

## **Chapter 9: Redevelopment Activity**

This chapter outlines alternative approaches for addressing stormwater management at projects that include the disturbance and reconstruction of existing impervious surfaces (i.e. redevelopment activity). The approaches set forth in this Chapter comply with the Department's technical standards.

The document includes the following sections:

9.1 Introduction

9.2 Scope and Applicability

9.3 How to Apply Alternative Stormwater Practices

9.4 Alternative Stormwater Management Practices – Proprietary Practices

### **Section 9.1 Introduction**

Redevelopment of previously developed sites is encouraged from a watershed protection standpoint because it often provides an opportunity to conserve natural resources in less impacted areas by targeting development to areas with existing services and infrastructure. At the same time, redevelopment provides an opportunity to correct existing problems and reduce pollutant discharges from older developed areas that were constructed without effective stormwater pollution controls.

Redevelopment activities can range from large-scale redevelopment (e.g. reconstruction of a box store, mall, etc.), to much smaller building, parking lot or road reconstruction project. The proposed density of the large-scale projects can be high, resulting in space constraints to implement on-site stormwater controls. Added to this basic space constraint is the need to tie in to the existing drainage infrastructure, which may be at an elevation that does not provide enough head for certain stormwater management practices (SMPs). Other problems encountered in redevelopment include the presence of underground utilities, incompatible surrounding land uses, highly compacted soils that are not suitable for infiltration, and contaminated soils that require mitigation and can drive up project costs.

Because the technical standards contained elsewhere in this Manual were primarily intended for new development projects, compliance with the sizing criteria in full may present a challenge on projects that include redevelopment activities. Therefore, this chapter sets forth alternative sizing criteria for redevelopment activities. Implementation of this alternative sizing criteria will result in pollutant

## **New York State Stormwater Management Design Manual**

Chapter 9: Redevelopment Activity

Section 9.1 Introduction

reductions over existing conditions with no practices in place, particularly when considering the cumulative effect of multiple projects.

For redevelopment activities located in critical environmental areas (see <http://www.dec.ny.gov/permits/6184.html>) and other sensitive environmental or regulated areas, all attempts should be made to seek compliance with the sizing criteria set elsewhere in this manual.

Key Terminology:

Alternative Sizing Criteria - The sizing criteria that can be achieved on construction projects that include redevelopment activities.

Alternative Stormwater Management Practice – Stormwater management practices that are outlined in this chapter for potential application for redevelopment activities and are designed and implemented in accordance with the recommendations in this chapter.

Disconnected impervious area - Impervious area that is not directly connected to a stream or drainage system, but which directs runoff towards pervious areas where it can infiltrate, be filtered, and slowed down.

Redevelopment Activity/Activities – Disturbance and reconstruction of existing impervious surfaces. This includes impervious surfaces that were removed within the last five (5) years.

Stormwater Management Practice (SMP) – A standard stormwater management practice that appears in Chapter 3 of this Manual, sized in accordance with Chapter 4 or 10, and designed in accordance with Chapter 6 or 10 of this Manual.

Stormwater sizing criteria – Criteria comprised of the following four elements: Water Quality Treatment, Runoff Reduction, Channel Protection, Overbank Flooding, and control of extreme storms as defined in Chapters 4 and 10 of this Manual for standard practices and any other requirements for enhanced treatment.

Total impervious area – This is the total area within the drainage area comprised of all materials or structures on or above the ground surface that prevents water from infiltrating into the underlying soils. Impervious surfaces include, without limitation: paved and/or gravel road surfaces, parking lots, driveways, and sidewalks; building structures; roof tops and miscellaneous impermeable structures such as patios, swimming pools, and sheds.

## New York State Stormwater Management Design Manual

Chapter 9: Redevelopment Activity

Section 9.2 Scope and Applicability

### Section 9.2 Scope and Applicability

The provision of stormwater management practices during redevelopment activities should follow an approach to balance between 1) maximizing improvements in site design that can reduce the impacts of stormwater runoff, and 2) providing a maximum level of on-site treatment that is feasible given the site constraints present where the redevelopment activities are occurring.

Under conditions where onsite treatment is not practicable, an appropriate off-site watershed improvement to offset the required level of control may be applied, in the presence of a regulated/permitted municipal stormwater management program. The off-site stormwater management approach is subject to applicable local agency approval for banking and trading of credits. This approach may not be an acceptable option in all cases. In addition, a SWPPP that incorporates this approach is considered to be not in conformance with the State's technical standards.

Requirements for installation of post construction controls set forth in current stormwater regulations do apply to construction projects that include redevelopment activities.

The sizing criteria described in this chapter apply to redevelopment activities only. If a construction project includes both new development and redevelopment activities, the stormwater management practices for the new development portion of the project must be designed in accordance with the sizing criteria in Chapter 4 or 10, and the redevelopment activities portion of the project is subject to the sizing criteria in Section 9.3.

If runoff from the reconstructed impervious area (i.e redevelopment activity) was being treated by an existing stormwater management practice that generally meets the criteria of one of the practices included in Chapters 5, 6, 9 or 10 of this manual, the final design must include WQv treatment equal to the treatment that was provided by the existing practice or the treatment options defined in Section 9.2.1 of this chapter, whichever provides the larger, more effective treatment.

#### 9.2.1 Sizing Criteria

Note: The following sizing criteria apply to construction projects that include redevelopment activities.

**A. Water Quantity** controls shall be sized using the following options:

## **New York State Stormwater Management Design Manual**

### Chapter 9: Redevelopment Activity

#### Section 9.2 Scope and Applicability

I- If the redevelopment activities result in no change to hydrology that increases the discharge rate from the project site (Note: Include the redevelopment activity portion of a project and if applicable, any new development in the analysis), the ten-year and hundred-year criteria do not apply. This is true because the calculated discharge of pre-development versus post-development flows results in zero net increase. This consideration does not mean that existing quantity controls may be neglected in planned designs. Existing quantity controls must be maintained for post-development flow discharge control.

II- **Channel protection** for redevelopment activities is not required if there are no changes to hydrology that increase the discharge rate from the project site (Note: Include the redevelopment activity portion of a project and if applicable, any new development in the analysis). This criterion, as defined in Chapter 4 of this Manual, is not based on a pre versus post-development comparison. However, for redevelopment activities this requirement is relaxed. If the hydrology and hydraulic analysis for the project site shows that the post-construction 1-year 24 hour discharge rate and velocity are less than or equal to the pre-construction discharge rate, providing 24 hour detention of the 1-year storm to meet the channel protection criteria is not required.

**B. Water Quality** treatment objective shall be achieved using the following options. If there is an existing stormwater management practice located on the site that captures and treats runoff from the impervious area that is being disturbed, the water quality volume treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options I - IV:

I- The plan proposes a reduction of existing impervious cover by a minimum of 25% of the total disturbed, impervious area. A reduction in site imperviousness will reduce the volume of stormwater runoff, thereby achieving, at least in part, stormwater criteria for both water quality and quantity. The final grading of the site should be planned to minimize runoff contribution from new pervious area onto the impervious cover. Effective implementation of this option requires restoration of soil properties in the newly created pervious areas. Soil restoration is achieved by practices such as soil amendment, deep-ripping, and de-compaction (See Section 5.1.6 Soil Restoration).

II- The plan proposes that a minimum of 25 % of the water quality volume (WQv) from the disturbed, impervious area is captured and treated by the implementation of standard SMP or reduced by application of green infrastructure techniques (see Chapter 5 of this Manual). For all sites that utilize structural SMPs, these practices should be targeted to treat areas with the greatest pollutant

## New York State Stormwater Management Design Manual

### Chapter 9: Redevelopment Activity

#### Section 9.2 Scope and Applicability

generation potential (e.g. parking areas, service stations, etc.). If the construction project includes both new development and redevelopment activities, treatment would be required for 25% of the existing, disturbed impervious area, however, the stormwater management practices for the new development portion of the project must be designed in accordance with the sizing criteria in Chapter 4. As with design of any practice, sizing of structures should be based on all areas contributing to the SMP. Construction projects that involve the redevelopment of a portion of the site, may choose diversion or flow splitters to be able to size the control structures for the reconstructed area only. For all sites that utilize green infrastructure techniques (See Table 3.2), a proposed plan is effective when runoff is controlled near the source and managed by infiltration, reuse, and evapotranspiration. Although encouraged, meeting the Runoff Reduction Volume (RRV) sizing criteria is not required for the redevelopment activity portion of a project.

III- The plan proposes the use of alternative SMPs to treat 75 % of the water quality volume from the disturbed, impervious area as well as any additional runoff from tributary areas that are not within the disturbed, impervious area. The use of alternative SMPs is discussed in Sections 9.3 and 9.4 of this chapter, which is focused on the accepted verified manufactured technologies.

IV- The plan proposes a combination of impervious cover (IC) reduction and standard or alternative SMPs that provide a weighted average of at least two of the above methods. The plan may provide a combination of the above options using the following calculation:

$$\%WQv \text{ treatment by Alternative practice} = (25 - (\% \text{ IC reduction} + \% \text{ WQv treatment by Standard practice} + \% \text{ runoff reduction})) * 3$$

For example, water quality volume for the alternative practice for the following scenarios can be computed as follows:

5% IC Reduction, 20% Standard Practice, 0% Runoff Reduction, 0% Alternative Practice

5% IC reduction, 0% Standard practice, 0% Runoff Reduction, 60% Alternative practice

0% IC reduction, 5% Standard practice, 5% Runoff Reduction, 45% Alternative practice

5% IC reduction, 5% Standard practice, 5% Runoff Reduction, 30% Alternative practice

#### 9.2.2 Performance Criteria

## **New York State Stormwater Management Design Manual**

### **Chapter 9: Redevelopment Activity**

#### **Section 9.4 Alternative Stormwater Management Practices Proprietary Practices**

The performance criteria of selected SMPs for redevelopment activities fall under three categories:

- Performance criteria for standard stormwater management practices as defined in Chapter 6 of this Manual, including required elements and design guidance details, must be applied in the design of the practices.
- Performance criteria for green infrastructure techniques as defined in Chapter 5 of this Manual, including design details and sizing methods, can be applied to meet the required RRv criteria, and
- The alternative SMPs discussed in this chapter are to be used for redevelopment activities only. The performance criteria for alternative SMPs are based on the testing protocols and procedure set for verification of manufactured system by regulatory agencies

### **Section 9.3 How to Apply Alternative Stormwater Practices**

When using an alternative SMP (i.e. proprietary practices), the WQv criteria shall be met by applying the sizing criteria in Section 9.2.1, Option B.III. to one of the alternative SMPs . Proprietary practices must be sized to capture and treat the WQv resulting from the contributing drainage area depending on whether it uses a volume-based or a rate-based sizing approach. For practices with a volume-based sizing approach, the practice must be sized to capture and treat 75 % of the WQv as defined in Chapter 4 of the Manual. For flow through practices, the practice must be sized to treat the peak rate of runoff from the WQv design storm, as defined in Chapters 4 and 10, and Appendix B of this Manual. The flow capacity identified in the verification process for the specific alternative practice must be greater than or equal to the calculated peak runoff rate from the WQv design storm. For off-line practices, the installation must include flow diversion that protects the practice from exceeding the design criteria.

### **Section 9.4 Alternative Stormwater Management Practices Proprietary Practices**

Proprietary practices encompass a broad range of manufactured structural control systems available from commercial vendors designed to treat stormwater runoff and/or provide water quantity control. The focus of this profile sheet is on those proprietary practices that provide a level of water quality treatment that is acceptable for redevelopment activities. Manufactured treatment systems are often attractive during redevelopment activities because they tend to take up little space, often installed underground, and can usually be retrofitted to existing infrastructure.

Common proprietary systems include:

## New York State Stormwater Management Design Manual

### Chapter 9: Redevelopment Activity

#### Section 9.4 Alternative Stormwater Management Practices Proprietary Practices

- Hydrodynamic systems such as gravity and vortex separators –devices that move water in a circular, centrifugal manner to accelerate the separation and deposition of primarily sediment from the water. They are suitable for removal of coarse particles, small drainage areas, and are more effective in an offline configuration.
- Wet vaults – water-tight “boxes” that include a permanent pool and promote settling of particulates through detention and use of internal baffles and other proprietary modifications. A manufacturer’s recommendation may base the sizing of the vaults on water quality volume or flow rate, incorporate bypass, and sediment capacity.
- Media filters – surface or subsurface practices that contain filter beds containing absorptive filtering media that promotes settling of particulates as well as adsorption and absorption of other pollutants attracted to the characteristics of the proprietary filter media. Similar to traditional filtering systems, they are flow through systems which function based on contact of polluted stormwater with the filtering media, commonly contained in prefabricated devices. Commercially available media range from fabrics, activated carbon, perlite, zeolite, and combination of multiple media mixes, with varied treatment performances.
- Underground infiltration systems- prefabricated pipes and vaults designed as alternative treatment systems to capture and infiltrate the runoff. Various proprietary products are marketed as space saving structures utilizing the infiltration capacity of the sites. The offline underground infiltration modular structures have potential to perform at an acceptable treatment level when designed according to all the technical specifications of the standard infiltration systems. Manufactured infiltration systems are considered standard practices when all the required elements, design guidance, soil testing, siting, and maintenance requirements, as defined in the Design Manual, are followed.

#### 9.4.1 Evaluation of Alternative Practices

As a group, the performance of manufactured stormwater management practices (SMPs) have been verified thus far only to a limited extent, with a majority of the verification studies limited to laboratory testing. Where verification data does exist, they generally indicate that these practices do not meet both the 80% total suspended solids (TSS) and 40% total phosphorus (TP) removal efficiency target that is specified in Chapter 3 of this Manual. However, proprietary practices that have been certified by specific verification sources and can demonstrate that they provides some level of water quality treatment, are allowed for redevelopment activities in New York State. This allowance is conditioned upon the system being operated at the specific tested design flow rate, defined based on the verified performance of each specific system. Based on the conclusions of the verification sources, it is believed that these treatment systems have the capability of achieving an acceptable TSS removal efficiency in field applications.

NYSDEC’s evaluation of proprietary systems for demonstration of minimum removal efficiency for redevelopment activities are based on one of the following stormwater management practice

## **New York State Stormwater Management Design Manual**

Chapter 9: Redevelopment Activity

Section 9.4 Alternative Stormwater Management Practices Proprietary Practices

evaluation systems: The U.S. Environmental Protection Agency (EPA) Environmental Technology Verification Program, the state of Washington Technology Assessment Protocol - Ecology (TAPE), the Technology Acceptance Reciprocity Partnership Protocol (TARP), the state of Maryland Department of the Environment, , and several other evaluation systems.

The proposed manufactured treatment systems that are verified or certified through ETV, TAPE, or TARP (primarily New Jersey Corporation for Advanced Technology) process and meet the criteria stated above are allowed for redevelopment activities in New York State. Proposed manufactured treatment systems that are not verified yet may be considered for acceptance in New York State if verified at any time through one these verification sources.

All the manufactured treatment systems must be sized appropriately to provide treatment for the water quality volume or the runoff from the entire contributing area. Due to the proprietary nature of the practices, designers are responsible to ensure that manufacturer's recommendations concerning all the design details such as structural integrity, configuration, assembly, installation, operation, and maintenance of the units are followed. Designers are also responsible to address, at minimum, all the relevant requirements set by New York State standards such as quantity controls, pretreatment, bypass, overflow, head configuration, inflow/outflow rates, maintenance, separation distance, accessibility, and safety issues concerning the selected practice.

### **9.4.2 Recommended Application of Practice**

Many proprietary systems are useful on small sites and space-limited areas where there is not enough land or room for other structural control alternatives. Proprietary practices can also be reasonable alternatives where there is a need to tie in to the existing drainage infrastructure, where site elevations limit the head for certain stormwater management practices (SMPs). Hydrodynamic separators are generally more effective on sites with potential loading of coarse particulates. While specific media filters may be suitable in most conditions, infiltration systems must be limited to sites with the A or B hydrologic soil groups.

### **9.4.3 Benefits**

The benefits of using proprietary practices will vary depending on the type of practice, but may include:

- Reduced space requirements for practices located below grade.

## New York State Stormwater Management Design Manual

### Chapter 9: Redevelopment Activity

#### Section 9.4 Alternative Stormwater Management Practices Proprietary Practices

- Reduced engineering and design due to prefabricated nature of systems and design support and tools provided by manufacturer.
- Spill containment and control capabilities

#### 9.4.4 Feasibility/Limitations

Depending on the proprietary system, the following factors may be considered as a limitation:

- Limited performance data. Data that does exist suggest these practices don't perform at the same level as the suite of standard practices in Chapters 3 and 6 of this Manual, particularly with regard to nutrient load reduction.
- Application constraints such as limits to area draining to a practice, due to pre-manufactured nature of products.
- High maintenance requirements (e.g., need for specialized equipment, confined space entry training, frequency of recommended maintenance, and cost of replacement components) that often are ignored or forgotten because many practices are underground and out of sight.
- Higher costs per treated area than other structural control alternatives, but this can be offset by value of land not needed due to subsurface nature of many proprietary practices.
- Concern over mosquito breeding habitat being provided by practices that have wet sumps as design components.

#### 9.4.5 Sizing and Design Guidance

Sizing and design guidance will vary based on the product being used. Since sizing criteria is integral to the verified performance of manufactured practices, designers should refer to the capacities and flow rates associated with the models (sizes) of the manufactured SMPs identified by the verification source.

The New York State design standards calls for small storm hydrology and the use of Simple Method for hydrology calculation. For practices with volume-based sizing approaches, sizing should be performed to meet the water quality volume as defined in Section 4.2 of this Manual. For rate or flow-based sizing approaches, sizing should be performed based on the peak rate of discharge for the water quality design storm, as described in Appendix B of this Manual.

Some proprietary practices can be designed on-line or off-line. On-line practices typically have built-in bypass capabilities. Flow through systems, which do not have built-in bypass must be designed as off-line systems

## **New York State Stormwater Management Design Manual**

Chapter 9: Redevelopment Activity

Section 9.4 Alternative Stormwater Management Practices Proprietary Practices

It is important for designers to specify proprietary practices based on their treatment capacities (CASQA, 2003). Since hydraulic capacity can be as much as ten times that of the treatment capacity, designer must ensure that hydraulic load does not exceed the performance rate defined in the verification process. The above applies to all design elements that affect the performance rate. Some examples of such design elements are head, orifice sizing, oil storage or sediment storage capacities, baffle configuration, or screen size.

Practices with a volume-based sizing approach must be sized to capture and treat 75 % of the WQv as defined in Chapter 4 of the Manual. Flow through practices must be sized to the peak rate of runoff from the WQv design storm, as defined in Chapters 4 and 10, and Appendix B of this Manual. For off-line practices, the installation must include flow diversion that protects the practice from exceeding design criteria.

### **9.4.6 Environmental/Landscape Elements**

There are few or no environmental or landscaping elements that designers can consider with most proprietary treatment practices. They are frequently absent or predetermined by the manufacturer. The use of land area above the facility needs to be selective and manufacturer design codes must be strictly followed.

### **9.4.7 Maintenance**

Maintenance is a critical component to ensure proper functioning of proprietary practices. Most manufacturers provide maintenance recommendations. When these schedules are not followed, proprietary practices can be expected to fail. Maintenance is often overlooked with proprietary products because they are underground and out of view. Most proprietary practices require a quarterly inspections and cleanouts at a minimum. In addition, specialized equipment (e.g., vactor trucks and boom trucks) may be required for maintaining certain proprietary products. Similar to standard practices, a maintenance agreement between the municipality and the property owner should be executed to clearly identify required or recommended maintenance activities, schedules, reporting, and enforcement procedures. Please also refer to maintenance requirements defined in Chapter 3 of this Design Manual.

### **9.4.8 Cost**

## **New York State Stormwater Management Design Manual**

Chapter 9: Redevelopment Activity

Section 9.4 Alternative Stormwater Management Practices Proprietary Practices

Proprietary systems are often more costly than other SMPs on a per-area-treated basis, but this is sometimes made up for in space savings. Manufacturers should be contacted directly for unit pricing, which will vary based on size of unit specified. As a rule of thumb, installation cost of most proprietary practices will range from 50 to 100% of the unit cost (CASQA, 2003). Other proprietary practices, may not have high initial capital or installation costs, but require frequent (i.e., at least quarterly) replacement of component parts for proper operation.

### ***References/Further Resources***

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