

# 1 Introduction

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## 1.1 Background

### 1.1.1 Stormwater Ordinance and Regulations

#### Existing Policy

Chapter 14-1600 of Philadelphia's Code, houses the stormwater legislation for the City. See the following Code sections:

§14-1603.1. Stormwater Management Controls

§14-1603.2. Environmental Controls for the Wissahickon Watershed

§14-1606. Flood Plain Controls

The Philadelphia Water Department (PWD) Stormwater Management Regulations (Stormwater Regulations) have been developed as per the Philadelphia Code, Chapter 14-1603.1.6.c.1

#### Overview of the Stormwater Regulations

There are three major elements to the Stormwater Regulations: Water Quality, Channel Protection, and Flood Control requirements.

##### Water Quality Requirement

The Water Quality requirement stipulates management of the first one inch of runoff from all Directly Connected Impervious Areas (DCIA) within the limits of earth disturbance. The Water Quality requirement is established to: (1) recharge the groundwater table and increase stream base flows; (2) restore more natural site hydrology; (3) reduce pollution in runoff; and (4) reduce combined sewer overflows (CSO) from the City's combined sewer systems. The requirement is similar to water quality requirements in surrounding states and in other major cities.

1) The requirement must be met by infiltrating the water quality volume unless infiltration is determined to be infeasible (due to contamination, high groundwater table, shallow bed rock, poor infiltration rates, etc.) or where it can be demonstrated that infiltration would cause property or environmental damage.

2) A waiver from the infiltration requirement must be submitted and approved if infiltration is not feasible. Waivers are available in **Appendix F.4: Special Circumstances and Waiver Requests**. When infiltration is not feasible for all or a portion of the water quality volume, the remaining portion must be treated by a PWD-approved stormwater management practice (SMP). Treatment and release requirements differ for separate and combined sewer areas, but all areas must route a minimum of 20% of the water quality volume through a PWD-approved SMP that provides volume reduction.



**Separate sewer areas:** The water quality volume must be routed through a SMP that provides volume reduction, flow attenuation, and water quality treatment.

**Combined sewer areas:** Runoff from a minimum of 20% of the DCIA must be routed through a PWD-approved volume reducing SMP. The release rate for the water quality volume must not exceed 0.24 cfs per acre of DCIA, and the volume must be detained in the SMP for no less than 24 hours and no more than 72 hours.

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## Channel Protection Requirement

The Channel Protection requirement is a slow release of the 1-year, 24-hour storm event detained from DCIA. The Channel Protection requirement is established to: (1) protect quality of stream channels and banks, fish habitat, and man-made infrastructure from the influences of high stream velocity erosive forces and (2) reduce the quantity, frequency and duration of CSOs.

The requirement applies equally to rivers and streams, and also to sites discharging to drainage ditches, natural or man-made ponds, and sewers if those systems ultimately discharge to receiving waters. However, the Channel Protection requirement does not apply to redevelopment which is under one acre or discharges to the Delaware River and the Schuylkill River main channels.

Philadelphia's Channel Protection requirement is modeled after those adopted in many other cities and states, including Atlanta, Baltimore, Boston, Detroit, Minneapolis, Portland, Seattle, Washington D.C., Maryland, New Jersey, and New York.



Channel Protection requirement: Detain and release runoff from DCIA at a maximum rate of 0.24 cfs per acre in no less than 24 hours and no more than 72 hours.



*Reducing DCIA within the limits of earth disturbance by 20% between the predevelopment and post-development condition EXEMPTS redevelopment projects from the Channel Protection requirement.*

The Water Quality and Channel Protection requirements are not additive. Management of the Water Quality requirement may reduce the storage volume required to meet the Channel Protection requirement. It might also be possible to meet both requirements in the same SMP or in a train of linked SMPs.

## Flood Control Requirement

The Flood Control requirement is established to: (1) reduce or prevent the occurrence of flooding in areas downstream of the development site, as may be caused by inadequate sewer capacity or stream bank overflow and (2) to reduce the frequency, duration and quantity of overflows in combined sewer sheds.

The Flood Control requirement is based upon ongoing watershed wide Pennsylvania Stormwater Management Act (Act 167) planning studies determining flood management districts for controlling peak rates of runoff. In general, a development project is required to meet peak rates of runoff post-development equal to pre-development conditions. As Act 167 planning programs are completed for Philadelphia's watersheds, new Flood Control Districts will be listed in the Manual which will more accurately reflect the level of flood protection needed in localized settings.

In Flood Management District C, development sites which can discharge directly to the Delaware River or Schuylkill River main channels without the use of City infrastructure may do so without control of proposed conditions peak rate of runoff. When adequate capacity in the downstream system does not exist and will not be provided through improvements, the proposed conditions peak rate of runoff must be controlled to the pre-development conditions peak rate as required in District A provisions for the specified design storm.



*Reducing DCIA within the limits of earth disturbance by 20% between the predevelopment and post-development condition EXEMPTS redevelopment projects from the Flood Control requirement.*

## 1.1.2 The Changing Regulatory Environment

Stormwater runoff from almost all the developed areas of the City, whether served by separate stormwater sewers or combined sewers, is causing impairment to the aquatic and riparian habitats of streams and rivers in Philadelphia. These water bodies are suffering from streambank and channel erosion resulting in the exposure of sewer infrastructure and decreased stream baseflow due to reduced groundwater recharge. The streams do not support healthy aquatic communities, do not meet uses designated by the State, do not serve as amenities to the community, and occasionally causes property damage due to flooding. In addition, stormwater is an important source of pollution to the drinking water intakes on the Schuylkill and Delaware Rivers.

These problems are not unique to Philadelphia. Stormwater Regulations are changing around the country to address these and similar problems. In general, these newer approaches to stormwater management require controls to improve the quality of stormwater prior to discharge, to reduce the effects of stormwater caused erosion and siltation, and measures to increase groundwater recharge. The Stormwater Regulations in Philadelphia ensures that Philadelphia has an up-to-date and effective stormwater program that meets the state and federal requirements and can be coordinated with the changing Regulations occurring in upstream municipalities.

The Stormwater Regulations were developed to meet a number of environmental, economic, social and regulatory goals for the City:

### Quality of Life – Along the Riverfront and in the Neighborhoods

The quality of life for people living and working in Philadelphia depends on both a healthy economy and a healthy environment. Philadelphia sits at the confluence of the Schuylkill and Delaware Rivers and has an extensive park system that conserves most land along its smaller creeks in a natural condition. This creates an opportunity for improved recreational and economic activities along the waterfronts and stream corridors. Philadelphia is making a substantial public investment in parks, greenways (links between neighborhoods and water corridors), and access to water-based activities over the coming decades to identify itself as a New River City. Effective stormwater management is necessary to make these riverfront and stream corridor areas safe and inviting.

### Flooding

Historically, Philadelphia's stormwater management requirements have focused on avoidance of flooding caused by increases in impervious coverage. These measures have been generally effective and will be continued. However, some problem areas have been identified in existing developed areas through the Act 167 program. As Act 167 planning studies continue for Philadelphia's watersheds new Flood Control Districts will be determined that more accurately reflect the level of flood protection needed in localized settings. The Stormwater Regulations will ensure that, over time, flooding frequency and severity will decrease as areas are redeveloped according to the stormwater requirements.

### Impaired Water Bodies and TMDLs

The Commonwealth of Pennsylvania designates uses that streams and rivers are required to support. These uses generally include water supply, recreation and fish consumption, and support of healthy aquatic communities. Currently, every river and stream in the City is listed as impaired, or not attaining its designated uses. Urban runoff, storm sewers, and CSOs are listed as sources of impairment for most Philadelphia streams. Some water bodies are listed as impaired by specific pollutants. For these, the State ultimately requires TMDL (Total Maximum Daily Load) to be set and attained. A TMDL is the maximum load of a specific pollutant that can be discharged by all sources and still allow the stream to meet water quality standards. The Stormwater Regulations are designed to significantly reduce the pollution associated with stormwater and CSOs, and will be a significant part of the measures used to attain TMDLs.

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## NPDES Stormwater Permits and Regulations

Storm sewers discharging to surface waters in Philadelphia are regulated under NPDES (National Pollution Discharge Elimination System). Measures required under NPDES stormwater permits include stormwater management during construction and stormwater management on the developed site after construction. The Stormwater Regulations keep Philadelphia in compliance with requirements in its stormwater permit.

## Pennsylvania Stormwater Management Act

The Pennsylvania Stormwater Management Act (Act 167) is administered by Pennsylvania Department of Environmental Protection (PADEP) and is designed to address the management of stormwater runoff resulting from development. Act 167 addresses both water quantity and quality, but it is most focused on quantity and flooding issues. Philadelphia collaborated with Delaware, Montgomery, and Chester Counties to produce an Act 167 Plan for the Darby-Cobbs Creek in 2004. Ultimately, plans will be produced for Tookany/Tacony-Frankford Creek, Pennypack Creek, Poquessing Creek, and Wissahickon Creek. Due to overlapping requirements of the NPDES and Act 167 programs, PADEP encourages municipalities to develop stormwater management programs that meet the requirements of both concurrently. The Stormwater Regulations bring Philadelphia into compliance and ensure that the entire region has similar stormwater management controls in place.

## NPDES Combined Sewer Permits and Regulations

Approximately 40% of Philadelphia's land area is served by sewers that carry sanitary sewage and stormwater in a single pipe. During dry weather, all this flow is treated at water pollution control plants before discharge to receiving waters. During wet weather, total flow exceeds the capacity of the sewer system and a portion of the flow is discharged untreated to receiving waters (combined sewer overflow).

Stormwater management is an integral part of Philadelphia's approach to CSO management. United States Environmental Protection Agency's (USEPA) CSO Control Policy, published in 1994, promotes effective stormwater management on a watershed basis. The most effective SMPs increase infiltration and evaporation at the site level and reduce the amount of wet weather flow in the sewer system. Other SMPs detain stormwater and release it to the sewer system at a slower rate, taking advantage of sewer system capacity over a longer period of time. These techniques are most effective during small storms. Techniques designed to limit streambank erosion and flood damage during large storms work equally well in areas of combined sewers and separate storm sewers. The Stormwater Regulations will, over time, significantly decrease the number of CSOs and are necessary if Philadelphia is to comply with federal and state CSO policy.

## Drinking Water Source Protection

The Delaware River and Schuylkill River are sources of drinking water for Philadelphia residents. The intakes on these rivers are also influenced by the water quality found in the Wissahickon, Pennypack, and Poquessing Creeks. Protection of source water is critical to citizen health and future economic development in Philadelphia. One of the many critical links between the Stormwater Regulations and the protection of Philadelphia's drinking water sources is USEPA's Surface Water Treatment Rule (SWTR) to address microbial and virus contamination. The SWTR requires that a surface water system have sufficient treatment to reduce source water concentrations of *Giardia lamblia* cysts and viruses by at least 99.9 percent (3 log) and 99.99 percent (4 log), respectively. A watershed control program that includes reduction in stormwater related pollutant loads will be an important aspect of meeting these microbial and virus reduction requirements.

## Improving the Development Process in Philadelphia

Clarification of stormwater management requirements and simplification of the development process can benefit both the environment and the economy. Efforts to redevelop vacant and abandoned lands provide opportunities to integrate better stormwater management with economic development. The Stormwater Regulations are designed to create standards consistent with industry practice, to provide checklists and manuals so that developers know exactly what is required, and to apply known, objective standards to all new development or redevelopment applications.

## 1.2 Organization

This Manual is intended to guide the developer in meeting the requirements of the Stormwater Regulations. Currently some practices and design methods in this manual are considered standards while others are simply recommendations. It is likely that with future revisions some elements will become more prescriptive while others become less prescriptive. Please be aware that these changes might occur and that the most up-to-date version can always be found at the Philadelphia Stormwater website [www.PhillyRiverInfo.org](http://www.PhillyRiverInfo.org).

The Manual is laid out to guide the developer through the entire site design process, beginning with initial site design considerations, through the Post-Construction Stormwater Management Plan (PCSMP) submittal elements, and ultimately PWD prerequisite approval on Building Permit approval. Tools are provided to assist in completion and submittal of a PCSMP consistent with the intent of PWD. They include flowcharts to guide the developer through each section, worksheets to assist with calculations, and checklists to ensure the PCSMP is complete. These tools work together to address stormwater management on the development site from concept to completion.

Each section of the Manual has been arranged with a specific purpose in mind:

- **Section 1** provides an overview of how and why stormwater management is a critical part of holistic site planning in Philadelphia.
- **Section 2** discusses the applicability of the Stormwater Regulations.
- **Section 3** covers preliminary site planning considerations and conceptual review.
- **Section 4** steps through an integrated site design process once the initial site layout is determined. This section describes approaches for using Nonstructural and Structural Controls to manage stormwater.
- **Section 5** explains all of the elements necessary for completing and submitting the PCSMP for the development project.
- **Section 6** presents methods for integrating stormwater management into site design for both non-structural and structural SMPs applicable to urban development in Philadelphia.
- **Section 7** presents technical design guidance for managing stormwater and specifications for structural SMPs.
- **Section 8** provides landscape guidance for non-structural and structural SMPs and lists recommended native plant species as well as prohibited invasive species.

## 1.3 How to Use this Manual

The following flow chart depicts how the manual can be used to work through the development review process.

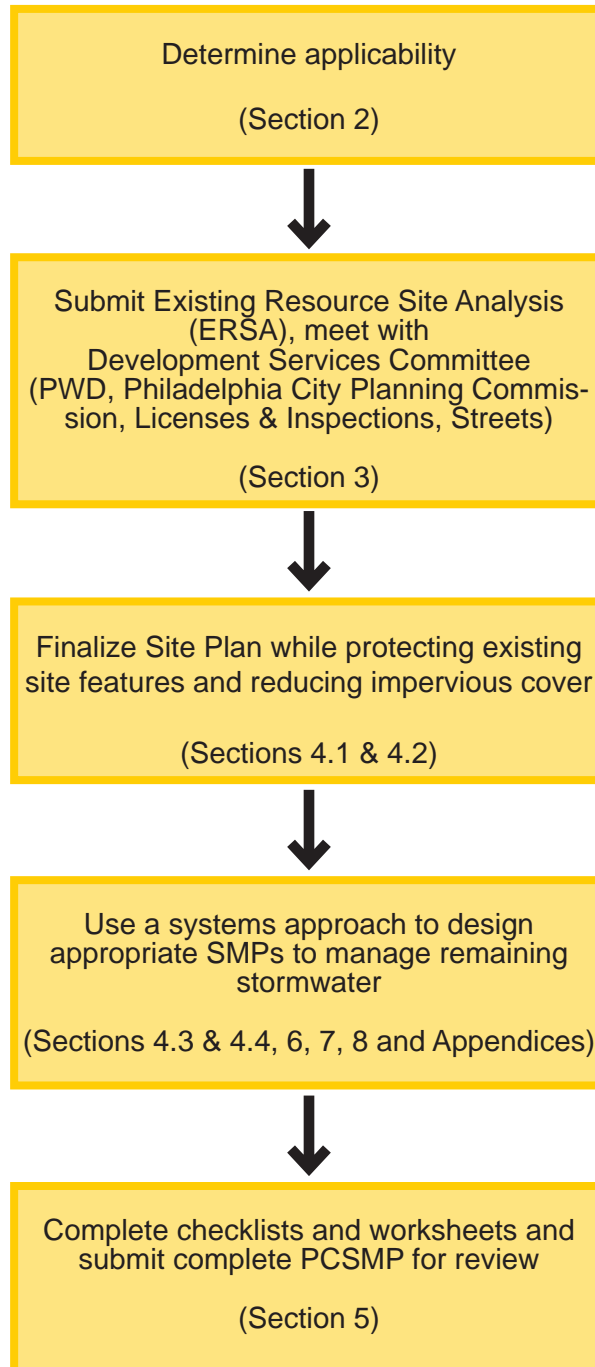


Figure 1.1: Using the Manual

Checklists and Worksheets are provided electronically on [www.PhillyRiverInfo.org/PWDDDevelopmentReview](http://www.PhillyRiverInfo.org/PWDDDevelopmentReview) to assist the developer in meeting the requirements of the Stormwater Regulations.