

# Current Practices in Ground Water and Vadose Zone Investigations



NIELSEN / SARA, editors

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# ***Current Practices in Ground Water and Vadose Zone Investigations***

*David M. Nielsen and Martin N. Sara, editors*

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## Foreword

This publication, *Current Practices in Ground Water and Vadose Zone Investigations*, contains papers presented at the symposium of the same name, held in San Diego, CA on 30 Jan. to 1 Feb., 1991. The symposium was sponsored by ASTM Committee D-18 on Soil and Rock, its Subcommittee D18.21 on Ground Water and Vadose Zone Investigations, the U.S. Environmental Protection Agency, and the U.S. Geological Survey. David M. Nielsen of Nielsen Ground Water Sciences, Inc. (NGWS) in Galena, OH and Martin N. Sara of Waste Management, Inc. in Oak Brook, IL presided as symposium chairmen and are the editors of the resulting publication.

# Contents

<b>Overview</b>	ix
 IMPROVING THE QUALITY OF GROUND-WATER INVESTIGATIONS	
<b>Realistic Expectations for Ground-Water Investigations in the 1990's— M. J. BARCELONA AND J. A. HELFRICH</b>	3
<b>The Need for Improved Use of Geologic Data in Ground-Water Investigations— P. T. REGAN, J. A. CONTE, AND M. M. MITCHELL</b>	24
<b>A Proposed Strategy for Assessing Compliance with the RCRA Ground-Water Monitoring Regulations—A. M. PARSONS AND P. A. DAVIS</b>	39
 SURFACE AND BOREHOLE GEOPHYSICS IN GROUND-WATER INVESTIGATIONS	
<b>The Use of Geophysics in the Detection of Buried Toxic Agents at a U.S. Military Installation—R. P. ALLEN AND M. A. SEELEN</b>	59
<b>Geophysical Methods Used to Guide Hydrogeological Investigations at an Umtra Site Near Grand Junction, Colorado—W. E. WIGHTMAN, B. C. MARTINEK, AND D. HAMMERMEISTER</b>	69
<b>Geoelectrics in Comprehensive Ground Water Contamination Studies—O. MAZAC, W. E. KELLY, AND I. LANDA</b>	79
 VADOSE ZONE INVESTIGATION METHODS	
<b>Vadose Zone Characterization Using Field Permeameters and Instrumentation— J. A. HAVLENA AND D. B. STEPHENS</b>	93
<b>Techniques for Quantifying the Recharge Rate Through Unsaturated Soils— R. G. KNOWLTON, JR., A. M. PARSONS, AND K. N. GAITHER</b>	111
<b>Evaluation of Four Vadose Zone Probes Used for Leak Detection and Monitoring—D. E. DANIEL, P. M. BURTON, AND S.-D. HWANG</b>	124

<b>Measurement of Organic Vapor Isotherms on Wet Soils and Aquifer Materials—</b> J. FARRELL AND M. REINHARD	140
---	-----

<b>Quality Assurance in Soil Gas Surveys: False Positive Acetone Identifications at a Codisposal Site—</b> T. R. HEINS, H. B. KERFOOT, D. J. MILLER, AND D. A. PETERSON	151
--	-----

#### DIRECT PUSH TECHNOLOGY IN GROUND-WATER INVESTIGATIONS

<b>Use of Piezometric Cone Penetration Testing with Electrical Conductivity Measurements (CPTU-EC) for the Detection of Hydrocarbon Contamination in Saturated Granular Soils—</b> A. I. STRUTYNSKY, R. E. SANDIFORD, AND D. CAVALIERE	169
---	-----

<b>Delineation of Lithology and Ground-Water Quality in a Complex Fluvial Estuarine Depositional Zone—</b> P. D. KUHLMEIER AND T. E. STURDIVANT	183
---	-----

<b>Use of Piezometric Cone Penetration Testing and Penetrometer Ground-Water Sampling for Volatile Organic Contaminant Plume Detection—</b> A. I. STRUTYNSKY AND T. J. SAINES	199
--	-----

#### GROUND-WATER MONITORING WALL DESIGN AND INSTALLATION

<b>Suggested Guidelines for the Use of PTFE, PVC, and Stainless Steel in Samplers and Well Casings—</b> L. V. PARKER	217
--	-----

<b>Methodology for the In-Field Design of Monitoring Wells in Heterogeneous Fine-Grained Formations—</b> S. D. REYNOLDS AND D. A. ZEMO	230
--	-----

<b>An Effective Monitoring Screen for Fine Sand Aquifers—</b> G. A. GILLESPIE	241
---	-----

<b>Design and Construction of Deep Groundwater Monitoring Wells—</b> L. D. BEARD	256
--	-----

#### WATER-LEVEL MEASUREMENT AND GROUND-WATER SAMPLING

<b>Using Vibration Strip Transducers for Measuring Water Levels in Monitoring Wells—</b> G. N. DURHAM AND T. G. BUMALA	273
--	-----

<b>A Field Investigation of Ground-Water Monitoring Well Purging Techniques—</b> V. MALTBY AND J. P. UNWIN	281
---	-----

<b>Deployment and Purging for In Situ Sensors in Monitoring Wells—</b> R. SCHALLA	300
---	-----

<b>A Review of Fiber Optic and Related Technologies for Environmental Sensing Applications—</b> J. W. GRIFFIN AND K. B. OLSEN	311
---	-----

## DETERMINATION OF HYDRAULIC PARAMETERS

<b>Measurement of Gas Permeability Through Clay Soils—M. T. IZADI AND R. W. STEPHENSON</b>	331
<b>A Comparison of Field and Laboratory Measurements of Hydraulic Measurements of Hydraulic Conductivity—M. PICORNELL AND A. GUERRA</b>	346
<b>Measurement of Hydraulic Conductivity in Clay Using Push-In Piezometers— A. J. LUTENEGGER AND D. J. DeGROOT</b>	362

## STATISTICAL EVALUATION OF GROUND-WATER DATA

<b>Assessing the Usability of Historical Water-Quality Data for Current and Future Applications—G. M. SPREIZER, T. J. CALABRESE, AND R. S. WEIDNER</b>	377
<b>An Alternative Data Evaluation Technique for Detecting Disposal Site Leakage Events—R. H. PLUMB, JR.</b>	391
<b>Considerations in Selecting Indicator Parameters for the Statistical Evaluation of Ground-Water Quality—E. F. PASTOR AND D. R. FRICK</b>	411
<b>Author Index</b>	427
<b>Subject Index</b>	429

# Overview

The three-day symposium on Ground Water and Vadose Zone Monitoring was held to evaluate the experiences gained in the 1980s in ground-water and vadose zone monitoring technology and to examine the expectations for the 1990s. The symposium was broken down into nine sessions, which were as follows:

- **Session I**—Improving the Quality of Ground-Water Investigations
- **Session II**—Surface and Borehole Geophysics in Ground-Water Investigations
- **Session III**—Vadose Zone Investigation Methods
- **Session IV**—Soil Vapor Migration, Monitoring & Remediation
- **Session V**—Statistical Evaluations of Ground-Water Data
- **Session VI**—Direct Push Technology in Ground-Water Investigations
- **Session VII**—Ground-Water Monitoring Well Design and Installations
- **Session VIII**—Ground-Water Sampling & Sample Analysis
- **Session IX**—Miscellaneous Field Methods Used in Ground-Water Investigations

The papers contained in this Special Technical Publication (STP) represent a collection of some of the information being used to develop standards for the rapidly growing and evolving field of ground-water and vadose-zone monitoring. The intent of the symposium was to foster interdisciplinary communication and to make available state-of-the-art technology to those scientists and engineers engaged in ground-water and vadose-zone monitoring. A side benefit, but an important one, is that some of the papers may be useful in developing acceptable standards.

The papers published herein received at least three peer reviews and were reviewed by the editors following revisions of papers by the authors. The editors express appreciation to the reviewers who assisted so much in assuring the quality of papers in this STP. Appreciation also is expressed to the speakers at the symposium, the authors who prepared, revised, and provided final papers for publication, and the ASTM staff and officers of Committee D-18.

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