

**INDEPENDENT STUDY TO  
ASSESS FUTURE SAVINGS  
FROM MITIGATION  
ACTIVITIES**

**VOLUME II: APPENDICES**

**March 2005**



Applied Technology Council



**INDEPENDENT STUDY TO  
ASSESS FUTURE SAVINGS  
FROM MITIGATION  
ACTIVITIES**

**VOLUME II: APPENDICES**

**PREPARED FOR:**

**Multihazard Mitigation Council  
National Institute of Building  
Sciences**

**PREPARED BY:**

**Applied Technology Council  
FEMA Contract No.  
EMW-1998-CO-0217  
Task Order 010**

**March 2005**



Applied Technology Council



## Acknowledgements

The following people contributed to this report.

### PROJECT TEAM

*Project Manager:* Thomas R. McLane, Applied Technology Council, Arlington, VA  
*Project Director:* Ronald T. Eguchi, ImageCat, Inc., Long Beach, CA  
*Community Studies Leader:* Elliott Mittler, Consultant, Woodland Hills, CA  
*Community Studies Co-Leader:* Craig Taylor, Natural Hazards Management, Inc., Torrance, CA  
*National Benefit-Cost Analysis Leader:* Adam Z. Rose, The Pennsylvania State University, University Park, PA  
*National Benefit-Cost Analysis Co-Leader:* Keith Porter, Consultant, Pasadena, CA  
Corey Barber, University of California, Berkeley, Berkeley, CA  
Jawhar Bouabid, PBS&J, Atlanta, GA  
Linda B. Bourque, University of California, Los Angeles, Los Angeles, CA  
Stephanie Chang, University of British Columbia, Vancouver, BC Canada  
Nicole Dash, University of North Texas, Denton, TX  
James Delahay, LBYD, Inc., Birmingham, AL  
Charles Huyck, ImageCat, Inc., Long Beach, CA  
Christopher Jones, Consultant, Durham, NC  
Megumi Kano, University of California, Los Angeles, Los Angeles, CA  
Karl Kappler, University of California, Berkeley, Berkeley, CA  
Lukki Lam, University of California, Berkeley, Berkeley, CA  
Rebecca Quinn, Consultant, Annapolis, MD  
Christopher Rojahn, Applied Technology Council, Redwood City, CA  
Archana More Sharma, University of California, Los Angeles, Los Angeles, CA  
Kenneth Strzepek, University of Colorado at Boulder, Boulder, CO  
John Whitehead, Appalachian State University, Boone, NC  
Michele M. Wood, University of California, Los Angeles, Los Angeles, CA  
Kathryn Woodell, University of California, Berkeley, Berkeley, CA  
Bo Yang, The Pennsylvania State University, University Park, PA

### INTERNAL PROJECT REVIEW TEAM

*Chair:* William Petak, University of Southern California, Los Angeles, CA  
David Brookshire, University of New Mexico, Albuquerque, NM  
Stephanie King, Weidlinger Associates, Inc., Los Altos, CA  
Dennis Mileti, University of Colorado at Boulder, Rancho Mirage, CA  
Doug Plasencia, AMEC Earth and Environmental, Tempe, AZ  
Zan Turner, City and County of San Francisco, San Francisco, CA

### CONSULTANTS

James R. McDonald, McDonald-Mehta Engineers, Lubbock, TX  
Bruce Miya, Consultant, Salt Lake City, UT  
Douglass Shaw, Texas A&M University, College Station, TX

## **CONTRIBUTORS OF DATA AND SOURCE MATERIALS**

Alan Escobar, Small Business Administration, Washington, DC  
Jeffrey Jensen, U.S. Army Corps of Engineers, Washington, DC

## Table of Contents

### *List of Appendices*

Acknowledgements.....	iii
A. Community Studies: Data Collection Guidelines and Questionnaire Specifications.....	1
B. Demographic Characteristics of Communities .....	39
C. Casualty Estimation Methodology.....	47
D. Property Loss Estimation – Flood .....	55
E. Property and Casualty Loss Estimation – Tornado .....	71
F. Business Interruption Benefits –Electricity and Water Utilities.....	73
G. Environmental and Historic Benefit Estimation .....	77
H. Process Grant Benefit Estimation .....	81
I. Base-Isolated Buildings Loss Estimation .....	91
J. Debris Flow Damage Estimation.....	93
K. Assumptions and Limitations .....	95
L. Community Selection Process.....	103
M. Project Impact .....	113
N. Combined Sampling and Modeling Uncertainty.....	149
O. Bibliography of Community Documents.....	153