

Chapter 3 – Preventing and Mitigating Stormwater Impacts

Introduction

Managing the stormwater impacts of land development requires the selective use of non-structural and structural stormwater control measures. Low Impact Development (LID) site planning and design is a critical and effective element of a successful stormwater management approach because it addresses the root causes of both stormwater quality and quantity problems by helping to preserve pre-development site hydrology and pollutant loads. Source controls and pollution prevention, as well as construction erosion and sedimentation controls, are also key elements for preventing or mitigating stormwater quality problems. These preventive measures can reduce the size and scope of structural stormwater Best Management Practices (BMPs). However, it is also recognized that structural stormwater BMPs, in combination with LID and other non-structural measures, are often necessary to fully meet stormwater quality and quantity control objectives.

What's New in this Chapter?

- ❖ Streamlined stormwater management framework and elements
- ❖ Recategorized structural stormwater BMPs based on function

This Manual addresses stormwater quality and quantity using LID site planning and design strategies, source controls, and structural stormwater BMPs. Construction-phase soil erosion and sedimentation controls, storm drainage facilities (catch basins, manholes, storm sewers, etc.), and flood mitigation/control are addressed as secondary topics as they relate to stormwater quality for more detailed guidance refer to the [Soil Erosion and Sediment Control Guidelines](#). Other statewide design guidance documents, as well as local ordinances and requirements, should be consulted for more information on these topics.

Guiding Stormwater Management Principles

A comprehensive stormwater management strategy should prevent or mitigate stormwater runoff problems and protect beneficial uses of receiving waters in a cost-effective manner. The stormwater management measures described in this Manual are designed to accomplish this objective by adhering to the following guiding principles:

- Preserve pre-development site hydrology (i.e., runoff, infiltration, interception, evapotranspiration, groundwater recharge, and stream baseflow).
- Provide minimum average annual reductions in post-development pollutant loads for sediment, floatables, nutrients, and other pollutants.

- Preserve and protect wetlands, stream buffers, natural drainage systems and other natural features that provide water quality and quantity benefits.
- Manage runoff velocity and volume in a manner that maintains or improves the physical and biological character of existing drainage systems and prevents increases in downstream flooding/streambank erosion.
- Prevent pollutants from entering receiving waters and wetlands in amounts that exceed the systems' natural ability to assimilate the pollutants and provide the desired functions.
- Seek multi-objective benefits (i.e., flood control, water quality, recreation, aesthetics, habitat) from stormwater control measures.

LID Site Planning and Design

LID site planning and design focuses on measures that counteract the impacts of development. LID includes the use of both non-structural site planning and design techniques, which are addressed in [Chapter 5](#), and the use of distributed, small-scale structural stormwater BMPs, which are practices referred to as Green Infrastructure (GI), see [Structural Stormwater BMPs](#) in this Chapter for the overview of GI.

LID site planning and design techniques have three general approaches: avoid, reduce, and manage the impacts of development. All of these approaches are designed to address the root causes of stormwater problems by helping to maintain pre-development hydrology and the pollutant removal functions of a site. LID approaches integrate stormwater management from the beginning of the site design process. Often these non-structural site design strategies can reduce the scope of or eliminate the need for more costly structural stormwater BMPs. This Manual emphasizes the use of LID site planning and design techniques early in the site development process and prior to the consideration of structural measures. LID site planning and design practices are addressed in [Chapter 5](#) – Low Impact Development Site Planning and Design Strategies of this Manual.

Source Control Practices and Pollution Prevention

Source controls and pollution prevention are operational practices that can reduce the types and concentrations of pollutants in stormwater runoff by limiting the generation of pollutants at their source. The guiding principle behind these techniques is to minimize contact of stormwater with potential pollutants, thereby reducing pollutant loads and the size and cost of stormwater treatment. This Manual emphasizes the use of source control practices and pollution prevention, in conjunction with LID site planning and design, to reduce the need for and scope of structural stormwater BMPs. A variety of common source control practices that can be implemented at residential, municipal, institutional, commercial, and industrial sites are addressed in [Chapter 6](#) – Source Control Practices and Pollution Prevention of this Manual, which includes references and links to existing available information sources on each topic.

Construction of Soil Erosion and Sedimentation Controls

As described in [Chapter 1](#), soil erosion and sedimentation control is addressed through the Soil Erosion and Sediment Control Act (Section 22a-325 through 22a-335, inclusive) as well as related local and state permitting requirements. The primary goal of the Act is to reduce soil erosion from stormwater runoff and nonpoint sediment pollution from land that is being developed. Measures for controlling soil erosion and sedimentation during construction are described in a site-specific Soil Erosion and Sediment Control (SESC) Plan. The post-construction stormwater management standards addressed in [Chapter 4](#) of this Manual include the development and implementation of an SESC Plan. Erosion and sedimentation control measures should be designed in accordance with the [Connecticut Guidelines for Soil Erosion and Sediment Control Guidelines](#) (as amended) and applicable local and state permit requirements.

Structural Stormwater BMPs

Structural stormwater Best Management Practices (BMPs) are stormwater management systems used to reduce the discharge of pollutants and the volume of runoff from developed sites to maintain pre-development hydrology, pollutant loads, and groundwater recharge. Structural stormwater BMPs can be designed to collect, store, treat, infiltrate, and evapotranspire stormwater runoff.

Structural stormwater BMPs that primarily rely on vegetation and soils to mimic natural processes and manage rainwater close to where it falls are also commonly referred to as “Green Infrastructure (GI).” Structural stormwater BMPs are one element of a comprehensive stormwater management approach and should be selected and designed only after consideration of LID site planning and design strategies and in combination with operational source control practices and pollution prevention. Note that GI can also be applied as a form of LID, especially at a watershed scale.

Stormwater quality and quantity controls are related and complementary elements of an effective stormwater management strategy. Structural stormwater BMPs are typically designed for small, frequent storms to achieve stormwater quality objectives (i.e., smaller than a one-year return frequency storm), in contrast to drainage and flood control facilities, which are typically designed for the two-year and larger storms. Stormwater BMPs can also be designed for stormwater quantity control by reducing post-development runoff volumes and peak flows.

This Manual includes the following major categories and types of structural stormwater BMPs that are recommended for use in Connecticut, based on their primary function:

- Pretreatment BMPs
- Infiltration BMPs
- Filtering BMPs
- Stormwater Pond and Wetland BMPs
- Water Quality Conveyance BMPs
- Stormwater Reuse BMPs

- Proprietary BMPs
- Other BMPs and BMP Accessories

Chapters [7](#) through [13](#) address the selection, design, construction, and maintenance of structural stormwater BMPs for new development, redevelopment, and retrofitting of existing developed areas.

This Manual addresses the topics of storm drainage design and flood control as they relate to stormwater quality management. Storm drainage facilities (catch basins, manholes, storm sewers, etc.) and stormwater BMPs used primarily for flood control should be designed in accordance with the [Connecticut Department of Transportation Drainage Manual](#) as well as applicable local and state design and permitting requirements, including flood management requirements.