

ENGINEERING
GEOLOGY
FIELD
MANUAL

SECOND EDITION

VOLUME I

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FIELD
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**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.

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Acknowledgments for Second Edition

The original compilation and preparation of this manual involved many engineering geologists and geophysicists 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 10 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, Engineering Geology Group 1 Manager, for his support and input throughout the preparation of the manual.

Although there are too many people to acknowledge individually who contributed to the revisions and the second edition, Frank Calcagno, Mel Hill (retired), Sandy Kunzer, Jeff Farrar, Sharon Hebenstreit, Linda Arrowwood, and Peter Rohrer made especially significant contributions. Mark McKeown contributed to and edited the second edition.

Continued recognition is given to Jerry S. Dodd (retired), who initiated the manual; Jerry's successor, Newcomb Bennett (retired), who kept the manual moving; and to Steve D. Markwell (retired), 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, and to Richard H. Throner, who wrote much of the original manual, who 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 that have been 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.

FOREWORD TO THE SECOND EDITION

Approximately 10 years have gone by since the first edition was published, and technology 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 has a 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 and environmental restoration/hazardous waste remediation activities are reflected in this edition.

A few of the most significant changes to the manual are the addition of a section on concrete core logging, a chapter on hazardous waste site investigations, and an index to facilitate finding relevant information. Many other suggested revisions and improvements collected since the manual was first published also are incorporated. *The manual now is in two volumes.* Volume I contains material commonly needed in the field, and Volume II includes reference or other material.

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 construction monitoring and use of geological information to assess site characteristics and risk, 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, in conjunction with the Engineering Geology Office Manual, forms the basis for the mutually beneficial exchange of ideas by Reclamation geologists. Experienced geologists will find useful reminders and 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 Bureau of Reclamation.

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

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Leadership Team Member
Geotechnical Services