

# STORMWATER MANAGEMENT STANDARDS

## 1.2.1 Overview

This section presents a comprehensive set of minimum performance standards for stormwater management for development activities in the state of Georgia. The overall aim is to provide an integrated approach to address both the water quality and quantity problems associated with stormwater runoff due to urban development.

The goal of a set of minimum stormwater management standards for areas of new development and significant redevelopment is to reduce the impact of post-construction stormwater runoff on the watershed. This can be achieved by (1) maximizing the use of site design and nonstructural methods to reduce the generation of runoff and pollutants; (2) managing and treating stormwater runoff through the use of structural stormwater controls; and (3) implementing pollution prevention practices to limit potential stormwater contaminants.

It should be noted that the standards presented here are recommended for all communities in Georgia. They may be adopted by local jurisdictions as stormwater management development requirements and/or may be modified to meet local or watershed-specific stormwater management goals and objectives. Please consult your local review authority for more information.

The minimum standards for development are designed to assist local governments in complying with regulatory and programmatic requirements for various state and Federal programs including the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit program and the National Flood Insurance Program under FEMA.

## 1.2.2 Minimum Standards for Development

### 1.2.2.1 Applicability

The stormwater management standards for new development and redevelopment are intended to apply to any development site that meets one or more of the following criteria:

- (1) New development that includes the creation or addition of 5,000 square feet or greater of new impervious surface area, or that involves land disturbing activity of 5,000 square feet of land or greater.
- (2) Redevelopment that includes the creation or addition of 5,000 square feet or greater of new impervious surface area, or that involves land disturbing activity of 1 acre or more.
- (3) Any commercial or industrial new development or redevelopment, regardless of size, with a Standard Industrial Classification (SIC) code that falls under the NPDES Industrial Stormwater Permit program, or a hotspot land use as defined below.

In addition, redevelopment sites that involve land disturbing activity of 5,000 square feet or greater, but less than 1 acre, must meet Minimum Standard 8 (to meet state and NPDES construction erosion and sediment control requirements) and should meet Minimum Standards 2, 9 and 10 to the maximum extent practicable.

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## Definitions

*New development* is defined as land disturbing activities, structural development (construction, installation or expansion of a building or other structure), and/or creation of impervious surfaces on a previously undeveloped site.

*Redevelopment* is defined as structural development (construction, installation or expansion of a building or other structure), creation or addition of impervious surfaces, replacement of impervious surface not part of routine maintenance, and land disturbing activities associated with structural or impervious development. Redevelopment does not include such activities as exterior remodeling.

A *hotspot* is defined as a land use or activity on a site that produces higher concentrations of trace metals, hydrocarbons or other priority pollutants than are normally found in urban stormwater runoff. Examples of hotspots include gas stations, vehicle service and maintenance areas, salvage yards, material storage sites, garbage transfer facilities, and commercial parking lots with high-intensity use.

## Exemptions

The following development activities are suggested to be exempted from the minimum stormwater management standards:

- (1) Developments that do not disturb more than 5,000 square feet of land;
- (2) Individual single family residential lots. (Single family lots that are part of a subdivision or phased development project should not be exempt from the minimum standards); and
- (3) Additions or modifications to existing single-family structures.

## Additional Requirements

New development or redevelopment in critical or sensitive areas, or as identified through a watershed study or plan, may be subject to additional performance and/or regulatory criteria. Furthermore, these sites may need to utilize or restrict certain structural controls in order to protect a special resource or address certain water quality or drainage problems identified for a drainage area.

### **1.2.2.2 Minimum Stormwater Management Standards**

The following standards are the recommended minimum stormwater management performance requirements for new development or redevelopment sites falling under the applicability criteria in subsection 1.2.2.1. (The word “shall” in brackets is provided for local jurisdictions that wish to adopt these standards as part of their stormwater management ordinances) A more detailed explanation of each minimum standard is provided in the next subsection.

#### **□ Minimum Standard #1 – Use of Better Site Design Practices for Stormwater Management**

Site designs should preserve the natural drainage and treatment systems and reduce the generation of additional stormwater runoff and pollutants to the fullest extent practicable.

#### **□ Minimum Standard #2 – Stormwater Runoff Quality**

All stormwater runoff generated from a site should [shall] be adequately treated before discharge. Stormwater management systems (which can include both structural stormwater controls and better site design practices) should [must] be designed to remove 80% of the average annual post-development total suspended solids (TSS) load and be able to meet any other additional watershed- or site-specific water quality requirements.

It is presumed that a stormwater management system complies with this performance standard if:

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- It is sized to capture and treat the prescribed water quality treatment volume, which is defined as the runoff volume resulting from the first 1.2 inches of rainfall from a site; and
  - Appropriate structural stormwater controls are selected, designed, constructed, and maintained according to the specific criteria in this Manual.
  - Runoff from hotspot land uses and activities is adequately treated and addressed through the use of appropriate structural stormwater controls and pollution prevention practices.
- ❑ **Minimum Standard #3 – Stream Channel Protection**  
Stream channel protection should [shall] be provided by using all of the following three approaches: (1) 24-hour extended detention storage of the 1-year, 24-hour return frequency storm event; (2) erosion prevention measures such as energy dissipation and velocity control; and (3) preservation of the applicable stream buffer.
- ❑ **Minimum Standard #4 – Overbank Flood Protection**  
Downstream overbank flood protection should [shall] be provided by controlling the post-development peak discharge rate to the predevelopment rate for the 25-year, 24-hour return frequency storm event. If control of the 1-year, 24-hour storm (Minimum Standard #3) is exempted, then overbank flood protection should [shall] be provided by controlling the post-development peak discharge rate to the predevelopment rate for the 2-year through the 25-year return frequency storm events.
- ❑ **Minimum Standard #5 – Extreme Flood Protection**  
Extreme flood protection should [shall] be provided by controlling and/or safely conveying the 100-year, 24-hour return frequency storm event such that flooding is not exacerbated. Existing and future floodplain areas should be preserved as possible.
- ❑ **Minimum Standard #6 – Downstream Analysis**  
A downstream hydrologic analysis should [shall] be performed to determine if there are any additional impacts in terms of peak flow increase or downstream flooding while meeting Minimum Standards #1 through 5. This analysis should [shall] be performed at the outlet(s) of the site, and downstream at each tributary junction to the point(s) in the conveyance system where the area of the portion of the site draining into the system is less than or equal to 10% of the total drainage area above that point.
- ❑ **Minimum Standard #7 – Groundwater Recharge**  
Annual groundwater recharge rates should be maintained to the extent practicable through the use of nonstructural methods.
- ❑ **Minimum Standard #8 – Construction Erosion and Sedimentation Control**  
Erosion and sedimentation control practices shall be utilized during the construction phase or during any land disturbing activities.
- ❑ **Minimum Standard #9 – Stormwater Management System Operation and Maintenance**  
The stormwater management system, including all structural stormwater controls and conveyances, should [shall] have an operation and maintenance plan to ensure that it continues to function as designed.
- ❑ **Minimum Standard #10 – Pollution Prevention**  
To the maximum extent practicable, the development project should [shall] implement pollutant prevention practices and have a stormwater pollution prevention plan.
- ❑ **Minimum Standard #11 – Stormwater Management Site Plan**  
The development project should [shall] prepare a stormwater management site plan for local government review that addresses Minimum Standards #1 through 10.

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### 1.2.2.3 Explanation of Minimum Standards

#### Use of Better Site Design Practices for Stormwater Management (Minimum Standard #1)

All site designs should implement a combination of approaches collectively known as *stormwater better site design practices* to the fullest extent possible. Through the use of these practices and techniques, the impacts of urbanization on the natural hydrology of the site and water quality can be significantly reduced. The goal is to reduce the amount of stormwater runoff and pollutants that are generated, provide for natural on-site control and treatment of runoff, and optimize the location of stormwater management facilities. Better site design concepts can be viewed as both water quantity and water quality management tools and can reduce the size and cost of required structural stormwater controls. Better site design practices are described in Section 1.4.

#### Stormwater Runoff Quality (Minimum Standard #2)

Stormwater runoff generated on the development site is to be treated by the stormwater management system to remove at least 80% of the calculated average annual post-development TSS loading from the site. This can be achieved through the use of site design practices and structural stormwater controls.

This requirement is quantified and expressed in terms of engineering design criteria through the specification of a *water quality volume* ( $WQ_v$ ) that must be treated to the 80% TSS removal performance goal. The water quality treatment volume is equal to the runoff generated on a site from 1.2 inches of rainfall. The water quality volume is one of the *unified stormwater sizing criteria*, which are used in conjunction to size and design stormwater management facilities to address stormwater impacts. The unified stormwater sizing criteria and methods to calculate the  $WQ_v$  are discussed in Section 1.3.

Structural stormwater controls are sized and designed to treat the  $WQ_v$ . Depending on their removal efficiency or site constraints, more than one structural control may need to be used in parallel or in series (treatment train) to meet the water quality treatment requirement. Further, this standard assumes that structural stormwater controls will be designed, constructed and maintained according to the criteria in this Manual. Stormwater discharges from land uses or activities with higher or special potential pollutant loadings may require the use of specific structural controls and pollution prevention practices. A detailed overview of structural stormwater controls is provided in Section 3.1.

The use of nonstructural site design practices that provide water quality benefits allows for a reduction (known as a "credit") of the water quality volume. The applicable design practices and stormwater site design credits are covered in Section 1.4.

#### Stream Channel Protection (Minimum Standard #3)

Protection of stream channels is to be provided to both downstream as well as on-site channels. This is accomplished through three complementary criteria:

The first method of providing streambank protection is the extended detention of the 1-year, 24-hour storm for a period of 24 hours using structural stormwater controls. It is known that the increase in runoff due to development can dramatically increase stream channel erosion. This standard is intended to reduce the frequency, magnitude and duration of post-development bankfull flow conditions. The volume to be detained is also known as the channel protection volume ( $Cp_v$ ). The channel protection volume is one of the *unified stormwater sizing criteria*, which are used in conjunction to size and design stormwater management facilities to address stormwater impacts. The unified stormwater sizing criteria and methods to calculate the storage requirements and routing of  $Cp_v$  are discussed in Section 1.3. The use of nonstructural site design practices that reduce the total amount of runoff will also reduce  $Cp_v$  by a proportional amount. This requirement may be waived by a local jurisdiction for sites that discharge directly into piped stormwater drainage systems, larger streams, rivers, wetlands, lakes, estuaries, tidal waters, or other situations where the reduction in the smaller flows will not have an impact on streambank or channel integrity.

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The second streambank protection method is to implement velocity control, energy dissipation, streambank stabilization, and erosion prevention practices and structures as necessary in the stormwater management system to prevent downstream erosion and streambank damage. Energy dissipation and velocity control methods are discussed in Section 4.5.

The third method of providing for stream channel protection is through the establishment of riparian stream buffers on the development site. Stream buffers not only provide channel protection but also water quality benefits and protection of streamside properties from flooding. It is recommended that 100-foot buffers be established where feasible. Additional stream buffer guidelines are presented in Section 1.4.

#### Downstream Overbank Flood Protection (Minimum Standard #4)

Overbank flood protection for downstream channels is to be provided by preventing the post-development 25-year, 24-hour storm peak discharge rate (denoted  $Q_{p25}$ ) from exceeding the pre-development (or natural conditions) discharge rate using structural stormwater controls. The overbank flood protection peak rate is one of the *unified stormwater sizing criteria*, which are used in conjunction to size and design stormwater management facilities to address stormwater impacts. The unified stormwater sizing criteria and methods to calculate the storage requirements and routing of  $Q_{p25}$  are discussed in Section 1.3. The use of nonstructural site design practices that reduce the total amount of runoff will also reduce  $Q_{p25}$  by a proportional amount.

Smaller storm events (e.g., 2-year and 10-year) are effectively controlled through the combination of the extended detention for the 1-year, 24-hour event (channel protection criterion) and the control of the 25-year peak rate for overbank flood protection. These design standards, therefore, are intended to be used in unison.

If the control of the 1-year, 24-hour storm under Minimum Standard #3 is exempted, then for overbank flood protection, peak flow attenuation of the 2-year ( $Q_{p2}$ ) through the 25-year ( $Q_{p25}$ ) return frequency storm events must be provided.

This standard may be adjusted by a local jurisdiction for areas where all downstream conveyances and receiving waters have the natural capacity to handle the full build-out 25-year storm through a combination of channel capacity and overbank flood storage without causing flood damage.

#### Extreme Flood Protection (Minimum Standard #5)

Extreme flood protection is to be provided by controlling and/or safely conveying the 100-year, 24-hour storm event (denoted  $Q_f$ ). This is accomplished either by (1) controlling  $Q_f$  through structural stormwater controls to maintain the existing 100-year floodplain, or (2) by sizing the on-site conveyance system to safely pass  $Q_f$  and allowing it to discharge into a receiving water whose protected floodplain is sufficiently sized to account for extreme flow increases without causing damage. In this case, the extreme flood protection criterion may be waived by a local jurisdiction in lieu of provision of safe and effective conveyance to receiving waters that have the capacity to handle flow increases at the 100-year level.

The extreme flood protection peak rate is one of the *unified stormwater sizing criteria*, which are used in conjunction to size and design stormwater management facilities to address stormwater impacts. The unified stormwater sizing criteria and methods to calculate the storage requirements and routing of  $Q_f$  are discussed in Section 1.3. The use of nonstructural site design practices that reduce the total amount of runoff will also reduce  $Q_f$  by a proportional amount.

#### Downstream Analysis (Minimum Standard #6)

Due to peak flow timing and runoff volume effects, some structural controls fail to reduce discharge peaks to predevelopment levels downstream from the development site. A downstream peak flow analysis is to be provided to the point in the watershed downstream of the site or the stormwater management system where the area of the site comprises 10% of the

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total drainage area. This is to help ensure that there are minimal downstream impacts from the developed site. The downstream analysis may result in the need to resize structural stormwater controls, or may allow the waiving of some unnecessary peak flow controls altogether. The use of a downstream analysis and the “ten-percent” rule are discussed in Section 2.1.

#### Groundwater Recharge (Minimum Standard #7)

Recharge to groundwater should be implemented to the extent practicable through the use of nonstructural better site design techniques that allow for recharge of stormwater runoff into the soil. The annual recharge from the post-development site should approximate the annual recharge from the pre-development or existing site conditions, based on soil types. Stormwater runoff from a hotspot site or land use should not be infiltrated without effective pretreatment.

The recommended stormwater runoff volume to be recharged to groundwater should be determined using the existing site (pre-development) soil conditions. The recommended rates of recharge for various hydrologic soil groups are as follows:

<u>Hydrologic Group</u>	<u>Volume to Recharge (x Total Impervious Area)</u>
A	0.40 inches of runoff
B	0.25 inches of runoff
C	0.10 inches of runoff
D	n/a

More information on site design practices that promote infiltration is found in Section 1.4.

#### Construction Erosion and Sedimentation Control (Minimum Standard #8)

All new development and redevelopment sites must meet the regulatory requirements for land disturbance activities under the Georgia Erosion and Sedimentation Control Act and/or the NPDES General Permit for Construction Activities. This involves the preparation and implementation of an approved erosion and sedimentation control plan, including appropriate best management practices, during the construction phase of development. Further guidance on practices for construction site erosion and sedimentation control can be found in the *Manual for Erosion and Sediment Control in Georgia*.

Better site design practices and techniques that can reduce the total amount of area that needs to be cleared and graded should be implemented wherever possible. It is essential that erosion and sedimentation control be considered and implemented in stormwater concept plans and throughout the construction phase to prevent damage to natural stormwater drainage systems and previously constructed structural stormwater controls and conveyance facilities.

#### Stormwater Management System Operation and Maintenance (Minimum Standard #9)

All new development and redevelopment sites are to prepare a comprehensive operation and maintenance plan for the on-site stormwater management system. This is to include all of the stormwater management system components, including drainage facilities, structural stormwater controls, and conveyance systems. To ensure that stormwater management systems function as they were designed and constructed, the operation and maintenance plan must provide:

(1) a clear assignment of stormwater inspection and maintenance responsibilities; (2) the routine and non-routine maintenance tasks to be undertaken; (3) a schedule for inspection and maintenance; and (4) any necessary legally binding maintenance agreements.

#### Pollution Prevention (Minimum Standard #10)

All new development and redevelopment sites are to consider pollution prevention in the design and operation of the site, and prepare a formal stormwater pollution prevention plan. Specific land use types and hotspots may need to implement more rigorous pollution prevention practices. The preparation of pollution prevention plans and the full set of pollution prevention practices are covered in Volume 3 of this Manual.

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### Stormwater Management Site Plan (Minimum Standard #11)

All new development and redevelopment sites are to develop a stormwater management site plan. The stormwater site plan is to provide details, including a narrative and technical information and analysis, that indicates how the proposed development meets Minimum Standards #1 through 10 (or the applicable local stormwater regulatory requirements). The preparation of stormwater management site plans is covered in Section 1.5.

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