practices and Design Standards**

The County may establish best management practices for controlling storm water runoff and detailed design criteria for storm water management systems. These practices and criteria shall be established in writing and made available to interested persons. Applicants for storm water construction approvals shall consider these practices and design criteria when designing storm water management systems.

**Chapter 4      STORM WATER CONSTRUCTION APPROVALS****Rule 401      Application Requirements**

(A) Applications for storm water construction approval, with supporting documentation and all required fees, shall be submitted to the Permit Office. Applications for storm water construction approval shall be made in a form and manner approved by the County. The County may establish requirements, guidelines, and forms for submitting such applications.

(B) All proposed modifications to the approved storm water management system shall be submitted to and approved by the County. All supporting documentation shall be submitted with any proposal to modify the storm water management system. A person shall not commence regulated construction activity associated with a proposed modification without the approval of the County.

**Rule 402      Review Procedures**

(A) The Permit Office shall approve, deny, or require modification of a storm water management system proposed in an application for storm water construction approval. The Permit Office shall notify the applicant of the approval, denial, or request for modification by first class mail. If the application is denied, then the Permit Office shall advise the applicant in writing of its reasons for denial and conditions required for approval.

(B) The Permit Office shall issue a storm water construction approval only if it determines that an applicant has satisfied the requirements of the Ordinance and these rules. An approval given to the applicant either in person or by first-class mail constitutes approval of an application for storm water construction approval.

**Chapter 5      PERFORMANCE STANDARDS FOR STORM WATER MANAGEMENT SYSTEMS****Rule 501      Flood Control**

(A) Except as otherwise provided in these rules, storm water management systems shall be designed and constructed to meet the minimum performance standards for flood control set forth in this Rule 501. Designing a storm water management system to meet these minimum performance standards shall be the responsibility of the applicant or its designee, subject to the County's approval.

(B) Flood Control Performance Standards

(1) For storm water management systems that have drainage areas of greater than five (5) acres, the peak flow rate of storm water runoff leaving the development site shall not exceed 0.15 cfs/acre for a 100-year storm.

(2) For storm water management systems that have drainage areas of five (5) acres or less, the peak flow rate of storm water runoff leaving the development site shall not exceed 0.15 cfs/acre for a 10-year storm.

**Rule 502 Water Resources Protection**

(A) Except as otherwise provided in these rules, storm water management systems shall be designed and constructed to meet the minimum performance standard for water resources protection set forth in this Rule 502. Designing a storm water management system to meet these minimum performance standards shall be the responsibility of the applicant or its designee, subject to the County's approval.

(B) Standard for Water Resources Protection. Storm water management systems shall be designed and constructed to remove eighty percent (80%) or more of the total suspended solids load from the development site, as determined on an annual average basis.

**Chapter 6 GENERAL DESIGN STANDARDS**

**Rule 601 Determination of Peak Flow Rate**

(A) Except as provided in Rule 601(B), the peak flow rate at a particular location within storm water management systems shall be calculated in accordance with the Rational Method Formula. The Rational Method Formula shall be expressed as follows:

$$Q = C \times I \times A$$

where Q = peak flow rate (cfs)

C = runoff coefficient

I = rainfall intensity (in/hr)

A = drainage area (acres)

(1) For purposes of calculating peak flow rate at a particular location using the Rational Method Formula, the runoff coefficient (C) shall be a weighted average that is based on the percentage of

different surface types within the drainage area. Runoff coefficients for various surface types are shown in Table 1.

| <b>Table 1: MINIMUM ACCEPTABLE RUNOFF COEFFICIENTS</b>  |                                |             |            |
|---|--------------------------------|-------------|------------|
| <b>Type of Surface</b>                                  | <b>Runoff Coefficients (C)</b> |             |            |
| Water Surfaces  | 1.00                           |             |            |
| Roofs   | 0.95                           |             |            |
| Asphalt or concrete pavements                           | 0.95                           |             |            |
| Gravel, brick or macadam surfaces                       | 0.85                           |             |            |
| Semi-pervious surfaces (e.g. lawns, parks, playgrounds) | slope < 4%                     | slope 4%-8% | slope > 8% |
| Hydrologic Soil Group A                                 | 0.15                           | 0.20        | 0.25       |
| Hydrologic Soil Group B                                 | 0.25                           | 0.30        | 0.35       |
| Hydrologic Soil Group C                                 | 0.30                           | 0.35        | 0.40       |
| Hydrologic Soil Group D                                 | 0.45                           | 0.50        | 0.55       |

(2) For purposes of calculating peak flow rate at a particular location using the Rational Method Formula, rainfall intensity (*I*) shall be calculated in accordance with the formulae in Table 2.

| <b>Table 2: DESIGN RAINFALL INTENSITIES</b>                        |                                   |                                  |
|--|-----------------------------------|----------------------------------|
| <b>Design Storm</b>  | <b>Rainfall Intensity (in/hr)</b> |                                  |
|  | <b>t Less than 60 Minutes</b>     | <b>t Greater than 60 Minutes</b> |
| 10-year  | $151.8/(t+19.9)$                  | $162.3/(t+25.4)$                 |
| 50-year  | $212.5/(t+23.3)$                  | $230.3/(t+30.3)$                 |
| 100-year   | $233.7/(t+23.5)$                  | $294.0/(t+45.0)$                 |
| where <i>t</i> = <i>time of concentration</i> (See Rule 601(A)(3)) |                                   |                                  |

(3) For purposes of determining rainfall intensity at a given location in accordance with Rule 601(A)(2), the time of concentration (*t*) for the most upstream end of the storm water management system shall be determined in accordance with Table 3, and shall be referred to as the initial time of concentration. For downstream locations in the storm water management system, the time of concentration (*t*) shall be the sum of the initial time of concentration, plus the travel time from the upstream end to the location for which the peak flow rate calculation applies.

| <b>Table 3: INITIAL TIME OF CONCENTRATION</b> |   |
|---|---|
| <b>Type of Land Use</b>                       | <b>Time of concentration (t<sub>o</sub>) (min)</b>  |
| Multiple Units                                | 15  |
| Commercial/industrial                         | 15  |
| Single family residential                     | 20  |
| Unimproved land                               | $t_o = L / (60 \times V) \text{ and } V = (0.48) \times S^{1/2}$ <p>where t<sub>o</sub> = initial time of concentration (minutes)<br/> L = length of overland sheet flow (feet)<br/> S = slope of overland sheet flow (percent)<br/> V = velocity of overland sheet flow (ft/sec)</p> |

(B) The County, in its sole discretion, may require the peak flow rate to be calculated in accordance with an alternative runoff hydrograph prediction method when necessary to satisfy the requirements of the Ordinance and these rules. The alternative hydrograph prediction method shall be based on the SCS Type II 24-hour rainfall distribution with conservative wet weather antecedent conditions.

(C) For purposes of calculating peak flow rate for a given development site, it shall be assumed that off-site drainage areas are developed consistent with any applicable master land use plan, storm water standards and storm water master plan enacted by the local unit of government in which the storm water management system is located, and the County's storm water management program.

**Rule 602      **General Design Standards for Flood Control****

(A) Except as otherwise provided in these rules, storm water management systems designed and constructed to satisfy the general design standards for flood control set forth in this Rule 602 satisfy the applicable flood control performance standard of Rule 501(B).

(B) The storm water management system shall include a detention system and/or retention basin that is designed and constructed in accordance with this Rule 602(B).

(1) Detention Systems

(a) Flood Control Storage Volume. The variables in the relationships in this Rule 602(B)(1) shall have the following values:

|       |   |   |
|-------|---|---|
| $Q_a$ | = | maximum allowable outflow rate from the detention system (cfs)  |
| $Q_o$ | = | maximum allowable outflow rate per acre imperviousness (cfs/acre imperviousness)                                      |
| $T$   | = | storage time defined as the instant storage begins until peak storage is attained (minutes)                           |
| $V_s$ | = | maximum volume of water stored in the detention system per acre imperviousness (ft <sup>3</sup> /acre imperviousness) |
| $V_t$ | = | maximum volume of water stored in the detention system (ft <sup>3</sup> )   |
| $A$   | = | drainage area (acres)   |
| $C$   | = | runoff coefficient  |

(i) The flood control storage volume ( $V_{t100}$ ) of detention systems that have a drainage area greater than five (5) acres shall be determined based on the following relationships for the 100-year storm:

$$Q_a = 0.15 \text{ cfs/acre} \times A$$

$$Q_o = Q_a / (A \times C)$$

$$T_{100} = (-45) + \sqrt{19845/Q_o}$$

$$V_{S100} = [(17649 \times T_{100}) / (T_{100} + 45)] - (40 \times Q_o \times T_{100})$$

$$V_{t100} = V_{S100} \times A \times C$$

(ii) The flood control storage volume ( $V_{t10}$ ) of detention systems that have a drainage area of five (5) acres or less shall be determined based on the following relationships for the 10-year storm:

$$Q_a = 0.15 \text{ cfs/acre} \times A$$

$$Q_o = Q_a / (A \times C)$$

$$T_{10} = (-19.9) + \sqrt{4530/Q_o}$$

$$V_{S10} = [(9108 \times T_{10}) / (T_{10} + 19.9)] - 40 \times Q_o \times T_{10}$$

$$V_{t10} = V_{S10} \times A \times C$$

(b) Detention systems shall include a flow restrictor that restricts outflow from the system such that the maximum outflow rate at the design water level will not exceed the maximum allowable outflow rate ( $Q_a$ ).

(2) Flood Control Storage Volume for Retention Basins. Retention basins shall be designed

to retain the volume of storm water equal to the runoff from two consecutive 100-year storm events ( $V_r$ ), as determined in accordance with the following relationship:

$$V_r = 2 \times 16500 \times A \times C$$

where  $V_r$  = flood control storage volume of retention basin (ft<sup>3</sup>)  
A = drainage area tributary to inlet (acres)  
C = runoff coefficient

(C) Adequate Outlet. Except as provided below, the storm water management system shall include an adequate storm water outlet.

(1) At a minimum, a storm water outlet shall be deemed inadequate if its capacity exceeds its reasonable share of the maximum capacity of the downstream watercourse or closed conduit, as determined by the County in its sole reasonable discretion.

(2) If the County determines that a proposed detention system does not include an adequate storm water outlet, the applicant may be required to design and construct improvements to the downstream County drain, watercourse or closed conduit. The County shall determine the extent to which downstream improvements may be required.

(3) Storm water management systems that include only retention basins for flood control shall not be required to satisfy this Rule 602(C).

(D) Flood Plain Restrictions. Storm water management systems shall not be constructed within a 100-year floodplain unless the storm water management system satisfies the additional requirements of this Rule 602(D).

(1) The storm water management systems shall not diminish the net storage capacity of the floodplain. Compensatory storage shall be required for any reduction in floodplain storage capacity.

(2) The storm water management system shall not negatively alter the conveyance of the watercourse.

(3) During a design storm event, the storage capacity of the storm water management system shall remain available for detention of storm water and storm water runoff from the development site.

(4) The storm water management system shall minimize disruption to the riparian habitat of

the floodplain by developing and implementing a plan for minimizing disturbance that is acceptable to the County.

(E) Additional Requirements

(1) To the fullest extent possible, storm water management systems shall follow the natural drainage pattern of the land within the development site and within the watershed in which the site is located.

(2) Storm water management systems that include surface water components shall not be located within pre-existing surface water.

**Rule 603      **General Design Standards for Water Resources Protection****

(A) Except as otherwise provided in these rules, storm water management systems designed and constructed to satisfy the general design standards for water resources protection set forth in this Rule 603 satisfy the water resources protection performance standard of Rule 502(B).

(B) Pretreatment System. Storm water management systems shall include a pretreatment system at each inlet to each detention system and/or retention basin. The pretreatment system shall satisfy either or both of the following requirements:

(1) Removal Rate. The pretreatment system(s) shall be designed and constructed such that the storm water management system achieves the pollutant removal rate required by Rule 502(B).

(2) First Flush

(a) The pretreatment system(s) shall be designed and constructed to capture the first flush and release the first flush to the detention system or retention basin gradually over a period of twenty-four hours.

(i) The pretreatment system storage volume necessary to capture the first flush shall be determined based on the following relationship:

$$V_{tff} = 1815 \times A \times C$$

where

|           |   |   |
|-----------|---|---|
| $V_{tff}$ | = | first flush storage volume (ft <sup>3</sup> ) |
| A         | = | drainage area tributary to inlet (acres)      |
| C         | = | runoff coefficient                            |

(ii) The pretreatment system(s) shall include a flow restrictor that restricts outflow to

gradually release the first flush storage volume over a period of twenty-four (24) hours. The 24-hour average allowable outflow rate shall be determined in accordance with the following relationship:

$$Q_{avg\ ff} = V_{t\ ff} / 86400$$

where  $Q_{avg\ ff}$  = 24-hour average allowable outflow rate (cfs)

$V_{t\ ff}$  = first flush storage volume (ft<sup>3</sup>)

(C) Bank Full Flood. Except as provided below, the storm water management system shall capture the runoff from the bank full flood and release the runoff gradually over a period of forty (40) hours.

(1) The storage volume necessary to capture runoff from the bank full flood to satisfy the requirement of this Rule 603(C) shall be determined in accordance with the following relationship:

$$V_{t\ bf} = 5160 \times A \times C$$

where  $V_{t\ bf}$  = bank full flood storage volume (ft<sup>3</sup>)

A = drainage area (acres)

C = runoff coefficient

(2) The bank full flood storage volume (above the permanent pool, if any) may be used to satisfy a portion of the flood control storage volume required by Rule 602(B).

(3) The storm water management system shall include a flow restrictor that restricts outflow from the system to gradually release the bank full flood over a period of forty (40) hours. The 40-hour average allowable outflow rate shall be determined in accordance with the following relationship:

$$Q_{avg\ bf} = V_{t\ bf} / 144000$$

where  $Q_{avg\ bf}$  = 40-hour average allowable outflow rate (cfs)

$V_{t\ bf}$  = bank full flood storage volume (ft<sup>3</sup>)

(4) Storm water management systems that include only retention basins for flood control shall not be required to satisfy the requirements of this Rule 603(C).

(D) Additional requirements. Storm water management systems that include surface waters as components of the system shall satisfy the following additional requirements.

(1) A buffer strip shall be established and/or preserved around each surface water on the development site.

(a) The minimum width of a buffer strip shall be 25 feet. Along watercourses, the width of a buffer strip shall be measured from the top of bank of the watercourse. Around other surface waters, the width of the buffer strip shall be measured from the minimum freeboard elevation of the surface water.

(b) Construction activities, paving, and chemical application, except for construction activities needed to create or establish the buffer strip, are prohibited in the buffer strip.

(c) The ground slope of a buffer strip shall not be steeper than 1:6.

(d) A buffer strip shall not be required around bioretention areas or vegetated swales.

(2) An applicant for storm water construction approval shall submit a landscape plan with the application for storm water construction approval. The plan shall depict landscaping elements that function as part of the storm water management system, including the buffer strip.

(a) The landscape plan shall include, at a minimum, specifications for the soils and plant materials that the applicant proposes to include in the landscape; and a description of the methods and planting techniques that the applicant proposes to utilize during landscape installation.

(b) The installation and maintenance of the landscaping described in the landscape plan shall be included as regulated construction activity for which the County may require financial assurance.

## **Chapter 7      SPECIFIC DESIGN STANDARDS**

### **Rule 701      Design Standards for Open Detention Basins**

Open detention basins used as components of storm water management systems shall satisfy the additional requirements of this Rule 701.

#### **(A)      Outlets**

(1) Flow restrictors in open detention basins shall be placed near or within the embankment of the system to provide ready maintenance access. Flow restrictors shall be constructed of materials that minimize future maintenance requirements.

(2) Open detention basins shall include an overflow structure to allow discharge when the water level in the basin exceeds the design water level. The overflow structure and its outlet pipe shall be designed to convey the peak flow rate tributary to the basin for the 10-year design storm.

(3) Open detention basins shall include an emergency spillway with a defined downstream drainage path to allow discharge when flows exceed the capacity of the overflow structure. The

emergency spillway elevation shall be 6 inches below the top of freeboard elevation. The spillway shall be armored to prevent erosion.

(B) Other Requirements

(1) The design water level of an open detention basin shall not exceed five (5) feet above the permanent pool water level.

(2) The open detention basin shall have a minimum four (4) foot deep permanent pool. Permanent pools shall not be required for constructed wetlands except when the County determines that a permanent pool is necessary to satisfy the performance standards of Chapter 5 of these rules. The volume of the permanent pool shall not satisfy any portion of the flood control storage volume required by Rule 602(B).

(3) Side slopes for open detention basins shall not be steeper than 1:6.

(4) A minimum of one (1) foot of freeboard is required above the design water level of an open detention basin.

**Rule 702**      **Design Standards for Retention Basins**

Retention basins used as components of storm water management systems shall satisfy the additional requirements of this Rule 702.

(A) Percolation Rate. Soils beneath the proposed location of the retention basin shall be sufficiently permeable to allow the infiltration of storm water and storm water runoff. Calculations and soil boring results showing the percolation rate of soils shall be submitted to the County with an application for storm water construction approval and shall be certified by a licensed professional engineer.

(B) Emergency Spillway. Retention basins shall include an emergency spillway with a defined downstream drainage path to allow discharge when flows exceed the design water level. The emergency spillway elevation shall be 6 inches below the top of freeboard elevation. The spillway shall be armored to prevent erosion.

(C) Other Requirements

(1) Side slopes for retention basins shall not be steeper than 1:6.

(2) A minimum of one (1) foot of freeboard is required above the design water level of a retention basin.

(3) The storage volume of the retention basin shall be measured above the existing groundwater elevation.

**Rule 703      Design Standards for Underground Detention Systems**

Underground detention systems used as components of storm water management systems shall satisfy the additional requirements of this Rule 703.

(A) Underground detention systems shall confine storm water and storm water runoff to the interior of the detention system, and shall not release the water except through an approved outlet.

(B) The County may restrict the types of materials and methods of construction for underground detention systems. At a minimum, an applicant must demonstrate that materials and construction methods for underground detention systems conform to applicable ASTM standards, AASHTO standards, and local standards adopted by the County.

**Rule 704      [Reserved]**

**Rule 705      [Reserved]**

**Rule 706      Design Standards for Forebays**

Forebays used as a component of a storm water management system shall satisfy the additional requirements of this Rule 706.

(A) Flow restrictors. Flow restrictors in forebays shall be placed near or within the embankment of the forebay to provide ready maintenance access and shall be constructed of materials that minimize future maintenance requirements.

(B) Weir. The forebay shall include a weir to allow discharge from the forebay into the detention system or retention basin when the forebay water level exceeds the top of the forebay storage volume. The weir shall be designed to convey the peak flow rate tributary to the forebay for the 10-year design storm.

(C) The total forebay storage volume (above the permanent pool, if any) may be used to satisfy both a portion of the flood control storage volume required by Rule 602(B) and the bank full flood storage volume required by Rule 603(C).

**Rule 707      Design Standards for Bioretention Areas**

Bioretention areas used as components of storm water management systems shall satisfy the

additional requirements of this Rule 707.

(A) Underdrain. The bioretention area design shall include an underdrain system to prevent excess pooling of water. Underdrains shall not be required where the applicant demonstrates that the infiltration rate of soil within the bioretention area is sufficient to prevent excess pooling.

(1) The underdrain shall be installed over a gravel layer that consists of at least six (6) inches of gravel.

(2) The underdrain shall include an adequate outlet into a detention system, retention basin, storm sewer, or watercourse.

(3) The hydraulic capacity of the underdrain shall be greater than the infiltration rate of the soil within the bioretention area.

(4) The underdrain shall be perforated along its entire length, except that no perforations shall be permitted within five (5) feet of a connection between the underdrain system and a storm sewer structure.

(5) The underdrain shall include a cleanout well to provide access for cleaning the underdrain system.

(B) Other requirements

(1) The pooling water depth for bioretention areas shall not exceed six (6) inches.

(2) Applicants that propose to include a bioretention area as a component of a storm water management system shall submit a grading plan for the development site that identifies the location of the bioretention area and the routes for construction and other vehicular traffic to demonstrate that soils and other subsurface media in or around the basin will not be compacted during construction.

#### **Rule 708      Design Standards for Manufactured Treatment Systems**

Manufactured treatments systems used as components of storm water management systems shall satisfy the additional requirements of this Rule 708.

(A) Manufactured treatment systems shall accumulate and store incoming solids so as to prevent re-suspension of captured solids.

(B) The removal efficiency of manufactured treatment systems shall be based on the documented performance of the system in full-scale independent studies over a range of storm sizes.

(C) Manufactured treatment systems shall incorporate a water-lock feature to prevent the release of trapped oil and floatable contaminants during storm events.

(D) The County may restrict the types of materials and methods of construction for manufactured treatment systems. At a minimum, an applicant must demonstrate that materials and construction methods for manufactured treatment systems conform to applicable ASTM standards, AASHTO standards, and local standards adopted by the County.

**Rule 709** [Reserved]

**Rule 710** [Reserved]

**Rule 711** Design Standards for Storm Water Conveyances

Conveyances used as components of storm water management systems shall satisfy the minimum requirements of this Rule 711.

(A) Watercourses

(1) Natural watercourses shall be preserved whenever possible. The County shall not approve modifications to natural watercourses unless the modification is required to protect the public health, safety, or welfare, or the environment.

(2) The flow capacity of each reach of a watercourse that is a component of a storm water management system shall be equal to or greater than the peak flow rate for a 10-year storm, as determined using the method described in Rule 601.

(3) The flow capacity of a watercourse shall be calculated in accordance with the following relationship (the "Manning Formula").

$$Q=(1.486 \times A \times R^{2/3} \times S^{1/2}) / n$$

where

|   |   |  |
|---|---|--|
| Q | = | flow capacity (cfs)                          |
| A | = | cross-sectional flow area (ft <sup>2</sup> ) |
| n | = | Manning's coefficient of roughness           |
| P | = | wetted perimeter (feet)                      |
| R | = | hydraulic radius (A/P in feet)               |
| S | = | hydraulic gradient (ft/ft)                   |

(B) Closed Conduits

(1) The flow capacity of each reach of a closed conduit that is a component of a storm water management system shall be equal to or greater than the peak flow rate for a 10-year storm, as determined using the method described in Rule 601.

(2) The flow capacity of a closed conduit shall be calculated using the Manning Formula described in Rule 711(A)(3).

(3) The invert elevation of each closed conduit entering a forebay with a permanent pool shall be equal to or greater than the permanent pool elevation.

(4) Hydraulic gradients for closed conduits shall meet both of the following requirements:

(a) The hydraulic gradient shall be calculated based on 10-year storm flows, starting with the crown elevation at the outlet, and shall be at least 2.5 feet below the rim elevation at any upstream manhole location.

(b) The rim elevation at any manhole location along a closed conduit upstream of a detention system shall be at least one (1) foot above the design water level of the detention system.

(5) The minimum allowable storm water velocity in a closed conduit shall be 2.5 feet per second. The maximum allowable storm water velocity in a closed conduit shall be 8.0 feet per second. The applicant may design a closed conduit that exceeds the maximum allowable storm water velocity only if the applicant demonstrates that special provisions in the design dissipate energy.

(6) The maximum distance between manholes, catch basins, and inlets in a closed conduit shall be in accordance with Table 4.

| <b>Table 4: MAXIMUM DISTANCES BETWEEN MANHOLES, CATCH BASINS, AND INLETS</b> |  |
|--|--|
| <b>Diameter of closed conduit (inches)</b>                                   | <b>Maximum distance (feet)</b>   |
| 36 and smaller   | 300  |
| greater than 36  | 300 plus 100 feet for each additional 12 inches in diameter greater than 36 inches |

(7) Manholes or junction chambers shall be constructed at all junctions and angle points within closed conduits and at all changes in conduit size or slope.

(8) Closed conduit inlets and outlets shall have an end treatment and soil erosion protection, and may be required to have a grate over the inlet/outlet.

(C) Bridges and Culverts: The following requirements apply to bridges and culverts:

(1) General

(a) The hydraulic capacities of culverts and bridges shall be calculated using a method approved by the County.

(b) All bridges and culverts shall be designed and constructed with adequate soil erosion protection.

(2) Bridges

(a) Bridges that convey a watercourse under a County Road shall be designed and constructed to pass the peak flow rate for a 100-year storm with no harmful increase in backwater elevations.

(b) The 100-year storm elevation upstream of a bridge shall be at least one (1) foot below the lowest elevation of either the bridge deck or the approach pavements to the structure.

(3) Culverts

(a) Culverts that convey a watercourse under a County Road shall be designed and constructed to convey at least the peak flow rate for a 10-year storm, as determined using the methods described in Rule 601.

(b) Culverts that will be inundated by storms larger than the design storm established by the Michigan Department of Transportation or the Michigan Department of Environmental Quality shall be designed and constructed with soil erosion protection that is adequate for the inundated condition.

**Rule 712** [Reserved]

## **Chapter 8** ADDITIONAL REQUIREMENTS

**Rule 801** Wetlands

The natural drainage pattern of the land within the development site shall not be altered in any way that may cause adverse effects to existing wetland areas. Untreated storm water shall not be permitted to outlet directly into a natural or mitigation wetland. At a minimum, storm water discharged into a natural or mitigation wetland shall pass through a pretreatment system designed to satisfy the water resources protection performance standards set forth in Rule 502(B).

**Rule 802** County Park Property

The County may establish additional or alternative requirements for storm water management systems that are located on County park property or that outlet within County park property.

**Rule 803 County Roads**

- (A) The minimum diameter of closed conduits beneath County Roads shall be 12-inches.
- (B) Storm water runoff from improved property abutting a County Road shall not be discharged into the storm water drainage system for the County Road without the County's prior approval.
- (C) The County may establish additional or alternative requirements for storm water management systems in County Roads.

**Chapter 9 FINANCIAL ASSURANCE**

**Rule 901 General Requirements**

(A) Before commencing construction of a storm water management system, the applicant shall provide financial assurance pursuant to Section 4.3(B) of the Ordinance. The storm water construction approval shall include the form and amount of the financial assurance to be provided and, if appropriate, may define temporal limits on the financial assurance. Storm water construction approval shall not be issued by the County unless and until the applicant provides proof of financial assurance to the County.

(B) If an application for storm water construction approval is submitted by more than one person, only one (1) person is required to demonstrate financial assurance; however, both parties are liable in the event of noncompliance.

**Rule 902 Amount of Financial Assurance**

(A) Financial assurance shall be provided in an amount at least equal to the current estimate of the cost of constructing the storm water management system.

(B) When the current estimate of the cost of constructing the storm water management system increases to an amount more than the amount of the financial assurance mechanism, the applicant, within 30 days after the increase, either shall cause the financial assurance mechanism to be increased to an amount at least equal to the current construction cost estimate and submit evidence of such increase to the County, or shall obtain other financial assurance for the difference. When the

current estimate of the cost of constructing the storm water management system decreases, the amount of financial assurance may be reduced to the amount of the construction cost estimate following written approval of the County.

**Rule 903**      **Performance Bonds**

(A) Applicants may satisfy the financial assurance requirements of the Ordinance and these rules by obtaining a performance bond that is executed on a form approved by the County and that conforms to the requirements of this rule.

(B) The bond shall guarantee that the applicant will construct the storm water management system in accordance with the Ordinance, these rules, and the storm water construction approval issued by the County.

(C) Under the terms of the bond, the surety shall become liable on the bond obligation when the applicant fails to perform as guaranteed by the bond when required to do so, and the County provides the applicant (1) seven (7) days notice of the failure, (2) an opportunity to cure the failure, and (3) a reasonable opportunity for a hearing conducted pursuant to the Ordinance.

(D) The penal sum of the bond shall be in an amount at least equal to the current estimate of the cost of constructing the storm water management system.

(E) Under the terms of the bond, the surety may cancel the bond by sending notice of cancellation, by certified mail, to the applicant and the County at least forty-five (45) days prior to cancellation. Cancellation shall not occur, however, during the 90 days beginning on the date of receipt of the notice of cancellation by both the applicant and the County, as evidenced by the return receipts. Within 30 days of receipt of a notice of cancellation of the bond from the surety, the applicant shall obtain alternate financial assurance approved by the County.

(F) The applicant may cancel the bond if the County has given prior written consent. The County shall provide such written consent when either of the following occurs: (1) the applicant substitutes alternative financial assurance as specified in these rules; or (2) the County releases the applicant from the financial assurance requirements of these rules pursuant to Rule 905.

**Rule 904**      **Letters of Credit**

(A) An applicant may satisfy the financial assurance requirements of these rules by obtaining

an irrevocable letter of credit that conforms to the requirements of this rule and that is executed on a form approved by the County. The issuing institution shall be a bank or financial institution that has the authority to issue letters of credit, whose letter of credit operations are regulated and examined by a federal or state agency, and that has an office in Wayne County.

(B) The letter of credit shall be unconditional and irrevocable and shall be issued for a period of at least one (1) year. The letter of credit shall provide that the expiration date will be automatically extended for a period of at least one (1) year unless, not less than 90 days before the current expiration date, the issuing institution notifies both the applicant and the County by certified mail of a decision not to extend the expiration date. Under the terms of the letter of credit, the 90 days shall begin on the date when both the applicant and the County have received the notice, as evidenced by the return receipts.

(C) If the applicant does not establish alternate financial assurance as specified in these rules and obtain written approval of such alternate assurance from the County within 90 days after receipt by both the applicant and the County of a notice from the issuing institution that it has decided not to extend the letter of credit beyond the current expiration date, the County may draw on the letter of credit. The County may delay the drawing if the issuing institution grants an extension of the term of the credit. During the last 30 days of any such extension, the County shall draw on the letter of credit if the applicant has failed to provide alternate financial assurance as specified in these rules and obtain written approval of such assurance from the County.

(D) The Director may draw on the letter of credit to correct violations and complete construction after doing both of the following:

(1) Notifying the applicant that the applicant has failed to construct the storm water management system in accordance with the storm water construction approval and other requirements of this Ordinance and these rules when required to do so; and

(2) Providing the owner or operator with 7 days notice.

**Rule 905 Release of the Financial Assurance Mechanism**

(A) Except as otherwise provided in these rules, within 60 days after receiving certifications from the applicant and an independent registered professional engineer that the storm water management system has been constructed in accordance with the Ordinance, these rules, and the storm

water construction approval issued by the County, the County shall notify the applicant, in writing, that financial assurance for the construction no longer is required.

(B) If the County has reason to believe that the storm water management system has not been constructed in accordance with the Ordinance, these rules, or the storm water construction approval, the County shall provide the applicant with a detailed written statement of any such reason. The County shall not be required to release the financial assurance mechanism provided by the applicant until the County is satisfied, in its reasonable discretion, that the storm water management system has been constructed in accordance with the Ordinance, these rules, and the storm water construction approval.

**Rule 906 Recordkeeping**

Applicants must maintain evidence of all financial assurance mechanisms used to demonstrate financial responsibility under the Ordinance or these rules until released from the financial responsibility requirements in accordance with Rule 905. Records maintained at any location other than the development site must be made available upon request of the County.

**Chapter 10 LONG-TERM MAINTENANCE**

**Rule 1001 General Requirement**

(A) An applicant shall submit a long term maintenance plan as part of an application for storm water construction approval. At a minimum, the long term maintenance plan shall set forth

(1) the preventative maintenance activities necessary to ensure that the storm water management system will function properly as designed;

(2) a schedule describing the frequency with which preventative maintenance activities shall occur;

(3) the manner in which the applicant shall assure, through a legally binding instrument, that the storm water management system shall be maintained in perpetuity.

(B) Long-term maintenance shall include site monitoring to ensure that a storm water management system is functioning properly as designed; remedial actions necessary to repair, modify, or reconstruct the system in the event the system does not function properly as designed at any time; notification to subsequent owners of limitations or restrictions on the property; actions necessary to

enforce the terms of restrictive covenants or other instrument applicable to the property pursuant to the Ordinance and these rules and such other actions as may be set forth in the Ordinance or these rules promulgated hereto.

(C) As a condition of final approval of the storm water management system, an applicant for storm water construction approval shall demonstrate to the County that the storm water management system shall be maintained in perpetuity.

**Rule 1002      Responsibility for Long-Term Maintenance**

Responsibility for long-term maintenance of a storm water management system shall be assumed by the local unit of government(s) in which the storm water management system is located or by another public corporation or entity (e.g. drainage district) approved by the County. Responsibility for long-term maintenance shall be assumed through a legally-binding instrument such as an ordinance, resolution, contract, or equivalent instrument approved by the County. A local unit of government or other public corporation or entity that assumes responsibility for long-term maintenance may designate another entity (including without limitation a homeowner's association, condominium association, or property owner) to undertake this responsibility; however, long-term maintenance under this rule shall remain the responsibility of the entity identified in the final storm water approval.

**Rule 1003      Long-Term Maintenance Agreements**

The County may establish requirements for the form and substance of instruments that meet the requirements of this rule.

**ADOPTED BY THE WAYNE COUNTY COMMISSION DECEMBER 19, 2006**

(2007-70-009B)