

OFFICE OF STRUCTURES

**MANUAL FOR HYDROLOGIC AND
HYDRAULIC DESIGN**

CHAPTER 1

INTRODUCTION

June 2020



TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION.....	1-1
1.1 Overview	1-1
1.2 Manual Organization and Versions.....	1-2
1.3 Office of Structures Responsibility	1-4

LIST OF TABLES

Table 1-1 Manual Organization and Chapter Outline.....	1-2
Table 1-2 Summary of Manual Version and Updates	1-5

CHAPTER 1 INTRODUCTION

1.1 OVERVIEW

This manual has been prepared by the Maryland Department of Transportation, State Highway Administration (MDOT SHA), Office of Structures, Structure Hydrology and Hydraulics Division, to provide guidance and direction to engineers involved in locating, analyzing, and designing bridges and culverts in Maryland. Engineers conducting hydrologic and hydraulic studies and analyses for MDOT SHA projects should adhere to the procedures and design guidelines presented in this manual.

The MDOT SHA Office of Structures (OOS) is composed of three units: the Structure Engineering Divisions, the Structure Inspection and Remedial Engineering Divisions, and an Administrative Section. The Structure Hydrology and Hydraulics Division (SHHD) is a division within the Structure Engineering Divisions (SED) unit. In addition to SHHD, SED includes three project development divisions, which are responsible for the design of new structures and the major rehabilitation of existing bridges and other highway related structures (i.e., new bridges, bridge replacements, bridge widenings, deck replacements, culverts, retaining walls, and noise abatement walls). The Structures Inspection and Remedial Engineering Divisions (SIREN) unit consists of four separate divisions which are responsible for structure condition inspection, structural analysis, routine and preventative maintenance, and repair and replacement.

The MDOT SHA Office of Structures was previously named the Office of Bridge Development. The Structure Hydrology and Hydraulics Division was previously named the Structure Hydrology and Hydraulics Unit. Other MDOT SHA guidance documents may use these former naming conventions.

No warranty expressed or implied is made on the contents of this manual. The distribution of this information does not constitute responsibility by the MDOT SHA or any contributors for omissions, errors, or possible misinterpretations that may result from the use or interpretation of the materials contained herein. Questions and/or comments regarding the use of the Manual should be referred to the SHHD.

The SHHD has made every effort to incorporate into the manual the pertinent results of research and technology transfer from the Federal Highway Administration, AASHTO, Transportation Research Board and others. However, the SHHD recognizes that the judgment of the engineer remains of paramount importance in the planning, design and construction of structures that meet the needs of the MDOT SHA and the State of Maryland. The SHHD requires the engineer to utilize the information in this manual when performing analysis. The SHHD also recommends that the engineer become familiar with other important publications such as the hydraulic manuals of the Federal Highway Administration.

1.2 MANUAL ORGANIZATION AND VERSIONS

The Manual for Hydrologic and Hydraulic Design, herein referred to as the SHHD Manual, consists of two volumes. The chapters in Volume I provide an overview of SHHD design and project development procedures for:

- collection, evaluation, analysis, submittal, and documentation of information for hydrology, stream morphology, hydraulics, and scour evaluation reports,
- development and review of plans and other project documents for the location and design of hydraulic structures, and
- procedures for ensuring that the hydraulics of the structure, morphology of the stream, environmental aspects in the project vicinity, and aquatic organism passage are fully considered in the location and design phases of project development.

The chapters in Volume II provide detailed design guidelines and analysis procedures for the various aspects of the design of hydraulic structures. Table 1-1 provides a list of the chapter organization for both Volume I and Volume II, as well as a list of appendices and references.

Table 1-1 Manual Organization and Chapter Outline

Volume I - Overview and Procedures	
1	Introduction
2	Laws and Regulations
3	Procedures, Design Guidelines, and Permits
4	Project Development
5	Data Sources and Field Surveys
6	Documentation
Volume II - Design Methodologies	
7	Scour Program for Existing Bridges
8	Hydrology
9	Open Channel Hydraulics
10	Bridge Hydraulics
11	Scour Evaluations
12	Bridge Deck Drainage Analysis
13	Culvert Hydraulics
14	Stream Morphology
15	Channel Stability Assessment and Design (under development)
Glossary	

Appendices	
A	In-Kind Replacement of Bridges and Culverts
B	ABSCOUR User's Manual
C	TideRout2 User's Manual
D	MPADD User's Manual
Maryland Hydrology and Hydraulics Panel Reports	
Maryland Hydrology Panel: Application of Hydrologic Methods in Maryland	
Maryland Hydraulics Panel: Recommendations for Hydraulic Analyses in FEMA Special Flood Hazard Areas in Maryland	
Maryland Hydraulics Panel: Progress Report: Culverts, Channel Stability, and Aquatic Organism Passage in Maryland	

Revisions to the Manual for Hydrologic and Hydraulic Design were completed in 2019 and 2020 and published in June of 2020. The revisions include some reorganization of the overall manual structure with a re-numbering of some chapters and appendices, as noted in Table 1-1. The revisions published in June 2020 include updates to the chapters included in Volume I, Overview and Procedures. The SHHD plans to continue with updates to Volume II, Design Methodologies, in 2020 and 2021. Prior to the completion of the Volume II revisions, the information provided in Volume I shall take precedence in the case of any inconsistency or data conflict.

The SHHD plans to continue providing periodic manual revisions to incorporate the results of pertinent research and technology, and to provide revisions to procedures and design guidelines that result from changes to Federal and State policy and regulations. For some subjects, such as hydrology or bridge scour, updates are completed through revision of a specific chapter. For topics relating to procedures and design guidelines, several chapters are interrelated and need to be read in context with each other to understand the scope of the guidance provided. Chapter 3, Procedures, Design Guidelines, and Permits, provides an overview of SHHD procedures and the design guidelines associated with the various process components. In general, the chapters in Volume I provide reference to the specific chapters in Volume II that present the SHHD design and analysis detailed procedures.

Users should verify that they are reviewing the most current version of the manual. Each chapter of the manual includes the version date on the title page. A list is provided at the end of this chapter with a summary of any updates or changes to the manual occurring after June 2020 (Table 1-2). It is possible that the manual may not always reference the latest version of software, such as GISHydro or HEC-RAS. The user should always check with the SHHD if there is a question about which software version to use.

SHHD does not provide hard copies of the manual. Rather, the manual is available in a PDF format online at www.gishydro.eng.umd.edu. Questions regarding the use of this manual should be directed to Mr. Andrzej (“Andy”) J. Kosicki: AKosicki@mdot.maryland.gov or 410-545-8340.

1.3 OFFICE OF STRUCTURES RESPONSIBILITY

The responsibility for hydrologic and hydraulic design in the MDOT SHA is divided between the Office of Structures, Structure Hydrology and Hydraulics Division and the Office of Highway Development, Highway Hydraulics Division. The policies and procedures set forth in this Manual apply to structures or other floodplain encroachments determined to be the responsibility of the Office of Structures. The following categories of projects are the responsibility of the SHHD:

1. All numbered structures included in the OOS inventory.
2. Any structure with a drainage area of 400 acres (0.625 square mile) or greater, and any channel stability improvements associated with these structures.
3. Roadway encroachments on floodplains or streams with a drainage area of 400 acres or greater.
4. Replacement of certain small drainage structures, which are not currently listed in the OOS inventory, upon request of Structures Inspection and Remedial Engineering Division (SIREN).

MDOT SHA stream restoration or stability projects not associated with a structure (i.e., restoration work completed for mitigation credits or stormwater discharge permit compliance) are not the responsibility of the OOS.

The following categories of drainage facilities and systems are the responsibility of the Highway Hydraulics Division:

1. Roadway drainage and storm water management facilities and systems.
2. Small structures (culverts) that are not included in the OOS inventory and have a drainage area of less than 400 acres, and any channel stability improvements associated with these small structures.

Questions relating to drainage and storm water management facilities or systems should be referred to the Highway Hydraulics Division. Questions relating to any numbered structure included in the OOS inventory should be referred to the Office of Structures.

Table 1-2 Summary of Manual Version and Updates

Date	Description
June 2020	Restructure of manual outline and chapter organization. Major revisions to Volume I, Chapters 1 through 6. Volume II is scheduled for update in 2020 and 2021. For any inconsistencies or conflict, the information provided in Volume I shall take precedence.