Computer Modeling of Water Distribution Systems

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American Water Works Association

Science and Technology

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Foreword

The Computer Assisted Design of Water Systems (CADWS) Committee of the Engineering and Construction Division of AWWA was formed in 1982 and was later renamed the Engineering Computer Applications Committee. The Engineering Computer Applications Committee's mission is to assemble and disseminate information on the use of computer technology in the design, analysis, mapping GIS, and operation of water systems, including use of AM/FM and GIS. The Engineering Computer Applications Committee consists of volunteers, a liaison from the Engineering and Construction Division, and a staff advisor. The committee develops programs for the Annual Conference and specialty conferences, manuals, and other documents.

The purpose of this manual is to compile, discuss, and explain matters relating to the computerized analysis of water distribution system networks for use by engineers, planners, managers, and others involved in the design and operation of water systems. This manual serves as a reference guide and as a manual of practice for those involved in making decisions regarding the implementation and use of distribution system modeling programs. This manual describes a variety of topics that are of primary concern to people involved in water-system analysis of closed-conduit networks or treated-water systems.

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Acknowledgments

The Distribution Modeling Subcommittee was formed to develop this edition of the manual for Computer Modeling of Water Distribution Systems. This group was authorized by the AWWA Engineering Computer Applications Committee of the Engineering and Construction Division under the Technical & Educational Council. The membership of the Distribution Modeling Subcommittee that authored, reviewed, revised, and contributed to this edition included

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Chapter 1

Introduction to Distribution System Modeling

OVERVIEW

Water utilities seek to provide customers with a reliable, continuous supply of high-quality water while minimizing costs. This water is often delivered through very large and complex distribution systems consisting of many miles of pipe and often containing numerous pumps, regulating valves, and storage reservoirs. These systems are often difficult to understand because of their physical complexity, and because of the large amount of data that must be processed. Sometimes, key pieces of information needed to understand a system are not available. In addition, the chemical interactions that take place in the water, and between the water and pipes or reservoirs, are complex. One tool that has evolved over time to help water system designers, operators, and managers in their task of delivering safe, reliable water at a low cost is distribution system modeling.

Distribution system modeling involves using a computer model of a water distribution system to predict the behavior of the system to solve a wide variety of design, operational, and water quality problems. The computer model is used to predict pressures and flows within a water distribution system to evaluate a design and to compare system performance against design standards. The model is used in operational studies to solve problems, such as evaluating storage capacity, investigating control schemes, and finding ways to deliver water under difficult operating scenarios. Water quality models are used to perform such tasks as computing water age, tracking chlorine residuals, and reducing disinfection by-products in a distribution system.