

FOREWORD

Robert C. MacArthur, Charles R. Neill and Marcelo H. Garcia

It is increasingly evident that global water and soil resources require significantly increasing efforts in management and preservation in order to meet present and future needs for human consumption and ecological balance. In many regions of the world, these resources are adversely affected by water or wind erosion of rocks and soils, by the consequent transport of sediment by streams and rivers, by the deposition of riverborne sediment in lakes, reservoirs, estuaries and seas, and by the incorporation or concentration of contaminants and toxic substances in sediments. This series of processes is often referred to briefly as *sedimentation*. Their investigation, evaluation and treatment in the context of civil engineering and public works facilities is commonly referred to as *sedimentation engineering*.

As distinct from articles and reports on specific aspects of sedimentation, one of the first English-language books to attempt a comprehensive treatment in a civil engineering context was ASCE's Manual 54, *Sedimentation Engineering*, edited by the late Professor Vito Vanoni with a long list of contributors, and published in 1975 after more than a decade of preparatory work. The 1975 manual describes and analyzes soil erosion and sediment yields, properties of sediment, sediment transport under the action of water and wind, techniques of sediment measurement, methods of sediment control in engineering works, and economic and legal aspects of sedimentation engineering. Manual 54 remains an important and reliable reference on many aspects of sedimentation engineering, but in other aspects it has become out-dated by advances in knowledge and by the emergence of new problems, issues and methods for assessing them. In terms of key issues at the beginning of the twenty-first century, perhaps the most notable missing material in the 1975 Sedimentation Engineering Manual relates to environmental and ecological problems associated with sedimentation and other significant topics such as river restoration and reservoir sedimentation. This is not surprising since most sediment-related environmental concerns were in their early stages at the time the original manual was being prepared.

Since the publication of Manual 54, extensive advances have been made in methods of investigation, measurement and analysis, including the extensive use of computer modeling procedures that are becoming increasingly more reliable to simulate sediment transport dynamics. Today more is known about fluvial transport of coarse sediment mixtures, erosion of cohesive and semi-cohesive materials, bridge-pier scour, reservoir sedimentation, river morphodynamics and about sedimentation hazards including debris torrents, mudflows and hyper-concentrated flows. Multidisciplinary research has expanded the understanding of linkages between fluvial processes and ecological responses, while sediment engineering studies are increasingly accepted and relied upon as necessary input to schemes for water resource development and for environmental restoration or enhancement. Perhaps most significant of all, the ecology and morphology of streams and the transport of contaminants has emerged as a major rationale for many sediment studies and are now essential considerations in project planning, design and permit consideration.

Moves towards the present publication began with the formation in 1991 of a *Task Committee to Expand and Update ASCE Manual 54* under the formulation and leadership of Dr. Robert MacArthur, then with the Corps of Engineers' Hydrologic Engineering Center in Davis, CA. In 1999, by which time initial drafts had been prepared for ten chapters, Professor Marcelo Garcia of the University of Illinois at Urbana-Champaign was appointed as Chief Editor, with the vision of a new volume of the Manual that would utilize state-of-the-art information published in ASCE's *Journal of Hydraulic Engineering* and other internationally recognized sources such as the IAHR Journal of Hydraulic Research. Realizing the monumental effort required to prepare a complete revision of the original Manual 54, it was decided that the new publication should be treated as a companion to its progenitor, which would be made available again through a new printing to be known as the Classic Edition (Vanoni, 2006).

This companion volume, designated Manual of Practice 110, *Sedimentation Engineering: Processes, Measurements, Modeling, and Practice*, consists of 23 chapters and 6 appendices covering selected topics — generally, those where important advances have been made since 1975, or topics that were not addressed at that time. The list of topics covered is not necessarily comprehensive, having been limited by constraints on the availability and time of writers. Significant matters that are not addressed include wind-induced erosion and transport and sediment transport in pipes (treated in Manual 54) and the field of coastal erosion and sedimentation (not addressed in Manual 54 or Manual 110).

This Manual 110 includes contributions from internationally recognized experts in various fields of sedimentation science and engineering. Lists of persons involved in preparing and writing this Manual are provided below. All parts of the manual have been subjected to extensive review and technical editing, and all writers and reviewers have operated either on a voluntary basis or with the support of their employing organizations.

Marcelo H. García
Editor of Manual of Practice 110
Past Chair, ASCE Sedimentation Committee

ORIGINAL ASCE TECHNICAL COMMITTEE TO REVISE MANUAL 54 (FORMED IN MAY 1991)

Robert C. MacArthur	Chair, ASCE Committee to Revise Manual 54; Past Chair, ASCE Sedimentation Committee
Brad R. Hall	Past Chair, ASCE Sedimentation Committee
William A. (Tony) Thomas	Original Control Member
Howard Chang	Original Control Member
Jeffrey B. Bradley	Original Control Member
Sam S.Y. Wang	Original Control Member
Vito A. Vanoni*	Special Advisor to the Task Committee
Norman H. Brooks	Advisor
Ray B. Krone*	Advisor
John F. Kennedy*	Advisor
Daryl B. Simons*	Advisor
Steven R. Abt	Original ASCE Executive Committee Contact
George W. Annandale	Corresponding Member
Dallas Childers*	Corresponding Member
Richard French	Corresponding Member
Vic J. Galay	Corresponding Member
G. Douglas Glysson	Corresponding Member
Douglas Hamilton	Past Chair, ASCE Sedimentation Committee
Forrest Holly, Jr.	Corresponding Member
Peter C. Klingeman	Corresponding Member
Gregory Morris	Corresponding Member
Charles R. Neill	Corresponding Member
Hasan Nouri	Corresponding Member
Stanley Schumm	Corresponding Member
James E. Slosson*	Corresponding Member
David T. Williams	Corresponding Member

* *Deceased*

CONTRIBUTORS

Jorge D. Abad	University of Illinois at Urbana-Champaign
George W. Annandale	Engineering and Hydrosystems, Inc.

David S. Biedenharn	ERDC-CHL U.S. Army Corps of Engineers
Erik Bollaert	Aqua Vision Engineering, Ltd.
Deva K. Borah	Woolpert, Inc.
Jeffrey Bradley	West Consultants, Inc.
Norman H. Brooks	California Institute of Technology
Howard H. Chang	San Diego State University
Ronald R. Copeland	ERDC-CHL U.S. Army Corps of Engineers
Stephen E. Coleman	University of Auckland
Yantao Cui	Stillwater Sciences
Panayotis Diplas	Virginia Polytechnic Institute and State University
Martin W. Doyle	University of North Carolina
Thomas Edwards	U.S. Geological Survey
Robert Ettema	University of Wyoming
Richard H. French	University of Texas at San Antonio
Vic J. Galay	Northwest Hydraulic Consultants
Marcelo H. García	University of Illinois at Urbana-Champaign
Douglas Glysson	U.S. Geological Survey
John R. Gray	U.S. Geological Survey
Thomas Grindeland	West Consultants, Inc.
Hans Hadley	West Consultants, Inc.
Brad R. Hall	Northwest Hydraulic Consultants
Douglas Hamilton	Exponent, Inc.
Michael Harvey	Mussetter Engineering, Inc.
Forrest M. Holly, Jr.	Forrest Holly Associates
Miki Hondzo	University of Minnesota
Rollin H. Hotchkiss	Brigham Young University
Peter C. Klingeman	Oregon State University
Roger Kuhnle	USDA-ARS National Sedimentation Laboratory
Edward C. Krug	Illinois State Water Survey
Dennis Lyn	Purdue University
Stephen Maynard	ERDC-CHL U.S. Army Corps of Engineers
William H. McAnally, Jr.	Mississippi State University
Robert C. MacArthur	Northwest Hydraulic Consultants
Ashish J. Mehta	University of Florida
Bruce W. Melville	University of Auckland
Julianne Miller	Desert Research Institute, UNLV
Greg L. Morris	Greg L. Morris & Associates
Charles R. Neill	Northwest Hydraulic Consultants
A. Jacob Odgaard	University of Iowa
Gary Parker	University of Illinois at Urbana-Champaign
Arthur C. Parola	University of Louisville
James E. Pizzuto	University of Delaware
Clifford A. Pugh	U.S. Bureau of Reclamation
Danny D. Reible	University of Texas at Austin
E. V. Richardson	Ayres & Associates
J. R. Richardson	University of Missouri at Kansas City
Stanley Schumm	Mussetter Engineering, Inc.
F. Douglas Shields, Jr.	USDA-ARS National Sedimentation Laboratory
Gerard Shuirman	Consulting Civil Engineer
Andrey B. Shvidchenko	Northwest Hydraulic Consultants
Francisco J. M. Simões	U.S. Geological Survey
Andrew Simon	USDA-ARS National Sedimentation Laboratory
James E. Slosson	Slosson and Associates
Miodrag Spasojevic	University of Novi Sad
Nancy Steinberger	Public Works Division, City of Boulder, CO

W. Anthony Thomas	Mobile Boundary Hydraulics
Colin R. Thorne	University of Nottingham
Chester C. Watson	Colorado State University
Andrew Wilcox	Stillwater Sciences
Daniel C. Yoder	University of Tennessee

ACKNOWLEDGMENTS

The preparation and writing of MOP 110 required a substantial effort by many authors and reviewers. Contributors to the writing of MOP 110 include the following: Norman Brooks, Robert MacArthur, Brad Hall, Charles Neill, Vic Galay, Andrey Shvidchenko, Marcelo Garcia, Gary Parker, Ashish Mehta, William McAnally, Jr., Panos Diplas, Roger Kuhnle, John Gray, Douglas Glysson, Thomas Edwards, Dallas Childers*, David Biedenharn, Chester Watson, Colin Thorne, Jim Pizzuto & ASCE Task Committee on River Width Adjustment, Jacob Odgaard, Jorge Abad, Douglas Shields, Jr., Ronald R. Copeland, Peter Klingeman, Martin Doyle, Andrew Simon, J. R. Richardson, E.V. Richardson, Bruce Melville, Arthur Parola, Stephen Coleman, Greg Morris, George Annandale, Rollin Hotchkiss, Robert Ettema, W. Anthony “Tony” Thomas, Howard Chang, Miodrag Spasojevic, Forrest Holly, Jr., Dennis Lyn, Deva Borah, Edward Krug, Daniel Yoder, Stanley Schumm, Michael Harvey, Richard French, Jeffrey Bradley, Julianne Miller, Thomas Grindeland, Hans Hadley, James Slosson, Douglas Hamilton, Gerard Shurman, Danny Reible, Miki Hondzo, Nancy Steinberger, Yantao Cui, Andrew Wilcox, Erik Bollaert, Steve Maynard, Cliff Pugh, Francisco Simoes, and Lawson Smith*.

**Deceased*

Reviewers that contributed with their effort include: Gary Parker, Peter Wilcock, Jose Rodriguez, Robert MacArthur, Charles Neill, Ray Krone, Han Winterwerp, Robert Holmes, Jr., Bruce Rhoads, Steve Darby, Jorge Abad, Peter Downs, Meg Jones, David Mueller, Peggy Johnson, Juan Pedro Martin-Vide, Brian Barkdoll, David Admiraal, S. Beltaos, H. T. Shen, Sam Wang, Forrest Holly, Octavio Sequeiros, Wolfgang Rodi, Cesar Mendoza, Arthur Schmidt, Julianne Miller, Steve McCutcheon, Aaron Packman, William Dietrich, Jim Pizzuto, Tom Lisle, Steve Wiele, Gary Freeman, Thanos Papanicolau, Yovani Cataño, and Francisco Pedocchi.

A Review Panel revised and approved the publication of MOP 110. Members of the review panel included: Pierre Julien, Jeffrey Bradley, Richard French, and Rollin Hotchkiss.

Many others contributed to this work by reviewing and discussing various topics and manuscripts with the authors and committee members. ASCE/EWRI contributed guidance, support and patience for the project and arranged the final editing and publication. The support of the Department of Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign is gratefully acknowledged.