



# **CHAPTER 1 INTRODUCTION**



## Chapter 1 INTRODUCTION

### 1.1 Purpose

This volume of the Nashville Stormwater Management Manual has been prepared by the Metropolitan Department of Water and Sewerage Services (MWS), as authorized by Ordinance No. 78-840 and approved by the Mayor, to establish technical guidelines to enforce the terms of that ordinance. It provides a compilation of readily available literature relevant to stormwater management activities in Nashville and Davidson County. Although it is intended to establish uniform design practices, it neither replaces the need for engineering judgment nor precludes the use of information not presented. It supports changes to Volume 1 - Regulations adopted in September 1999 and includes references to and from Volume 4 – Best Management Practices released in March 2000.

### 1.2 Format and Contents

The Nashville Stormwater Management Manual is presented in four volumes:

- Volume 1 – Regulations
- Volume 2 – Procedures
- Volume 3 – Theory
- Volume 4 – Best Management Practices (BMP) Manual

Volume 2 includes the following chapters:

1. Introduction
2. Hydrology
3. Open Channel Hydraulics
4. Gutter and Inlet Hydraulics
5. Culvert Hydraulics
6. Storm Sewer Hydraulics
7. Bridge Hydraulics
8. Detention/Retention Hydraulics
9. Erosion and Sediment Control
10. Outlet Protection
11. Data Collection
12. Computer Programs



Titles for Chapters 1 through 10 coincide with those for Volume 3, which does not include material related to the topics of Chapters 11 and 12. However, it should be noted that Volume 3 was not updated in the 1999/2000 revision period.

Tables and figures for Volume 2 are located at the end of each chapter, with tables preceding figures. Each chapter is introduced by a detailed table of contents that includes table and figure titles. Cited literature for the entire volume is listed alphabetically by author after the last chapter. Terms and symbols are defined immediately after each equation. Additional material appended to the manual but bound separately includes watershed master plans available from MWS. Example problems are provided at the end of selected sections to demonstrate the application of procedures. Application of site specific procedures addressing stormwater quality are presented in Volume 4 – Best Management Practices. A summary list of example problems is given below.

Problem	Title	Page No.
2-1	Hyetograph Development	2-5
2-2	Runoff Excess Using the Rational Method Runoff Coefficient	2-10
2-3	Rainfall Excess Using the SCS Curve Number	2-11
2-4	Time of Concentration Computation	2-15
2-5	Rational Method Peak Runoff Rate	2-23
2-6	USGS Regression Equation Peak Runoff Rate	2-23
2-7	SCS TR-55 Graphical Method Peak Runoff Rate	2-24
2-8	SCS Dimensionless Unit Hydrograph	2-31
2-9	Flood Hydrograph Using Unit Hydrograph Theory	2-32
2-1	Inman's Dimensionless Hydrograph	2-35
2-1	Rational Hydrograph Method	2-36
3-1	Direct Solution of Manning's Equation	3-21
3-2	Grassed Channel Design Stability	3-21
3-3	Grassed Channel Design Capacity	3-22
3-4	Riprap Design	3-24
3-5	Direct Step Method	3-29
3-6	Standard Step Method	3-30
4-1	Gutter Flow for Standard Pavement Sections	4-8
4-2	Gutter Flow for Composite Sections	4-8
4-3	Grate Inlet intercept on Grade	4-13
4-4	Grate Inlet at Sump	4-13
5-1	Circular Pipe Culvert	5-20
5-2	Concrete Box Culvert	5-22
5-3	Box Culvert with Roadway Overtopping	5-23
5-4	Box Culvert with Side-Tapered Inlet	5-25
8-1	Routing Using the Storage indication Method	8-14
8-2	Multi-Design Storm Detention/Retention Calculations	8-15



8-3	Water Budget Calculations	8-19
9-1	Plan Evaluation	9-6
10-1	Riprap Apron Design for Minimum Tailwater Conditions	10-6
10-2	Riprap Apron Design for Maximum Tailwater Conditions	10-7
10-3	Riprap Outlet Basin Design for Supercritical Flow and Minimum Tailwater Conditions	10-10
10-4	Riprap Outlet Basin Design for Supercritical Flow and Maximum Tailwater Conditions with Excessive Outlet Velocity	10-11
10-5	Riprap Outlet Basin Design for Subcritical Flow Conditions	10-12
10-6	Baffled Outlet Basin Design	10-16
10-7	USBR Type II Outlet Basin Design	10-22

### 1.3 Limitations

The procedures in Volume 2 include original material as well as frequently used charts, equations, computation forms, and figures duplicated from readily available publications. Textual material from these publications has not been duplicated in its entirety, and the user is encouraged to obtain original or additional reference material, as appropriate. Only desktop procedures are developed in this manual. A guide to selected computer programs is provided in Chapter 12. Computer applications require appropriate user documentation and experience and should be considered for the following types of stormwater calculations:

1. Water surface profile computations, particularly for nonuniform flow conditions.
2. Development of runoff hydrographs.
3. Routing of runoff hydrographs through complex open channel, storm sewer, and storage basin facilities.
4. Bridge hydraulic evaluations.

Careful consideration should always be given to site conditions, project requirements, and engineering experience so that procedures are properly applied and adapted as needed.



## **1.4 Updating**

This volume of the Nashville Stormwater Management Manual will be updated and revised, as necessary, to reflect up-to-date engineering practices and information applicable to Metropolitan Nashville and Davidson County.

Questions and comments should also be submitted to MWS:

Attn: Stormwater Development Review  
Metro Water Services  
800 Second Avenue S  
Nashville, Tennessee 37210

Copies of this and other volumes of the manual may be downloaded from the MWS web site:

<http://www.nashville.gov/stormwater>