



Chapter 1 Introduction

1.1 Introduction

As the City of Chattanooga continues to grow and develop, impervious surfaces such as parking lots, rooftops, and roadways increase the amount of stormwater runoff during rainfall events, altering the natural hydrologic regime. Without a properly designed and implemented stormwater management program, increased stormwater runoff may lead to stream channel erosion, increased levels of pollutants entering the City's streams and rivers, increased flooding potential, and decreased groundwater recharge. Implementation of the practices in this manual will help protect the City's water resources, improving the benefit to human health, fish and wildlife habitat, and recreational opportunities.

Stormwater management is also critical in alleviating the impacts of stormwater runoff in the City's combined sewer overflow (CSO) areas. Reducing the amount of stormwater runoff that enters the City's CSO system through infiltration, flow reduction, and reuse helps protect the City's infrastructure system and prevent the hazards associated with flooding and sanitary sewer overflows and discharges into the City's streams and creeks and the Tennessee River.

1.2 Purpose of this Manual

This document has been named the "Rainwater Management Guide." This name signifies a change in the approach to stormwater management, specifically as it applies to the practice of land development. The term rainwater is indicative of the emphasis on smaller, more frequent rainfall events, whereas the term "guide" denotes the intent of this document to serve as a tool and aid for the developer and design professional.

The City of Chattanooga has developed the "Rainwater Management Guide," also referred to as the manual or the guide, to provide a comprehensive tool for the developer and design professional to effectively and efficiently meet required rainwater runoff standards.

This manual is also available on the City's website (<http://www.chattanooga.gov/>) in an interactive format to expedite and streamline the design and review process.

This manual serves to comply with the provisions of the NPDES MS4 Permit of the City of Chattanooga by providing stormwater management measures and methods designed to assist with the preservation and restoration of natural hydrologic regimes, minimizing CSO surcharges and improving the City's water quality. The practices and processes in this manual can also provide benefits to the developer that may include:





- Reducing land clearing and grading costs
- Reducing infrastructure costs (streets, curbs, gutters, sidewalks)
- Reducing stormwater management fees
- Potentially eliminating or reducing the size of detention ponds
- Increasing value and marketability

Stormwater management is critical to protecting and restoring the City's livability and improving the quality of the City's watersheds. Projects that meet the requirements of the City's runoff reduction program by implementation of the low-impact development practices in this manual will contribute to accomplishing citywide goals and comply with the State of Tennessee's water quality regulations.

1.3 Regulatory Mandates

In response to the impacts of urbanization on water quality, the United States Congress passed the Clean Water Act of 1972, as amended, which prohibits the discharge of pollutants into waters of the United States unless said discharges are compliant with a National Pollutant Discharge Elimination System (NPDES) permit. Permit requirements implemented in 1990 (Phase I) initially required only medium and large cities (cities with populations of at least 100,000) to obtain an NPDES permit for their municipal separate storm sewer system (MS4) discharges. These requirements were expanded in 2003 (Phase II) to include small regulated municipalities (with populations greater than 50,000). The Tennessee Department of Environment and Conservation (TDEC) renewed the City's NPDES MS4 Permit on December 1, 2010, and imposed additional requirements for stormwater management thereunder. The City of Chattanooga's NPDES MS4 Permit Number TNS068063 includes permit performance requirements, definitions, timelines, and other components. The permit can be accessed at <http://www.tn.gov/environment/wpc/stormh2o/TNS068063.pdf>.

Compliance with the current NPDES MS4 Permit requires the City to establish a comprehensive stormwater management program to develop, implement, and enforce controls to reduce the discharge of pollutants from areas of new development and redevelopment. The program includes volume management, water quality, and flow rate standards for onsite stormwater management facilities and focuses on low-impact development and green infrastructure best management practices.

1.4 Changes in Stormwater Management

The City's NPDES MS4 Permit includes a number of new stormwater management requirements. The most significant of these requires volume management for new and redevelopment projects. Specifically, the permit requires that the City develop design standards for new and redevelopment projects such that "the first inch of rainfall must be managed with no discharge to surface waters." In other words, the first inch of rainfall must be captured and infiltrated, evapotranspired, or reused through better stormwater and





land development practices. The intent is to preserve and maintain as much as possible the natural hydrology of the land. This approach of managing small, frequent rainfall events is accomplished with low-impact development or green infrastructure.

Chattanooga receives approximately 53 inches of rainfall per year on average. Approximately 86 percent of the rainfall events in Chattanooga are small, resulting in 1 inch or less of precipitation (see Figure 1-1). The volume of rain from these small rainfall events, when added cumulatively over a year, comprises approximately half of the total annual rainfall volume (see Figure 1-2).

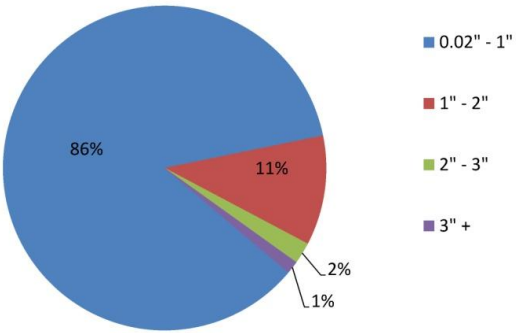


Figure 1-1. Approximately 86 percent of the rainfall events in Chattanooga are 1 inch or less in total rainfall depth.

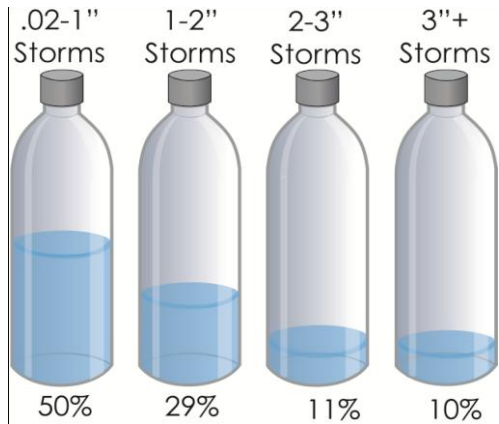


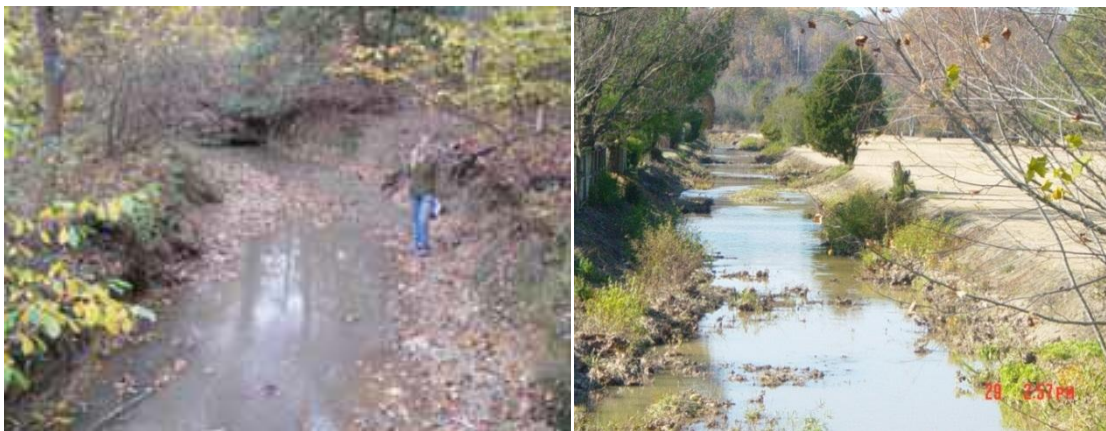
Figure 1-2. The cumulative volume of the 1-inch rainfall events, in an average year, is approximately 50 percent of the average annual volume of rainfall of 53 inches.

Before development, these small rainfall events would be absorbed by trees, vegetation, and soils, generating little or no stormwater runoff. But with the addition of impervious surfaces, stormwater runoff occurs more frequently and in larger amounts than it did under natural (undeveloped) conditions (see Figure 1-3). This increase in stormwater runoff volume and runoff frequency can cause erosion and changes in the stream channel shape (hydro-modification), contributing to water quality problems as well as increasing flooding problems (see Figures 1-4 and 1-5). The runoff also conveys pollutants from the land surface into streams and waterways. Equally important, as more runoff occurs, less water infiltrates the groundwater. Groundwater is a critical source of stream base flow (and water quality).





Figure 1-3. Typical impervious surfaces in Chattanooga generate runoff nearly every time it rains, conveying pollutants to streams.



Figures 1-4 and 1-5. The increased volume of runoff in the stream channel leads to stream channel erosion and worsened flooding.

Because small rainfall events generate little runoff under natural conditions, but almost entirely “run off” when the land surface is paved, the City’s stormwater program – as required by the City’s NPDES MS4 Permit issued by TDEC – is focused on managing these small rainfalls so there is no runoff or surface discharge. This is the basis for the City’s requirements to manage stormwater volume.

The focus on runoff volume is a regulatory requirement and represents an important change in stormwater management practice in Chattanooga. This change, however, is not unique to Chattanooga. Runoff volume management has been universally accepted and acknowledged as an important approach to prevent further damage of urban watersheds. The approach is aimed at preserving as much as possible the beneficial hydrologic balance of those watersheds by limiting hydro-modification.





In addition to volume management, the permit includes requirements for water quality management and riparian buffer establishment. The permit also allows incentives for certain redevelopment projects, such as high density (more than seven units per acre) and mixed use, while recognizing that certain areas may have limitations for volume management based on soil types, contaminants, karst, or other constraints.

This document serves as the technical guidance document for the selection, integration, design, and implementation of a number of stormwater (rainwater) management practices referred to herein as Best Management Practices (BMPs) to meet the City's stormwater management requirements for new and redevelopment projects.

