Chapter 1 Introduction to this Manual

1.0 Purpose of Manual

The City of Charleston, West Virginia (City) recognizes that our surface waters are an extremely valuable natural resource. The lack of proper stormwater management has become a threat to that valuable resource nationwide. Due to federal regulation, environmental quality concerns, and flooding issues, the City has prioritized stormwater management and is moving forward with implementing the Municipal Separate Storm Sewer System (MS4) permit requirements. The City is committed to being progressive and proactive in the area of stormwater management.

City of Charleston - Haddad Riverfront

Compliance with MS4 requirements involve development and implementation of the plans and procedures and documentation of the results. This manual has been designed to provide guidance to Developers, Owners, Engineers and Contractors in understanding how construction and post construction stormwater must be handled and the permitting process for new and re-developments.

This manual is an integral part of a larger comprehensive plan titled “Long Term Storm Water Comprehensive Plan” (LTSWCP). The LTSWCP sets forth an overall City approach or “roadmap” for MS4 compliance for short, medium and long range goals. The LTSWCP is scheduled to be updated on a 5 year basis.

The Stormwater Management Guidance Manual applies to new development, redevelopment, and upgrades to existing residential and commercial development. It focuses on site planning, source control, nonpoint source control, pollution prevention, and stormwater treatment practices. Developers, designers, engineers, architects, business owners, and residents of the City will all be able to utilize this manual to manage storm water during construction and post-construction. Using this manual will assist these entities to meet or exceed environmental quality standards while also complying with maximum allowable quantity discharges from sites. Individual site factors will always play the most significant role in stormwater control, however this manual will serve as a guide for traditional and alternative control measures to make the best decisions possible for site

Purpose of Manual

development, and to assist the City in its attempt to comprehensively manage its stormwater through Best Management Practices (BMPs). For a determination of BMPs and other terms used throughout this documents, please see the Glossary included at the end of this manual. Additionally, a list of acronyms is provided as a preface to this document.

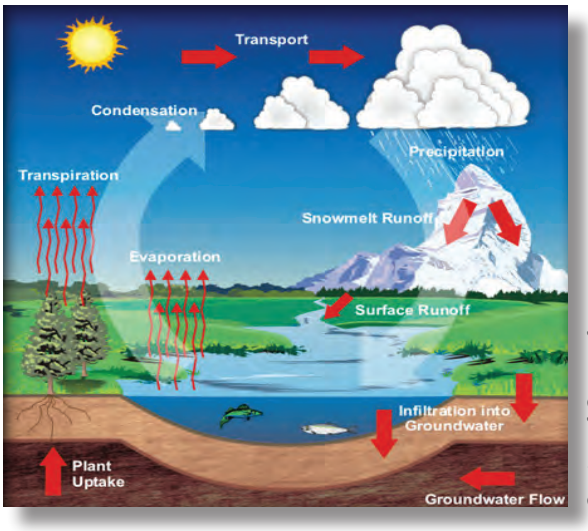
This manual integrates recommended technologies, design procedures, standards, and City regulations.

State Capital - Kanawha Rvier

1.1 Why Stormwater Matters

As the City continues to develop, more impervious surfaces are created, thereby increasing the amounts of stormwater runoff during rain events. This increased runoff erodes streambanks, causes water quality issues, prevents groundwater recharge, and can cause flooding.

Streambank erosion occurs when water is carried swiftly to streams during strong rain events. As the rain travels across paved areas and is routed through pipes and culverts, it gains speed and scours away streambanks, reducing much needed habitats for insects and fish. It also erodes the stream channels, which over time will cause sediment to continually be deposited in waterways. This can have a devastating effect on the ecosystem of the stream by burying insect habitats in the water and endangering the fish and other aquatic life.



Courtesy of Greenroofs.com

Figure 1-1.1
The Water Cycle

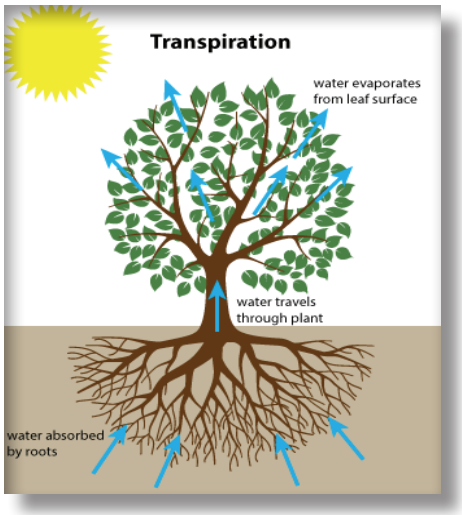
Stormwater runoff also affects water quality by carrying pollutants into our streams. Runoff can contain sediment, harmful bacteria and viruses, herbicides and pesticides, oil and grease, and excess nutrients, such as nitrogen and phosphates, among many other potential pollutants. Runoff entering our streams with elevated temperatures can also negatively affect the fish and insect population by increasing stream temperatures from their norm. When large amounts of these pollutants enter a stream damage to the vegetation and aquatic life can occur and are considered violations of state and federal water quality standards.

While water quality is a key component of why stormwater matters, reducing the quantity of stormwater runoff is an important goal as well. With increased urbanization, the potential for flooding increases as more water enters the City's already stressed infrastructure. Incorporating good stormwater practices will help to reduce the frequency and severity of flooding.

The Water Cycle and Stormwater Management

Nature continuously recycles the Earth's water supply through a process known as the hydrologic cycle, more commonly called the water cycle. The water cycle, illustrated in Figure 1-1.1 is made up of these basic components: evaporation (transpiration or evapotranspiration), condensation, precipitation, infiltration, groundwater recharge, and stormwater runoff.

Evaporation, illustrated in Figure 1-1.2, is the process by which water is converted from liquid form to its vapor form and then transferred from land and waterbodies to the atmosphere. Transpiration occurs when water contained in liquid form in plants is converted to vapor and is released into the atmosphere. Plants release most of their water uptake through this process. Because it is difficult to distinguish between evaporation and transpiration, this combined process is



Courtesy of the University of WI

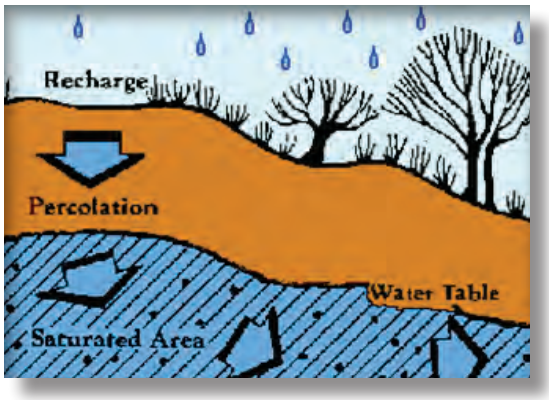
Figure 1-1.2
Evaportation

sometimes referred to as 'evapotranspiration'.

Precipitation occurs when moisture falls to the Earth's surface. Water vapor in the atmosphere condenses and is delivered to the ground as dew, rain or snow.

Some of the precipitation that falls to the surface is absorbed into the ground and is stored underground in the water table (called an aquifer) (illustrated in Figure 1-1.3). This water is then transported underground to streams, lakes and rivers.

Water that is not absorbed into the ground is called runoff. Runoff spreads across the ground's surface by beginning as a thin sheet of water, to a small trickle, and finally a stream. Runoff can cause erosion leading to the pollution of rivers, lakes and streams. If precipitation is intense and the soil is saturated, flooding can occur.



Courtesy of Purdue University and Reg. 5 USEPA

Figure 1-1.3
Water Table

Because the overall water balance must be maintained, altering one part of the cycle impacts other parts. Removing trees and adding impervious surfaces reduces the amount of space available for infiltration into the ground and for evapotranspiration from plants. This reduction of infiltration, evapotranspiration and absorption thereby greatly increases the amount of stormwater runoff. As rainstorms generate runoff, pollutants are collected and concentrated into stormwater conveyance systems and ultimately end up in our local rivers and streams. The following Table 1-1.1 is a summary of common pollutants found in stormwater runoff.

Table 1-1.1: Common Urban Stormwater Pollutants

Pollutant	Potential Source
Excess Nutrients: Nitrogen, Phosphorus	Animal waste, lawn and garden fertilizers, failing septic systems, illicit sanitary connections, and alternative snow removal chemicals.
Sediments: Suspended, Dissolved & Deposited	Construction sites, stream bank erosion, runoff from impervious surfaces, and bare soil.
Paint, Household Cleaners	Latex and oil based paint, bleach, detergents, and solvents.
Pathogens: Bacteria, Viruses	Animal waste, failing septic systems, illicit sanitary connections, and general trash.
Organic Materials	Leaves, grass clippings, brush, and failing septic systems.
Oil and Grease	Industrial processes, commercial processes, automobile, emissions, fluid leaks, and improper oil disposal.
Metals: Copper, Lead, Zinc, Mercury, Chromium, Aluminum	Industrial processes, normal wear of automobile brake linings, tires, emissions, fluid leaks, battery acid and metal roofs.
Synthetic & Organic Chemicals and Pesticides	Over application of herbicides, insecticides, fungicides, rodenticides; industrial processes; and commercial processes.
Deicer's and Antifreeze	Road salting, snowmelt runoff from snow piles in parking lots and roads, the spring snowmelt season, and during winter snow events.
Trash and Debris	Litter washed through the storm drain network.

The Watershed Approach

The United States Environmental Protection Agency (USEPA) and the West Virginia Department of Environmental Protection (WVDEP) manage water quality issues by looking at individual watersheds. Developing priorities, performing sampling and assessments, and focusing other resources and efforts based on watershed delineations allow environmental protection agencies to be more effective and efficient. The WVDEP has divided the State into 32 major watersheds. Charleston is uniquely situated in the corners of three major watersheds: the Elk Watershed and the Upper and Lower Kanawha Watersheds as indicated in Figure 1-1.4. These watersheds share boundaries at the confluence of the Elk River into the Kanawha River. The Elk River is the City's and surrounding area's drinking water source. West Virginia American Water Company's intake that serves 9 counties and over 300,000 people is located on the Elk River within the City Limits of Charleston.

Figure 1-1.4
City of Charleston Watersheds

1.2 Current Federal Stormwater Regulations

Federal law requires that urbanized areas that operate small Municipal Separate Storm Sewer Systems (MS4s), such as Charleston, design a program to control stormwater runoff with an overall goal of reducing the discharge of pollutants to our surface waters. This includes adopting local regulations governing construction and post-construction stormwater runoff. The primary focus of these requirements are developing and implementing best management practices (BMPs) to control runoff and reduce pollution. This manual is one of many steps the City is taking to comply with the Clean Water Act and the National Pollutant Discharge Elimination System (NPDES) Stormwater Regulations (40 CFR § 122). These regulations have base requirements identified and described briefly in Table 1-2.1 known as the Six Minimum Controls.

Table 1-2.1: Six Minimum Controls

1	**Public Education and Outreach:** distributing educational materials and performing outreach to inform citizens about the impacts that polluted stormwater runoff can have on water quality and the steps they can take to reduce or prevent pollution.
2	**Public Involvement and Participation:** providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a stormwater management panel.
3	**Illicit Discharge Detection and Elimination:** developing and implementing a plan to detect and eliminate illicit discharges to the stormwater system.
4	**Construction Site Runoff Control:** developing, implementing and enforcing an erosion and sediment control plan for construction activities in urban areas to control erosion and minimize the discharge of the other potential contaminants from construction sites.
5	**Post Construction Runoff Control:** developing, implementing and enforcing a program to address discharges of long term post-construction stormwater runoff from new development and redevelopment areas.
6	**Pollution Prevention and Operation and Maintenance for Municipal Operations:** developing and implementing a program with the goal of reducing pollutant runoff from municipal operations and training for City staff on pollution prevention measures and techniques.

This manual addresses the six requirements listed in Table 1-2.1 and describes how the City intends to remain in compliance with the Federal and State Mandates.

1.2.1 Public Education and Outreach

The City is required to educate the public on stormwater issues and engage in outreach activities. The development and distribution of this manual is a core milestone to achieve this requirement. Distribution of the manual, along with Appendix I "Homeowners Guide" and multiple educational flyers, see Figure 1-2.1, will help educate the public about stormwater and the impacts individual actions can have on water quality. One goal of the Homeowners Guide is to assist residents in learning what they can do to reduce the volume of stormwater entering West Virginia streams and how they can help improve the quality of that water.

The City will also be maintaining an internet site (www.charlestonstormwater.org) where the public can obtain information regarding stormwater issues, events, and projects, as well as contact information for the City stormwater staff.

Figure 1-2.1
City of Charleston Homeowner's Guide

1.2.2 Public Involvement and Participation

During development of this manual, the City sought input from interested and affected parties. An initial meeting of this group was held on February 23, 2009. The purpose of this meeting was to provide an overview of the intent of the manual, and to discuss questions and concerns raised by the meeting attendees.

After a draft of the manual was distributed in late May 2009, a subsequent meeting was held on June 4, 2009. Similar to the first meeting, suggestions and concerns of the participants were discussed. A second draft manual was provided in September 2009, and a follow up meeting was held on February 10, 2010. A revised draft of the manual was issued in March 2010.

In addition to the meetings, the City, GAI Consultants and Timmermeyer PLLC delivered a presentation at the WV Contractor's EXPO on March 25, 2009. The presentation described the City's intentions for the manual and reinforced that public input was welcome throughout the process.

Figure 1-2.2
Rain Barrel Awareness Campaign

A follow up presentation by the same companies was made at the 2010 EXPO to discuss the third draft of the manual.

- Rain barrel workshops held annually, see Figure 1-2.2.
- Interactive art projects with Stormwater themes.
- Classroom Projects
- Interactive Stormwater games for children.
- Facebook page.

As this manual is implemented and stormwater management continues to evolve, the City is committed to the promotion of public involvement in regulation development.

1.2.3 Illicit Discharge Detection and Elimination

Chapter 7 of this manual provides a description of Illicit Discharge Detection and Elimination (IDDE) procedures and the protocol being utilized by the City, see Figure 1-2.3. Specific practices for citizens and businesses to help protect surface water are also discussed.

Figure 1-2.3
Illicit Discharge Detection

Figure 1-2.4
Erosion from jobsite

1.2.4 Construction Site Runoff Control

Chapter 5 of this manual provides requirements for protecting the City's surface water from excessive erosion and sedimentation from construction sites. Many of the practices have been used for years. This manual also presents new and innovative practices that are beginning to be utilized throughout the country. All construction sites within the City involving soil disturbance are required to use erosion and sediment controls, see Figure 1-2.4. Any site exceeding 5,000 square feet (sf) of soil disturbance will require a City stormwater permit. City requirements vary based on disturbance (refer to Chapter 2). Any site exceeding one (1) acre of soil disturbance will be required to meet City and State permitting requirements.

1.2.5 Post Construction Runoff Control

Chapter 6 of this manual provides design requirements for the management of post construction runoff. These guidelines provide structural methods for controlling total runoff volume, peak flow rate and stormwater quality. As part of Charleston's Stormwater Management Program, new development and redevelopment are required to minimize the total amount of stormwater runoff draining from a site. The maximum rate which water can drain from property is also regulated for all but the largest storms[1]. Finally, practices are specified to catch oils and greases, trash, and other pollutants before they leave a site. Property owners of new and redevelopment projects will be required to maintain these permanent stormwater measures in perpetuity.

Figure 1-2.5
Roadside detention area

[1] Chapter 4 provides acceptable stormwater runoff calculations for peak runoff control requirements.

1.2.6 Pollution Prevention and Operation and Maintenance for Municipal Operations

Chapter 8 of this manual discusses current practices that the City is implementing to minimize the potential for impacts to surface water from routine City operations and maintenance.

1.2.7 The Sanitary Board of the City of Charleston, West Virginia, A Municipal Utility

Chapter 9 of this manual describes current procedures for coordinating with the Charleston Sanitary Board (CSB) with a new or re-development project that occurs in areas with Combined Sewer Systems. Protocols for contacting the CSB and general requirements are outlined.

The City further recognizes that there are potential benefits of integrating municipal stormwater and wastewater plans. In particular, Combined Sewer Overflow (CSO) water quality can be dramatically improved through the thoughtful integration of stormwater volume and quality controls prior to a project tying its stormwater system into an existing combined system. As of June 5, 2012 the EPA released their integrated planning framework model that endorses local municipalities and treatment utilities to integrate future planning and dollars for the greater good of the community. This integration document can be found at http://water.epa.gov/polwaste/npdes/stormwater/upload/integrated_planning_framework.pdf.

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