Chapter 7
POST-CONSTRUCTION WATER QUALITY POLICIES AND PROCEDURES

7.1. Overview

Metro's comprehensive stormwater management program addresses stormwater runoff during construction through Erosion Prevention and Sediment Control (EPSC) practices and after construction through stormwater quantity and quality controls. After construction has been finished on a site and the site is stabilized, pollutants can be washed into the storm drain system and into receiving streams off of hardened or impervious surfaces, such as driveways, roads and roofs. Typical stormwater runoff contains sediments, nutrients, pathogens, and metals, as well as gross solids such as litter. These pollutants are carried into streams and other water bodies. Major metropolitan areas, including Metro, are required under Federal and State law to reduce the discharge of these stormwater pollutants to achieve stormwater treatment goals set by the U.S. Environmental Protection Agency. Projects that disturb greater than 10,000 square feet and are new developments, significant redevelopments, and/or grading permit sites are therefore required to design, install, and maintain stormwater quality and quantity controls.[1] In the case of significant redevelopment, the entire footprint of the significantly redeveloped structure shall count toward the total disturbed area. Stormwater quality and quantity controls should be integrated into a development's conceptual design early in the design process.

Metro has established a post-construction stormwater quality program that applies a consistent standard that seeks to achieve pollutant removal primarily by runoff reduction practices regardless of the type of development. This chapter describes the post-construction stormwater quality program and associated requirements including:

- Runoff reduction requirement;
- Pollutant removal requirement (to be utilized if runoff reduction is demonstrated to be unfeasible);
- A listing of pre-approved structural Stormwater Control Measures (SCMs);
- Testing requirements for proprietary SCMs.

[1]Please see Chapter 8 and Appendix D for residential infill requirements.

The Stormwater Management Manual, Volume 5 Low Impact Development (LID) and Volume 4 Best Management Practices, Section 6, contain detailed design, inspection and maintenance information as well as design examples for the pre-approved Stormwater Control Measures (SCMs) listed in this chapter. A site design tool that can be used in developing the post-construction stormwater quality plan can be downloaded from Metro Water Services' LID website.

MWS reserves the right to require additional or prescribed treatment for known sources of pollutants such as dog parks. These areas shall be indicated on site plans and should not route directly to the MS4 or community waters.

7.2. Runoff Reduction

The site design shall provide, in combination or alone, management measures that are designed, built, and maintained to infiltrate, evapotranspire, harvest, and/or use, at a minimum, the stormwater runoff generated at a site by the first inch of every rainfall event preceded by 72 hours of no measurable precipitation. A site designed in accordance with the Stormwater Management Manual, Volume 5, LID Manual, that meets the 80% runoff reduction goal contained therein is presumed compliant with this goal.

7.2.1 Redevelopment Credit

Projects on previously developed sites can reduce their runoff reduction requirement from 80% to 60%. A site is considered previously developed if its pre-development site weighted runoff coefficient is greater than 0.4. Please see Section 3.2 of the LID Manual for additional information on runoff coefficients. Please contact MWS Development Services for runoff reduction requirements for sites located in Metro Nashville's combined sewer area.

7.2.2 Site Limitations

MWS staff may approve alternative practices to runoff reduction when site limitation(s) exist. Criteria to determine the circumstances under which alternatives are available shall not be based solely on the difficulty or cost of implementing practices. The determination may be based on the following site limitations:

i. Where the potential for introducing pollutants into groundwater exists, unless pretreatment is provided;
ii. Where pre-existing soil contamination is present in areas subject to contact with infiltrated runoff;
iii. Presence of sinkholes or other karst features on a site;
iv. Where pre-development infiltrative capacity of soils precludes runoff reduction measures;
v. A site-use that is inconsistent with capture and reuse of stormwater or a green roof.

Site limitations should be assessed per site post construction drainage area. Please see the *Tennessee Permanent Stormwater Management and Design Guidance Manual* for additional information on limitations to runoff reduction.

A project that cannot meet water quality standards may, as an alternative, be eligible to pay into a Public Stormwater Quality Project Fund. Applicants should coordinate with MWS staff for eligibility criteria and calculation of payment.

If a project is requesting an exemption from the runoff reduction requirement for any of the site drainage areas, the project engineer must submit adequate justification as determined by MWS that one of the aforementioned limitations applies. This may include, but is not limited to soil maps, geotechnical reports, infiltration testing, soil logs, and environmental site assessments.

7.3. Pollutant Removal

Drainage areas of the project site that cannot meet the runoff reduction requirement must be designed to remove at least 80% of the average annual post-construction total suspended solids (TSS) load. It is presumed that the drainage area complies with this performance standard if:

- It is sized to capture and treat the water quality treatment volume, which is defined as the runoff volume resulting from the first 1.1 inches of rainfall from a site; and
- Appropriate structural stormwater controls are selected, designed, constructed, and maintained according to the specific criteria in the SWMMs.

More information about the pollutant removal methodology can be found in the SWMM Vol. 4, Section 6. Please contact MWS Development Services for TSS removal efficiency requirements for sites located in Metro Nashville's combined sewer area.

7.4. Pre-Approved SCMs

Stormwater Control Measures (SCMs) are structural and non-structural practices designed to reduce the pollutants leaving a site. For the purposes of this manual, SCMs are divided into Green Infrastructure Practices (GIPs) and Permanent Treatment Practices (PTPs). GIPs are designed for runoff volume reduction and typically have two runoff reduction levels based on design. Table 7-1 lists the accepted GIPs and the runoff reduction credit given to each. PTPs are designed for pollutant removal and are rated by their ability to removal Total Suspended Solids. Table 7-2 presents a pre-approved listing of PTPs and their assigned TSS removal capability. Design and maintenance information for each SCM can be found in the SWMM Volume 5, LID Manual, and SWMM Volume 4, Permanent Treatment Practices (PTP) Section 6.

Table 7-1 GIPs for use in Metro

Green Infrastructure Practice	% Rainfall Volume Removed/Captured – RR Credit							
	Level 1				Level 2			
1. Bioretention	60				80			
2. Urban Bioretention	40				N/A			
3. Permeable Pavement	40				80			
4. Infiltration Trench	50				90			
5. Water Quality Swale	40				60			
6. Extended Detention	25				N/A			
7. Grass Channel	10/20				20/30			
8. Sheet Flow	Conservation Area (HSG Soils A and B) – 75% Conservation Area (HSG Soils C and D) – 50% Vegetated Filter Strip (All Soils) – 50%							
9. Reforestation (A, B, C, D soils)	96	94	92	90	98	97	96	95
10. Rain Tanks/Cisterns	Design dependent; Variable up to 90%							
11. Green Roof	Design dependent; 40-90%							

Table 7-2 PTPs for use in Metro

PTP Removal Efficiency for Total Suspended Solids (TSS)	
Structural Control	**TSS Removal (%)**
Wet Pond	80
Stormwater Wetland	80
Bioretention Area	80
Sand Filter	80
Enhanced Swale	80
Filter Strip	50
Grass Channel	50
Organic Filter	80
Underground Sand Filter	80
Submerged Gravel Wetland	80
Infiltration Trench	80
Gravity (Oil-Grit) Separator	40
Proprietary Structural Control	Based on Testing (see Section 7.6)
Dry Detention / Dry ED Basin	60

7.5. Proprietary SCMs

Many proprietary SCMs are available to treat stormwater runoff. However, some of these SCMs do not have established pollutant removal data. Pollutant-removal capability shall be determined as percent total suspended solids (TSS) removal by both field testing and laboratory testing.

Proprietary devices shall be approved by MWS, through an application and acceptance process, prior to consideration for use in Metro. Please contact MWS Development Services staff for the current list of approved devices. Metro requires applicant manufacturers to conduct testing to demonstrate the pollutant-removal capability of proprietary SCMs. Metro has established submittal requirements and guidelines for test protocol. Qualified laboratories, which follow the applicable requirements and guidelines, should be utilized to ensure the usefulness and accuracy of the data submitted. Additionally, manufacturers' claims for SCM performance must be verified through data that is obtained in independent, third-party testing. More specific application requirements can be found in section 7.6.1; however, manufacturers are to contact MWS prior to application to ensure that the most recent application requirements are obtained.

MWS may additionally accept manufacturers operating under current proprietary SCM certifications from the New Jersey Department of Environmental Protection (NJDEP). MWS may consider the results of other certification systems and review each on a case-by-case basis. If MWS accepts such a certification, the acceptance shall be based on the same conditions for performance, including deadlines for documentation that are defined in the issuer's certification letter.

7.5.1 Submittal Requirements

The application for consideration of proprietary SCM approval by Metro shall include the following:

1. Statement of the intended use of the device. Intended uses may include pretreatment (for floatables, oil and grease, or sediment, for example), water quality treatment, hydraulic detention, velocity dissipation, an element of a comprehensive treatment train, etc.
2. Statement of the TSS removal performance at the flow rate specified in the equation in Section 7.6.2, certified by an independent testing laboratory.
3. A report of the results of the independent testing laboratory satisfying the requirements of Section 7.6.3.1.
4. Published technical papers, if available, documenting performance of the device.
5. Engineering drawing of the assembled device.
6. Installation, repair, and maintenance instructions and schedule.
7. Parts list including materials of construction and recommended manufacturers.
8. Certified tests of load bearing capacity for traffic bearing devices.
9. A sample device should be made available to Metro Water Services Stormwater Division upon request.
10. A list of locations where the device is installed and operational. The list should include the customer's name, agency, telephone number, and address.
11. Other relevant information requested by Metro from the manufacturer.

Any device found not to meet the certified performance criteria may be removed from the approved list. Submittals containing unsubstantiated or unrealistic claims shall be returned without further review pending receipt of a resubmittal without such claims. An approved

device may not be suitable for use in all applications. Metro may reject the use of an otherwise approved device, if a specific application is determined by Metro to be not suitable.

7.5.2 Design Guidance for Water Quality Treatment

Most proprietary SCMs are flow-through-type SCMs and rated for TSS removal based upon a specified flow rate. The WQv equation establishes a volume that must be treated. In an effort to simulate the WQv approach for proprietary SCMs, the following peak flow design equation must be used to develop the stormwater quality treatment required.

$$Qp = C * I * A$$

Where:
Qp = the peak flow through the proprietary SCM in cubic feet/second (cfs)
C = runoff coefficient
I = rainfall intensity, 2.45 inches/hour for Metro
A = the contributing drainage area for the SCM, in acres

7.5.3 Performance Standards for Proprietary SCMs

Pollutant removal for Metro is defined as a goal of eighty percent (80%) TSS removal. Treatment may be achieved using a single treatment method, such as a wet pond, or by using a treatment train. A treatment train achieves eighty percent (80%) removal of TSS using a combination of pretreatment and/or treatment methods. Manufacturers of proprietary SCMs may apply for either 1) pretreatment approval (50% TSS removal); or 2) full treatment approval (80% TSS removal).

Proprietary SCM approval shall last for four (4) years, unless the terms of certification provide for a shorter period, for devices approved under the application and approval procedures contained herein, after which time reapplication is required. Applicants are required to meet any and all Metro rules, regulations, and policies in effect. Proprietary SCM approval for devices certified by NJDEP shall expire as stated in such certification letter.

Metro reserves the right to terminate approvals for reasons including, but not limited to: 1) restrictions placed by the Tennessee Department of Environment and Conservation; 2) product modifications or system failures indicating questionable performance capability; 3) changes in Metro stormwater regulations or policy, or 4) changes in the Technology Acceptance Reciprocity Partnership (TARP) or NJDEP protocols.

7.5.3.1 Testing Requirements for Proprietary SCMs

It is the responsibility of the manufacturer to develop and implement technically valid plans for laboratory and field testing. The following guidelines are provided as minimum considerations for an approvable testing program. Metro reserves the right to reject any data submitted, including invalid or undocumented testing procedures. Metro may provide review of test plans, as staff time allows.

All testing plans must include a Quality Assurance Plan, which defines testing and analysis methods. The Quality Assurance Plan must be prepared by a qualified testing laboratory. Examples of a Quality Assurance Plan are provided, among other sources, in *The Technology Acceptance Reciprocity Partnership Protocol for Stormwater SCM Demonstrations, August 2001 (updated July 2003).*

7.5.3.1.a Field Testing

Metro requires that field testing conform to *The Technology Acceptance Reciprocity Partnership Protocol for Stormwater SCM Demonstrations, August 2001 (updated July 2003) and the NJDEP Protocol for Total Suspended Solids Removal Based on Field Testing Amendments to TARP Protocol Dated August 5, 2009, Revised December 15, 2009,* and that conformation with and deviations from the TARP be noted in an applicant's protocol and test report.

The following items are required in addition to the TARP procedure:

1. Results are to be reported in mg/L TSS, which is consistent with the requirements of the MWS NPDES Discharge Permit. TSS shall be analyzed in accordance with Standard Method APHA 2540D. Reporting in both total suspended solids, TSS, and suspended sediment concentration, SSC, is recommended by TARP procedure.
2. All data collected must be reported. All maintenance performed on the tested device at any time during the overall field testing program shall be reported. This reporting shall include a description of each task performed, reason(s) for the maintenance, the quantities of any sediment removed, and a discussion of any anomalous, irregular, or missing maintenance data.
3. Particles larger than 1000 microns must be excluded from the analysis results.
4. At a minimum, the peak runoff rate from at least three of the sampled storms shall exceed seventy-five percent (75%) of the design flow of the unit. At least five (5) of the flows must exceed fifty percent (50%) of the design flow of the unit.
5. Field tests must be conducted without adding sediment to the influent or augmenting flow. Sediment must be naturally occurring, undisturbed, on-site sediment.
6. Rainfall data from a site gauge must be provided for each sampled storm event.
7. In order to determine the tested device's required maintenance interval, the minimum duration of the overall field testing program shall be one (1) year beginning at the time of the device's installation, commissioning, or the beginning of the removal rate testing, whichever is greater.

7.5.3.1.b Laboratory Testing

Metro requires that laboratory testing conform to the following NJDEP protocols:

- *NJDEP Protocol for Manufactured Hydrodynamic Sedimentation Devices for Total Suspended Solids Based on Laboratory Analysis, August 5, 2009 (Revised December 15, 2009)*
- *NJDEP Protocol for Manufactured Filtration Devices for Total Suspended Solids Based on Laboratory Analysis, August 5, 2009 (Revised December 15, 2009)*

As of January 25, 2015, all devices must have either a current NJDEP certification or comply with the following laboratory testing protocols:

- *NJDEP to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device, January 25, 2013*
- *NJDEP Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device, January 25, 2013*

Conformation with and deviations from the NJDEP protocol should be noted in an applicant's protocol and test report.

7.6. Safety and Mosquito Control

7.6.1 Safety Considerations

Public safety must be considered in the design of each SCM. Volume 5 and Section 6 of Volume 4 contains the detailed design parameters for each SCM type. These design parameters incorporate safety factors into the design itself, such as safety benches in wet ponds and locking grate options for vault type SCMs. Additional safety precaution options are listed below.

1. Fencing is not usually recommended because of access requirements for maintenance and emergency response; therefore, alternative safety precautions, such as gentle slopes and safety benches, are preferred. However, fencing of stormwater ponds may be required under conditions such as those specified in Volume 2, Chapter 8.10 Access Management.
2. Each entrance point for water into a detention area should incorporate an energy dissipater so that water does not flow into ponds at an unsafe rate.
3. All devices should be easily and safely accessible without special requirements (e.g. confined-space equipment and procedures).
4. All covers should be spring-loaded or lightweight for easy opening and a manually activated locking mechanism should be incorporated into the structure. Automatic locking devices are not permissible.
5. Vegetative growth should be controlled to prevent barriers to access inlets, outlets and treatment areas.
6. Stormwater management ponds shall include escape provisions as follows:
    a. If a pond has an outlet structure greater than 4 feet in height, escape provisions must be incorporated in or on the structure. Escape provisions include permanent ladders, steps, rungs, or other features that provide an easy egress from the pond or its outlet structure.

b. In new ponds, the maximum interior slope for an earthen dam, embankment, or berm shall not be steeper than 3:1 (horizontal to vertical).

7.6.2 Mosquito Control

Many stormwater SCMs have either a permanent pool of water or hold stormwater for an extended period of time and can potentially provide mosquito-breeding habitat. However, if structural SCMs are properly designed, installed, and maintained, mosquito problems can be minimized. The following controls should be considered when determining the appropriate SCM and long-term maintenance plans for each development:

1. SCMs with open water (such as stormwater ponds) may need aeration or some other means of water movement through artificial means.
2. Ponds designed to detain water temporarily should discharge water in 72 hours or less. (This issue has been addressed in the Permanent Treatment Practices (PTP) section of Volume 4 through the design and maintenance guidance.)
3. Good maintenance and monitoring of SCMs is essential. For instance, discharge orifices should be monitored for debris or sediment clogging *weekly* in the summer months when mosquito breeding peaks.
4. Grout around riprap to prevent pooling while maintaining the benefits of the riprap for energy dissipation.
5. Vault-type SCMs that have the potential to hold water for longer than 72 hours should be contained and completely sealed.
6. Introduce *Gambusia affinis* (mosquitofish) or other mosquito predators into stormwater ponds with permanent pools. They feed on immature mosquitoes.
7. Use mosquito larvicides as a last resort to control mosquitoes.

7.7. Stormwater Control Measure (SCM) Long Term Maintenance

Each water quality SCM installed on a site requires maintenance so that it functions properly, ensuring that it helps fulfill the water quality goal for the site. Therefore, a SCM-specific Maintenance Document for each development site is required. Please see Section 6.7.1 or Appendix F for additional information.

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