ENGINEERING GEOLOGY FIELD MANUAL

SECOND EDITION

VOLUME II

2001

U.S. Department of the Interior
Bureau of Reclamation

The Mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to tribes.

The Mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Acknowledgments for Second Edition Volume 2

The original compilation and preparation of this manual involved many engineering geologists, geophysicists, and engineers within Reclamation. Their input is greatly appreciated. This second edition incorporates comments on the first edition and technological changes since the first edition was prepared approximately 13 years ago. Without the comments and input from the Denver, Regional, and Area Offices, the revision would not have happened. Special thanks to Sam Bartlett for his support and input throughout the preparation of the second edition and to James Krulik who saw to the completion of this edition.

Although there are too many people to acknowledge individually who contributed to the revisions and the second edition, Jack Cunningham, Robert Bianchi, Jeff Farrar, David Gillette, Sandy Kunzer, Richard Markiewicz, Ronald Pearson, Peter Rohrer, Ulrich Schimschal, and Andy Viksne made especially significant contributions. Mark McKeown made notable contributions, wrote several new chapters, and edited the second edition.

Continued recognition is given to Jerry S. Dodd who initiated the manual; Jerry's successor, Newcomb Bennett, who kept the manual moving; and to Steve D. Markwell, who saw the first edition completed. We extend our thanks and appreciation to Louis R. Frei, who helped establish and document many geological standards of practice; to Richard H. Throner, who wrote much of the original manual and assembled and served on committees for preparation and review; to Sam R. Bartlett, who compiled and printed the early loose leaf version of the manual; and to Mel Hill, who completed the publication of the first edition. To the Regional Geologists and their staffs and the many geotechnical engineers who offered comments incorporated into the manual, we extend our thanks and appreciation for their work as well. The manual would not be complete without the drawings and figures; to the engineering and physical science technicians we extend our gratitude and thanks. We further acknowledge Robert Rood and Patty Alexander, the technical writers who assisted in the editing and helped prepare the manual for printing.

FOREWORD
TO THE SECOND EDITION
VOLUME 2

Approximately 13 years have gone by since the first edition of the manual was published, and technology, methodology, and missions have changed significantly. This second edition incorporates many modifications and additions. The Global Positioning System (GPS) has revolutionized how we survey and locate ourselves in the field, computers are used extensively to collect and evaluate data, and computer aided modeling, design, and drafting are almost universal. Reclamation's current mission places greater emphasis on maintenance and safety of infrastructure, dam safety analyses and modifications, and water resource management than on design and construction of new hydraulic structures. Techniques for these activities are reflected in this edition.

A few of this edition's most significant changes to the manual are the addition of a section on water testing for grouting, an expanded chapter on permeability testing, a chapter on the global positioning system, a significantly modified chapter on rip rap, a chapter on foundation preparation, treatment, and cleanup, a chapter on waxing, preserving, and shipping samples, and an index to facilitate finding relevant information. Many other suggested revisions and improvements collected since the manual was first published also are incorporated. Volume I contains material commonly needed in the field, and Volume II includes reference and supplementary information and materials.

As in the first edition, the *Engineering Geology Field Manual* presents the practices for the collection of geologic data obtained by the Bureau of Reclamation. The manual establishes common guidelines, procedures, and concepts for the collection, evaluation, and presentation of geologic information. The analysis of geologic conditions, the

preparation of designs and specifications, and effective monitoring of construction require consistent, comprehensive, and timely geologic information. The use of these guidelines by all Reclamation engineering geologists collecting, documenting, evaluating, and presenting geological and geotechnical data promotes consistency, helps assure that the required evaluations and data are complete, and promotes integration and coordination of geological and engineering activities.

The *Engineering Geology Field Manual* forms the basis for the mutually beneficial exchange of ideas by geologists and engineers. Experienced geologists will find useful reminders, new procedures, and special techniques, while less experienced engineering geologists and those from other disciplines can use the manual to expand their familiarity with geology as practiced in the geotechnical field.

Review and comments on the manual are encouraged, and if you have comments or suggested additions, please forward them to the Engineering Geology Group at Reclamation's Technical Service Center.

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