Chapter 9: Redevelopment Projects

This chapter outlines alternative approaches to stormwater management for redevelopment projects. 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 Purpose
9.3 Scope and Applicability
9.4 How to Apply Alternative Stormwater Practices
9.5 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 projects are typically located in older, more urban areas, and can range from large-scale redevelopment, where a new town center is created, to much smaller commercial or residential projects. The proposed density of such projects is typically 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 standards may present a challenge on some redevelopment projects. Therefore, this chapter sets forth alternatives for certain redevelopment projects. Implementation of these alternative controls can result in useful pollutant reductions, particularly when considering the cumulative effect of multiple projects.

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

Key Terminology:

Alternative Sizing Criteria - The sizing criteria that can be achieved in redevelopment projects through a variety of approaches as outlined in this chapter.

Alternative stormwater practices – Stormwater management practices that are outlined in this chapter for potential application in redevelopment scenarios 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.

Pre-development - For redevelopment projects, pre-development means the preconstruction condition. This is based on the assumption that the site has been built out for a long period of time. For redevelopment projects that have completed the demolition phase (removal of impervious cover) and will not begin reconstruction for five (5) or more years, the pre-development condition shall be the post-demolition condition.

Redevelopment - Reconstruction or modification to any existing, previously developed land such as residential, commercial, industrial, institutional or road/highway, which involves soil disturbance. Redevelopment is distinguished from development or new development in that new development refers to construction on land where there had not been previous construction. Redevelopment specifically applies to constructed areas with impervious surface.

Redevelopment Project – A project that undergoes redevelopment.The project area can be entirely under redevelopment or the project area can be a combination of redevelopment and new development.

Standard Practice – 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, 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; compacted dirt surfaced roads; building structures; roof tops and miscellaneous impermeable structures such as patios, pools, and sheds.

Section 9.2 Purpose

The purpose of this chapter is to provide alternatives to the technical standards contained elsewhere in this Manual that would be acceptable for certain redevelopment projects. This includes identification of acceptable stormwater management practices and the required sizing criteria.

Redevelopment projects are generally expected to comply with technical standards contained elsewhere in this Manual. However, under circumstances where one of the redevelopment application criteria set forth in Section 9.3.1 are met and the design utilizes alternative sizing and selection of stormwater management controls defined in this chapter, the stormwater pollution prevention plan (SWPPP) will be considered to be in conformance with the State's technical standards.

The SWPPP provides post construction runoff controls for the disturbed area including both pervious and impervious areas. As with design of any practice, sizing of structures should be based on all areas contributing to the stormwater management practice**.** For projects where redevelopment is limited to a portion of the site, a flow splitter or diversion structure may be used to redirect runoff from the new impervious areas to an appropriately sized treatment system.

Section 9.3 Scope and Applicability

The provision of stormwater management practices in redevelopment 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 redevelopment project site constraints.

Under conditions where onsite treatment is not practicable, an appropriate off-site watershed improvement to off set 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 redevelopment projects. Redevelopment sites must first attempt to comply with all the post-construction management requirements outlined elsewhere in this Manual. When physical constraints in a redevelopment situation are present, such as those described in Section 9.3.1, the alternative stormwater management practices and sizing criteria presented in this chapter may be used. The SWPPP for a redevelopment project, with or without increased impervious area, must clearly state that the redevelopment conditions meet the application criteria in Section 9.3.1 in order to utilize alternative sizing and selection of stormwater management controls defined in this chapter.

The sizing criteria described in this chapter cannot be used to address runoff from new development. If a construction project includes both new development and redevelopment, the stormwater management practices for the new development portion of the project must be designed in accordance with the sizing criteria in Chapter 4, and the redevelopment portion of the project is subject to the sizing criteria in Section 9.3.2.

If runoff from the reconstructed impervious area 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 9.3.2 of this chapter, whichever provides the larger, more effective treatment.

Section 9.3.1 Application Criteria

This Chapter applies when specific physical constraints are present at a site that will disturb existing impervious area and then reconstruct that area as either pervious or impervious surface. Where site-specific circumstances do not allow proper sizing and installation of the management practices contained in this Manual, a SWPPP must clearly identify and document the design difficulties that meet redevelopment application criteria and provide documented justification for the use of proposed alternative approaches presented in this chapter. To make such determination, the following criteria must be met:

(1) An existing impervious area is disturbed and then reconstructed as either a pervious or impervious surface, and
(2) There is inadequate space for controlling stormwater runoff from the reconstructed area, or
(3) The physical constraints of the site do not allow meeting the required elements of the standard practices.

The physical constraints pertain to soils, water table, and head. Details of the constraints are listed in Table 7.2, Physical Feasibility Matrix, of this Manual.

The application criteria are not solely based on the conditions within the disturbed area. In determining the feasibility of siting SMPs, the entire site within the property boundary must be considered.

Section 9.3.2 Sizing Criteria

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

I- If redevelopment results in no increase in impervious area or changes to hydrology that increases the discharge rate from the site, 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 a redevelopment project is not required if there is no increase in impervious area or changes to hydrology that increase the discharge rate. This criterion, as

defined in Chapter 4 of this Manual, is not based on a pre versus post-development comparison. However, for a redevelopment project this requirement is relaxed. If the hydrology and hydraulic study 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.

III- If the redevelopment results in an increase in the total impervious area and subsequently increased discharge rate, apply quantity controls for the increased discharge. If the redevelopment results in modified hydrology or flow due to discharge to other sub-watersheds, slope change, direct channelization, curb-line modification, etc., apply quantity controls for the increased discharge.

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 practices or reduced by application of green infrastructure techniques (see Chapter 5 of this Manual). For all sites that utilize structural stormwater management practices, these practices should be targeted to treat areas with the greatest pollutant generation potential (e.g. parking areas, service stations, etc.). If redevelopment results in the creation of additional impervious area, treatment would be required for 25% of the existing impervious area, plus 100% of the

additional impervious area. As with design of any practice, sizing of structures should be based on all areas contributing to the stormwater management practice**.** Redevelopment, which reconstructs 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 redevelopment projects that meet the Application Criteria in Section 9.3.1..

III- The plan proposes the use of alternative practices 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 practices is discussed in Sections 9.4 and 9.5 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 practices 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 treatment by Alternative practice = (25 - (% IC reduction + % WQv treatment by Standard practice + % 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

Section 9.3.3 Performance Criteria

The performance criteria of selected practices for redevelopment projects 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 practices discussed in this chapter are to be used for redevelopment projects only. The performance criteria for alternative practices are based on the testing protocols and procedure set for verification of manufactured system by regulatory agencies. A list of accepted technologies is available on the Department's website.

Section 9.4 How to Apply Alternative Stormwater Practices

When using an alternative practice (i.e. proprietary practices), the WQv criteria shall be met by applying the sizing criteria in Section 9.3.2, Option B.III. to one of the alternative practices. 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 9.5 Alternative Stormwater Management Practices -Proprietary Practices

Description

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 applications. Manufactured treatment systems are often attractive in redevelopment scenarios because they tend to take up little space, often installed underground, and can usually be retrofitted to existing infrastructure.

Common proprietary systems include:

- 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.

9.5.1 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, certain proprietary practices that provide some level of water quality treatment and which have been certified by specific verification sources, as identified on the Department's website, are allowed for redevelopment applications 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 application are based on one of the following stormwater management practice 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, the International Stormwater Best Management Practices Database, 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 applications 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.

9.5.2 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.

9.5.3 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.
- Reduced engineering and design due to prefabricated nature of systems and design support and tools provided by manufacturer.
- Spill containment and control capabilities

9.5.4 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.

9.5.5 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

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.

The list of verified technologies on DEC's website provides references to the key elements of the design for each SMP. This list includes type of the system, proper applications, design methods, treatment capacity and accepted operation rate for each SMP.

9.5.6 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.

9.5.7 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.

9.5.8 Cost

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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