

permeability and groundwater contaminant transport

Zimmie/Riggs, *editors*

ASTM STP 746

**AMERICAN SOCIETY FOR
TESTING AND MATERIALS**

PERMEABILITY AND GROUNDWATER CONTAMINANT TRANSPORT

A symposium
sponsored by ASTM
Committee D-18 on
Soil and Rock for
Engineering Purposes
AMERICAN SOCIETY FOR
TESTING AND MATERIALS
Philadelphia, Pa.,
17-23 June 1979

ASTM SPECIAL TECHNICAL PUBLICATION 746
T. F. Zimmie, Rensselaer Polytechnic
Institute, and C. O. Riggs, Central
Mine Equipment Co., editors

ASTM Publication Code Number (PCN)
04-746000-38



AMERICAN SOCIETY FOR TESTING AND MATERIALS
1916 Race Street, Philadelphia, Pa. 19103

Copyright © by AMERICAN SOCIETY FOR TESTING AND MATERIALS 1981
Library of Congress Catalog Card Number: 81-65838

NOTE

The Society is not responsible, as a body,
for the statements and opinions
advanced in this publication.

Printed in Baltimore, Md.
September 1981

Foreword

The symposium on Permeability and Groundwater Contaminant Transport was held on 17-23 June 1979 in Philadelphia, Pa. The meeting was sponsored by the American Society for Testing and Materials through its Committee D-18 on Soil and Rock for Engineering Purposes. The chairmen were T. F. Zimmie, Rensselaer Polytechnic Institute, and C. O. Riggs, Central Mine Equipment Co., both of whom also served as editors of this publication.

Related ASTM Publications

Behavior of Deep Foundations, STP 670 (1979), \$49.50, 04-670000-38

Dynamic Geotechnical Testing, STP 654 (1978), \$34.50, 04-654000-38

Dispersive Clays, Related Piping, and Erosion in Geotechnical Projects, STP 623 (1977), \$40.75, 04-623000-38

Soil Specimen Preparation for Laboratory Testing, STP 599 (1976), \$35.00, 04-599000-38

Manual on Water, STP 442A (1978), \$28.50, 04-44210-16

A Note of Appreciation to Reviewers

This publication is made possible by the authors and, also, the unheralded efforts of the reviewers. This body of technical experts whose dedication, sacrifice of time and effort, and collective wisdom in reviewing the papers must be acknowledged. The quality level of ASTM publications is a direct function of their respected opinions. On behalf of ASTM we acknowledge with appreciation their contribution.

ASTM Committee on Publications

Editorial Staff

Jane B. Wheeler, *Managing Editor*

Helen M. Hoersch, *Senior Associate Editor*

Helen P. Mahy, *Senior Assistant Editor*

Allan S. Kleinberg, *Assistant Editor*

Contents

| | |
|--|-----|
| Introduction | 1 |
| Glossary—A. I. JOHNSON | 3 |
| Measurement of the Hydraulic Conductivity of Fine-Grained Soils— R. E. OLSON AND D. E. DANIEL | 18 |
| Rock Permeability or Hydraulic Conductivity—An Overview— G. F. SOWERS | 65 |
| Suitability of Thermocouple Psychrometers for Studying Moisture Movement in Unsaturated Soils—D. E. DANIEL, J. M. HAMILTON, AND R. E. OLSON | 84 |
| Permeability of Soils Using Contaminated Permeant—B. B. GORDON AND MICHAEL FORREST | 101 |
| Low-Gradient Permeability Testing of Fine-Grained Marine Sediments—A. J. SILVA, J. R. HETHERMAN, AND D. I. CALNAN | 121 |
| Correlative Measurements of Pore Size Distribution and Permeability in Soils—IGNACIO GARCIA-BENGOCHEA AND C. W. LOVELL | 137 |
| Impermeabilization of a 300-Hectare Cooling Pond—G. AUVINET AND J. ESPINOSA | 151 |
| Evaluating the Saturated and Unsaturated Hydraulic Conductivity of Soils—ATEF ELZEFTAWY AND KEROS CARTWRIGHT | 168 |
| Measurement of Hydraulic Conductivity of Partially Saturated Soils—J. M. HAMILTON, D. E. DANIEL, AND R. E. OLSON | 182 |
| Predictive Tools for Contaminant Transport in Groundwater— A. A. METRY | 197 |
| Computer Simulation of Movement of DIMP-Contaminated Groundwater Near the Rocky Mountain Arsenal, Colorado— S. G. ROBSON | 209 |

| | |
|---|-----|
| Attenuation of Radionuclides and Toxic Elements by <i>In Situ</i> Soils at a Uranium Tailings Pond in Central Wyoming— | |
| SIROUS HAJI-DJAFARI, P. E. AN TOMM MARIA, AND H. L. CROUSE | 221 |
| Summary | 243 |
| Index | 247 |

