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Quality of Ground Water

Guidelines for Selection and Application of Frequently Used Models



AMERICAN SOCIETY OF CIVIL ENGINEERS

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Quality of Ground Water

Guidelines for Selection and Application of Frequently Used Models

Prepared by the Committee on Ground Water Quality of the Environmental Engineering Division of the American Society of Civil Engineers

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ABSTRACT:

The Task Committee on Contaminated Ground Water Modeling was approved in September 1990 by the Executive Committee of ASCE's Environmental Engineering Division with the express purpose of assessing widely used models of contaminated ground water. In order to accomplish this, the committee first surveyed the professional community to determine which models are in frequent use; it then classified these models according to a unified set of criteria that they had developed. Based on these criteria, the task committee created guidelines for the application of the models that include the capabilities and limitations of each model. This monograph represents the valuable information compiled by this task committee.

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(As developed by the ASCE Technical Procedures Committee, July 1930, and revised March 1935, February 1962, April 1982)

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A series entitled 'Manuals and Reports on Engineering Practice,' to include the Manuals published and authorized to date, future Manuals of Professional Practice, and Reports on Engineering Practice. All such Manual or Report material of the Society would have been refereed in a manner approved by the Board Committee on Publications and would be bound, with applicable discussion, in books similar to past Manuals. Numbering would be consecutive and would be a continuation of present Manual numbers. In some cases of reports of joint committees, bypassing of Journal publications may be authorized.

MANUALS AND REPORTS OF ENGINEERING PRACTICE

10 Technical Procedures for City Surveys 13 Filtering Materials for Sewage Treatment Plants 14 Accommodation of Utility Plant Within the Rights-of-Way of Urban Streets and Highways 31 Design of Cylindrical Concrete Shell Roofs 33 Cost Control and Accounting for Civil Engineers 34 Definitions of Surveying and Associated Terms 35 A List of Translations of Foreign Literature on Hydraulics 36 Wastewater Treatment Plant Design 37 Design and Construction of Sanitary and Storm Sewers 40 Ground Water Management 41 Plastic Design in Steel-A Guide and Commentary 42 Design of Structures to Resist Nuclear Weapons Effects 45 Consulting Engineering-A Guide for the Engagement of Engineering Services 46 Report on Pipeline Location 47 Selected Abstracts on Structural Applications of Plastics 49 Urban Planning Guide 50 Planning and Design Guidelines for Small Craft Harbors 51 Survey of Current Structural Research 52 Guide for the Design of Steel Transmission Towers 53 Criteria for Maintenance of Multilane Highways 54 Sedimentation Engineering 55 Guide to Employment Conditions for Civil Engineers Management, Operation and Maintenance of Irrigation and Drainage Systems 57 58 Structural Analysis and Design of Nuclear Plant Facilities 59 **Computer Pricing Practices** 60 Gravity Sanitary Sewer Design and Construction Existing Sewer Evaluation and Rehabilitation 62 63 Structural Plastics Design Manual 64 Manual on Engineering Surveying 65 Construction Cost Control Structural Plastics Selection Manual 66 67 Wind Tunnel Model Studies of Buildings and Structures 68 Aeration-A Wastewater Treatment Process Sulfide in Wastewater Collection and Treatment Systems 69 70 Evapotranspiration and Irrigation Water Requirements 71 Agricultural Salinity Assessment and Management 72 **Design of Steel Transmission Structures** 73 Quality in the Constructed Project-a Guide for Owners, Designers, and Constructors 74 Guidelines for Electrical Transmission Line Structural Loading 75 Right-of-Way Surveying 76 Design of Municipal Wastewater Treatment Plants 77 Design and Construction of Urban Stormwater Management Systems 78 Structural Fire Protection Steel Penstocks 79 80 Ship Channel Design 81 Guidelines for Cloud Seeding to Augment Precipitation Odor Control in Wastewater Treatment Plants 82 83 Environmental Site Investigation Mechanical Connections in Wood Structures 84 85 Quality of Ground Water Operation and Maintenance of Ground Water Facilities 86 Urban Runoff Quality Manual 87 Management of Water Treatment Plant Residuals 88 89 Pipeline Crossings

FOREWORD

The Task Committee on Contaminated Ground Water Modeling was approved in September 1990 by the Executive Committee of ASCE's Environmental Engineering Division. The task committee was formed with the express purpose of assessing widely used models of contaminated ground water. Udai P. Singh of CH2M Hill initiated the formation and activities of this task committee and served as the contact member of the Executive Committee through the publication of this monograph. In 1992, this task committee was named as the Division's Ground Water Quality Committee.

The two principal objectives of this committee have been to: (1) survey the professional community to determine which models are in frequent use, and classify those models according to a unified set of criteria developed by this task committee, and (2) develop guidelines on the application of these models that describe capabilities and limitations. This monograph presents the valuable information that the committee has compiled.

The original task committee was organized into five groups, led as follows:

- C. Harold Emmett, Jr., P.E., ATSDR: Task I. Conduct a survey of professionals to determine which ground water quality models are in frequent use.
- Lakshmi N. Reddi, Ph.D., P.E., Kansas State University: Task II. Develop criteria for classifying the models.
- R. Lee Peyton, Jr., Ph.D., P.E., University of Missouri-Columbia: Task III. Review, evaluate, and classify the models.
- Bijay K. Panigrahi, Ph.D., P.E., P.G., Remedial Engineering & Science, Inc.: Task IV. Document input parameter requirements and implementation guidance.
- Ashok Pandit, Ph.D., P.E., Florida Tech: Task V. Summarize model capabilities and limitations.

Other committee members who significantly contributed to the preparation of this monograph include:

- Abnish C. Amar, Ph.D., P.E., Entech Engineers, Inc.
- Brenton M. Hamil, P.E., Florida Department of Transportation
- Charles S. Hebson, Ph.D., P.E., Robert G. Gerber, Inc.
- James H. Jensen, P.G., PEER Consultants
- Daniel E. Medina, Ph.D., P.E., Northeastern University
- R. Kerry Rowe, Ph.D., P.E., University of Western Ontario

The final draft, based on four years of effort, was reviewed for the Society by an independent Blue Ribbon Panel consisting of:

- Charles B. Andrews, P.E., S.S. Papadopulos & Associates, Inc.
- Chester R. McKee, Ph.D., P.E., In Situ, Inc.
- Miguel A. Medina, Ph.D., P.E., Duke University
- James W. Mercer, P.G., Geo Trans, Inc.

Model developers who commented on the final draft included R. Kerry Rowe of the University of Western Ontario, Leonard F. Konikow of the U.S. Geological Survey, Thomas A. Prickett of Thomas Prickett & Associates, Milovan S. Beljin of the University of Cincinnati, Clifford I. Voss of the U.S. Geological Survey, Chunmiao Zheng of the University of Alabama, Sumant Gupta of CH2M Hill, and Brendan M. Harley of Camp, Dresser and McKee, Inc. Steven C. McCutcheon, P.E. of the USEPA Environmental Research Laboratory in Athens, Georgia edited the final manuscript. The standing committee integrated all comments into the final version of the report.

> Sayed M. Sayed, Ph.D., P.E., Chair Committee on Ground Water Quality

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