

RESUME OF HOWARD H. CHANG

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Date of Birth: November 12, 1939

I. EDUCATION

B.S. in Civil Engineering, National Cheng Kung University, Taiwan, China, 1962.

M.S. in Civil Engineering, Colorado State University, 1965.

Ph.D. in Civil Engineering (Hydraulics, Hydrology, Sedimentation), Colorado State University, 1967.

II. MEMBERSHIP IN HONORARY AND PROFESSIONAL SOCIETIES

Chi Epsilon Fraternity (Civil Engineering Honorary)

Tau Beta Pi Society (Engineering Honorary)

Sigma Xi (Scientific Research)

Phi Kappa Phi (Scholarship)

Phi Beta Delta (International Scholars)

American Men of Science (1971)

American Society of Civil Engineers

American Institute of Aeronautics and Astronautics: Member 1968, Associate Fellow, 1972

Professional Civil Engineer, California and Arizona

American Academy of Water Resources Engineers

Sedimentation Committee of the American Society of Civil Engineers, 1977-1981

Chairman of the Civil Engineering Department, San Diego State University, 1976-1979

Who's Who in Technology Today, 1982-83

International Who's Who in Engineering, 1st Edition, Cambridge, England, 1984

Who's Who in California, 1989

National Research Council, National Academy of Sciences, 1984-1987

Associate Editor, Journal of Hydraulic Engineering, ASCE, 1985-1987

Task Committee on Flood Hazard Analysis on Alluvial Fans, ASCE, 1987-1989;

Chairman of subcommittee on erodible channels

International Scientific Committee, International Symposium on Sediment Transport Modeling, 1989

Conference Chair, 1990 National Conference on Hydraulic Engineering, ASCE, San Diego, CA

Expert Consultant to Committee on Glen Canyon Environmental Studies, Water Resources and Technology Board, National Academy of Sciences, Washington, D.C. 1991

Committee on Drainage Manual Revision for City of San Diego, 1993

Ph.D. Examination Committee, Hydraulic Engineering, Royal Institute of Technology, Sweden, May 1993

Member of National Cooperative Highway Research Program Project Panel E24-8, National Research Council, 1994-95

Panel member of National Cooperative Highway Research Program Project “Expert System for Bridge Scour and Stream Stability”, National Research Council, 1995-97

Organizing Committee member of the 20th Annual Conference for the Association of State Floodplain Managers, June 10-14, 1996, San Diego

Member of Scientific Advisory Group on Flooding to the San Diego County Board of Supervisors, 997-98

Chair of National Cooperative Highway Research Program Project Panel 24-16 on Methodology for Migration of River Channels, National Research Council, 1997-99

Member of the Federal Emergency Management Agency committee on Riverine Erosion Hazard Area, 1998-1999

Honorary Faculty of the Wuhan University of Hydraulic and Electrical Engineering, Wuhan, China, 1998

Expert Consultant to the Yangtze Science Institute in Wuhan, China, technology transfer for studying river channel changes affected by the Three Gorges Dam Project which is the largest engineering project in the world, 1998

Member of the Editorial Board, International Journal of Sediment Research, since 1999, Beijing, China

Honorary Faculty of Sichuan University, Chengdu, China, 1999-2003

Member of the Editorial Board, Journal of Floodplain Management, since 1999, Costa Mesa, California

Consultant for World Bank loaned Yangtze River Dike Strengthening Project, Wuhan, China, 2004

Director of the Fairbanks Ranch Community Services District, 2004

III. AWARDS

Outstanding Faculty Award (for teaching excellence) by the Tau Beta Pi Society, School of Engineering, San Diego State University, Dec. 1969.

Outstanding Contribution to Aerospace Engineering Award (for research achievements in fluid dynamics and aerodynamics) by the San Diego Section of AIAA, May 1970.

Outstanding Contribution to the Institute at the Sectional Level (for outstanding services), AIAA, San Diego Section, May 1973.

Outstanding Faculty Award, in recognition of the selection as the most influential university professor in Civil Engineering, San Diego State University, May 1981.

Outstanding Faculty Award of the University, Selected by the University President upon recommendation of the faculty Senate, awarded by the San Diego State University Alumni and Associates, 1981.

Outstanding Civil Engineering Achievement Award, co-recipient of this award with the Flood Plain Management Program of the County of San Diego, awarded by the San Diego Section of ASCE, 1982.

Exceptional Merit Service Award, monetary award by the President of San Diego State University for the 1982-83 academic year.

Outstanding Faculty Award, in recognition of the selection as the most influential university professor in Civil Engineering, San Diego State University, May 1984.

Outstanding Service Award, for service on the Board of Directors of the San Diego State University Foundation, October 1985.

Meritorious Performance and Professional Promise Award, monetary award by the President of San Diego State University, 1986, 1987, 1989.

Outstanding Faculty Award, in recognition of the selection as the most influential university professor in Civil Engineering, San Diego State University, May 1988.

Outstanding Civil Engineering Project Award, on the hydraulic design of environmental flood control channel *First San Diego River Improvement Project*, awarded by the San Diego Section of ASCE, 1990.

Outstanding Advising Award, selected by students of Chi Epsilon Honorary Society for Civil Engineering at San Diego State University, May 1991

Outstanding Faculty Award, in recognition of the selection as the most influential university professor in Civil Engineering, San Diego State University, May 1991.

Outstanding Advising Award, selected by students of Chi Epsilon Honorary Society for Civil Engineering at San Diego State University for 1991-92, December 1992

Orchid Award for environmental solution to the First San Diego River Improvement Project, by American Institute of Architects, et al., November, 1992

Outstanding Faculty Award, in recognition of the selection as the most influential university professor in Civil Engineering, San Diego State University, May 1993.

Outstanding Faculty Award of the University, Selected by the University President upon recommendation of the faculty Senate, awarded by the San Diego State University Alumni and Associates, 1994.

Outstanding Faculty Award, in recognition of the selection as the most influential university professor in Civil Engineering, San Diego State University, May 1994.

Keynote speaker at the International Symposium on River Waterfront Development on Computer-Aided Design for River Channel Stabilization, Nile Research Institute, Egypt, Sept. 16, 1994.

Outstanding Faculty Award, in recognition of the selection as the most influential university professor in Civil Engineering, San Diego State University, May 1995.

Best Paper Award, for the paper “Operation Rule to Maintain Long-Term Sediment Balance in Reservoirs”, with Tu, Geary, and Lee, at the Hydro Power of 95 Conference, San Francisco, May, 1995.

Outstanding Civil Engineering Project Award of Merit, on the hydraulic design of *Flood Control Stabilization Structure*, awarded by the San Diego Section of ASCE, June 1995.

Achievement in Academics Award, recognizing contributions to engineering through education, leadership and service, awarded by the College of Engineering, Colorado State University, September, 1995.

Outstanding Faculty Award, in recognition of the selection as the most influential university professor in Civil Engineering, San Diego State University, May 1996.

Outstanding Civil Engineering Project Award, on the hydraulic design of Labaja Bridge, awarded by the San Diego Section of ASCE, June 1996.

Outstanding Faculty Award, in recognition of the selection as the most influential university professor in Civil Engineering, San Diego State University, May 1997.

Outstanding Faculty Award, in recognition of the selection as the most influential university professor in Civil Engineering, San Diego State University, May 1998.

Outstanding Teaching Award, College of Engineering, San Diego State University, May 1998.

Outstanding Project Award for Rose Creek Bridge replacement, co-recipient of the award with Simon Wong Engineering, awarded by the San Diego Section of ASCE, May 2003.

Honorary Member (for Technical Leadership and Teaching Skills), San Diego Section of the American Society of Civil Engineers, 2007.

Lifetime Achievement Award in the State of California, given by the American Society of Civil Engineers, at the Annual Awards Banquet in Sacramento, CA, February 24, 2009.

IV. TEACHING

Courses Taught at San Diego State University

E 120 Engineering Problem Analysis (Digital Computers);

E 420 Intermediate Engineering Problem Analysis;

E 510 Methods of Analysis;

EM 340 Fluid Mechanics;

EM 341 Fluid Mechanics Laboratory;

EM 540 Intermediate Fluid Mechanics;

EM 541 Hydrodynamics;

CE 444 Applied Hydraulics;

CE 445 Applied Hydrology;

CE 495 Civil Engineering Design
CE 499 Special Study;
CE 530 Open Channel Hydraulics;
CE 600 Seminars in Water Resources Engineering;
AE 612 Supersonic Flow Theory;
CE 638 Sedimentation and River Engineering;
EM 744 Advanced Fluid Mechanics II;
Review for Engineering Registration

Laboratory Development: Fluid Mechanics Laboratory from September 1967 to September 1973. Some major pieces of equipment were acquired, including the water table, the Coanda table, the hydraulic bench, the small wind tunnel, the spin table, etc. Several new experiments were developed and added to the instructional program.

Soil Erosion Research Laboratory from January 1998 to present. The 2,000 square feet indoor space houses a test bed 3 m by 10 m with artificial rainfall, designed to emulate the natural rainfall with respect to drop-size distribution, drop fall velocity, and rainfall intensity and duration. The slope of the test bed can be raised up to 26.6° . The experimental study covers erosion rates of various soils and surface conditions.

V. DEVELOPMENT OF COMPUTER MODELS

Dr. Chang is the developer of the FLUVIAL-12 model for river sedimentation and channel changes. The model has been extensively tested and calibrated by field data. It has been applied to over 100 river studies. This model is also adopted by the Chinese National Academy of Sciences for use on the Yangtze River.

Dr. Chang has also developed models for sediment yield analysis, hydrologic simulation, and culvert hydraulics.

VI. BOOKS AND CHAPTERS

Chang, H. H., *Fluvial Processes in River Engineering*, John Wiley & Sons, February 1988, 432 pp. Known adoptions as a graduate text: Johns Hopkins University, Purdue University, McGill University in Canada, University of Iowa, University of Colorado, Clarkson University, University of Canterbury in New Zealand, South Dakota State University, Chengdu University, Washington State University, Brigham Young University, Clemson University, University of Nebraska, University of Kentucky, University of Maryland, University of Alaska, Concordia University in Montreal Canada, Virginia Tech, Oregon State University, University of Idaho, Tennessee Technological University, Ferdowsi University and Tarbiat Modares University in Iran, National University of Lisbon in Portugal, California State University at Fullerton, Technical University of Nova Scotia, Universiti Sains Malaysia, and Taiwan Chung Hsing University. The Chinese translation is published by the Science Press, Beijing, 1990.

Chang, H. H. and Hill, J. C., Editors, *Hydraulic Engineering*, Proceedings of the 1990 National Conference on Hydraulic Engineering, American Society of Civil Engineers, New York, NY, 1204 pp.

Chang, H. H., and McCracken, H., 1975, "Bucket Rotor Wind-Driven Generator", *Energy Book No. 1*, edited by John Prentis, Running Press, p.27. Also in Wind Energy Conversion Systems, NSF/RA/W-73-006, December 1973. Also presented at NSF/NASA Wind Energy Workshop, June 11-13, 1973, Washington, D. C.,

Chang, H. H., 1987, "Modeling Fluvial Processes in Streams with Gravel Mining," in *Sediment Transport in Gravel-Bed Rivers*, Thorne, et al. editors, John Wiley & Sons, pp. 977-988. Also presented at the Intern. Workshop on Problems of Sediment Transport in Gravel-Bed River, Colorado State University, August 12-17, 1985.

Chang, H. H., Moncrief, J., and Dyck, R. I. J., "Changes in Channel Morphology Induced Sand Mining", *Recent Research Developments in Hydrology, Research Signpost*, Trivandrum, Kerala State, India, 1996.

Thomas, W. A., and Chang, H. H., "Computational Modeling of Sedimentation Processes", Chapter 14, *Sedimentation Engineering*, ASCE Manuals and Reports for Engineering Practice, No. 110, 2008.

VII. REFEREED JOURNAL PUBLICATIONS

Chang, H. H., and Waidelich, J. P., 1970, "A Mathematical Model for the Behavior of Thrust Reversers", *Journal of Aircraft*, 164-168. Also presented at the AIAA 7th Aerospace Sciences Meeting, New York, Jan. 1969.

Chang, H. H., and Simons, D. B., 1970, "Bed Configuration of Straight Alluvial Channels When the Flow is Nearly Critical", *Journal of Fluid Mechanics*, 42(3), 491-495.

Chang, H. H., Simons, D. B., and Woolhiser, D. A., 1971, "Flume Experiments on Alternate Bar Formation", *Journal of the Waterways, Harbors and Coastal Engineering Division*, ASCE, 97(WW1), 155-165. Closure in 99(WW1), 1973, 127-128.

Chang, H. H., and Conly, J. F., 1971, "Potential Flow of Segmental Jet Deflectors", *Journal of Fluid Mechanics*, 46(3), 465-475.

Chang, H. H., and Hill, J. C., 1976, "Computer Modeling of Erodible Flood Channels and Deltas", *Journal of the Hydraulics Division*, ASCE, 102(HY10), 1461-77. Closure in 104(HY9), 1978, 1355-6.

Chang, H. H., and Hill, J. C., 1977, "Minimum Stream Power for Rivers and Deltas", *Journal of the Hydraulics Division*, ASCE, 103(HY12), 1375-89. Closure in 104(HY12), 1978, 1678-81.

Chang, H. H., 1978, Discussion of "Mathematical Modeling of Scour and Deposition", *Journal of the Hydraulics Division*, ASCE, 104(HY9), 1360-61.

Chang, H. H., 1979, "Geometry of Rivers in Regime", *Journal of the Hydraulics Division*, ASCE, 105(HY6), 691-706.

Chang, H. H., 1979, "Minimum Stream Power and River Channel Patterns", *Journal of Hydrology*,

41, Elsevier Scientific Publishing Co., Amsterdam, The Netherlands, 303-327.

Chang, H. H., 1980, "Stable Alluvial Canal Design", *Journal of the Hydraulics Division ASCE*, 106(HY5), 873-891.

Chang, H. H., 1980, "Geometry of Gravel Streams", *Journal of the Hydraulics Division, ASCE*, 106(HY9), 1443-56. Closure in 108(HY2), 1982, P. 298.

Chang, H. H., 1982, "Mathematical Model for Erodible Channels", *Journal of the Hydraulics Division, ASCE*, 108(HY5), 678-689. Closure in 109(HY4), 655-656.

Chang, H. H., 1982, "Fluvial Hydraulics of Deltas and Alluvial Fans", *Journal of the Hydraulics Division, ASCE*, 108(HY11), 1282-1295.

Lane, L. J., Chang, H. H., Graf, W. L., Grissinger, E. H., Guy, H. P., Osterkamp, W. R., Parker, G., and Trimble, S. W., 1982, "Relationships between Morphology of Small Streams and Sediment Yield", *Journal of the Hydraulics Division, ASCE*, 108(HY11), 1328-65.

Chang, H. H., 1983, "Energy Expenditure in Curved Open Channels", *Journal of Hydraulic Engineering, ASCE*, 109(7), 1012-22. Closure in 110(6), 1984, p. 865.

Chang, H. H., 1984, "Analysis of River Meanders", *Journal of Hydraulic Engineering, ASCE*, 110(1), 37-50.

Chang, H. H., 1984, "Modeling of River Channel Changes", *Journal of Hydraulic Engineering, ASCE*, 110(2), 157-172. Closure in 113(2), 1987, 265-267.

Chang, H. H., 1984, "Modeling General Scour at Bridge Crossings", *Transportation Research Record*, 950, Vol. 2, 238-243. Also presented at the Second Bridge Engineering Conference, Transportation Research Board, Minneapolis, Minnesota, September 24-26, 1984.

Chang, H. H., 1984, "Regular Meander Path Model", *Journal of Hydraulic Engineering, ASCE*, 110(10), 1398-1411. Closure in 113(3), 1987, 407-409.

Chang, H. H., 1984, Comment on "Extremal Hypotheses for River Regime: An Illusion of Progress," by George A. Griffiths, *Water Resources Research*, 20(11), 1767-68.

Chang, H. H., 1984, "Variation of Flow Resistance through Curved Channels", *Journal of Hydraulic Engineering, ASCE*, 110(12), 1772-82.

Chang, H. H., 1984, "Meandering of Underfit Streams", *Journal of Hydrology*, Elsevier Science Publishers B.V., Amsterdam, 75, 311-322.

Chang, H. H., 1985, "River Morphology and Thresholds", *Journal of Hydraulic Engineering, ASCE*, 111(3), 503-519.

Chang, H. H., 1985, "Design of Stable Alluvial Canals in a System", *Journal of Irrigation and Drainage Engineering, ASCE*, 111(2), 36-44.

Chang, H. H., 1985, "Water and Sediment Routing through Curved Channels", *Journal of Hydraulic Engineering*, ASCE, 111(4), 644-658.

Chang, H. H., 1985, "Channel Width Adjustment during Scour and Fill", *Journal of Hydraulic Engineering*, ASCE, 111(10), 1368-70.

Chang, H. H., 1985, "Formation of Alternate Bars", *Journal of Hydraulic Engineering*, ASCE, 111(11), 1412-20.

Chang, H. H., 1986, "River Channel Changes: Adjustments of Equilibrium", *Journal of Hydraulic Engineering*, ASCE, 112(1), 43-55.

Stow, D. A., and Chang, H. H., 1987, "Coarse Sediment Delivery by Coastal Streams to the Oceanside Littoral Cell, California," *Journal of the American Shore and Beach Preservation Association*, 55(1), 30-40.

Chang, H. H., 1987, Comment on "Modeling of Alluvial Channels", by Dawdy and Vanoni, *Water Resources Research*, 23(11), 2153-2155.

Stow, D. A., and Chang, H. H., 1987, "Magnitude-Frequency Relationship of Coastal Sand Delivery by a Southern California Stream", *Geo-Marine Letters*, an International Journal of Marine Geology, 23(1), 217-222.

Chang, H. H. and Stow, D., 1988, "Sediment Transport Characteristics of a Coastal Stream", *Journal of Hydrology*, Elsevier Science Publishers B. V., Amsterdam, 99, 201-214.

Chang, H. H. and Osmolski, Z., 1988, "Fluvial Design of River Bank Protection", *Hydrosoft*, Computational Mechanics Publications, U. K. 1(2), 88-92.

Chang, H. H. and Osmolski, Z., 1988, "Computer-Aided Design for Channelization", *Journal of Hydraulic Engineering*, ASCE, 114(11), 1377-1389.

Chang, H. H. and Stow, D., 1989, "Mathematical Modeling of Fluvial Sediment Delivery", *Journal of Waterway, Port, Coastal, and Ocean Engineering*, ASCE, 115(3), 311-326.

Chang, H. H., 1990, "Hydraulic Design of Erodible-Bed Channels", *Journal of Hydraulic Engineering*, ASCE, 116(1), 87-101.

Webb, C. K., Stow, D. A., and Chang, H. H., 1991, "Morphodynamics of Southern California Inlets", *Journal of Coastal Research*, 7(1), 167-187.

Zhou, J., Chang, H.H., and Stow, D., 1993, "A Model for Phase Lag of Secondary Flow in River Meanders", *Journal of Hydrology*, 146, pp. 73-88.

Chang, H. H., 1994, "Selection of Gravel-Transport Formula for Stream Modeling", *Journal of Hydraulic Engineering*, ASCE, Vol. 120, No. 5, May, pp. 646-651.

Chang, H. H., Harrison, L., Lee, W., and Tu, S., 1996, "Numerical Modeling for Sediment-Pass-Through Reservoirs", *Journal of Hydraulic Engineering*, ASCE, Vol. 122, No. 7, pp. 381-388.

Chang, H. H., 1997, "Modeling Fluvial Processes in Tidal Inlet", *Journal of Hydraulic Engineering*, ASCE, Vol. 123, No. 12, pp. 1161-1165.

Chang, H. H., 1998, "Riprap Stability on Steep Slopes", *International Journal of Sediment Research*, Beijing, China, Vol. 13, No. 2, June, pp. 40-49.

Chang, H.H., "River Engineering", *Encyclopedia of Science & Technology*, McGraw-Hill Inc., New York, NY, 2000.

Chang, H. H., Grove, R., and Pearson, D., 2001, "Modeling Changes in an Ephemeral Coastal River", *Journal of Floodplain Management*, Floodplain Management Association, Vol. 2, No. 2, April, pp. 17-28.

Chang, H. H., Pearson, D., and Tanious, S., "Lagoon Restoration near an Ephemeral River Mouth", *Journal of Waterways, Ports and Coastal Engineering*, ASCE, March 2002, pp79-87.

Chang, H. H., "Sediment Transport Modeling for Stream Channel Scour Below a Dam", *Applied Engineering in Agriculture*, Vol 17(6), ASAE, Paper No. SW3684, 2002, pp94-96.

Chang, H. H., Tanious, S., and Pearson, D., "Flood Level Computation for Ephemeral Coastal Streams", *Journal of Floodplain Management*, Floodplain Management Association, Vol. 3, No. 1, June 2002, pp. 9-16.

Huang, H. Q., Chang, H. H., and Nanson, G. C., "Minimum Energy as the General Form of Critical Flow and Maximum Flow Efficiency, and for Explaining Variations in River Channel Patterns", *Water Resources Research*, Vol. 40, W04502, 2004.

Huang, H. Q. and Chang, H. H., "The Scale Independent Linear Behavior of Alluvial Channel Flow", *Journal of Hydraulic Engineering*, ASCE, Vol. 132, No. 7, Technical Paper 722, July 2006.

Chang, H.H., "A Case Study of Fluvial Modeling of River Responses to Dam Removal", *Journal of Hydraulic Engineering*, ASCE, Vol. 134, No. 3, March 1, 2008, pp. 295-302.

Chang, H.H., "River Morphology and River Channel Changes", *Transactions of Tianjin University*, Volume 14, November 4, August, 2008, pp254-262, ISSN 1006-4982 (print), 1995-8196 (online).

VIII. CONFERENCE PROCEEDING PUBLICATIONS

Chang, H. H., Simons, D. B., and Brooks, R. H., 1967, "The Effect of Water Detention Structures on River and Delta Morphology", *Proceedings of the 14th General Assembly*, International Union of Geodesy and Geophysics, Berne, Switzerland, 438-448. Also presented at the Assembly.

Chang, H. H., Simons, D. B., and Brooks, R. H., 1974, "Laboratory Study of Delta Formation", ASCE Annual and Environmental Engineering Convention, Kansas City, Missouri, Meeting Preprint

2381, 21 pp.

Chang, H. H., and Hill, J. C., 1978, "Morphology of Rivers and Delta Using Energy Method", *Proceedings of the International Conference on Water Resources Engineering*, January 10-13, Bangkok, Thailand, 255-275.

Chang, H. H., 1979, "Floods and Changing Streams", *Earthquakes and Other Perils of San Diego Region*, edited by Abbott, P. L., and Elliott, W. J., prepared for Geological Society of America field trip by San Diego Association of Geologists, 151-158.

Chang, H. H., 1979, "Sediment Yield in Relation to Stream Morphology", *Proceedings of the 18th Congress*, 5, International Association for Hydraulic Research, Cagliari, Italy, September 10-14, 11-21.

Chang, H. H., 1980, "Stream Bed Erosion and Sedimentation in Southern California, U.S.A.", *Proceedings of the International Symposium on River Sedimentation*, Vol. 1, Beijing, China, March 24-29, 529-542.

Chang, H. H., 1981, "Evaluation of Downstream Changes for the Elk River", *Proceedings of Downstream River Channel Changes from Diversion or Reservoir Construction*, Research Institute of Colorado, Ft. Collins, Colorado, August, 27-29, 193-199.

Chang, H. H., and Hill, J. C., 1982, "Modeling River channel Changes Using Energy Approach", *Applying Research to Hydraulic Practice, Proceedings of the Hydraulics Division Specialty Conference*, ASCE, Jackson, Miss., August 17-20, 454-465.

Chang, H. H., 1982, "Analysis of Alluvial Stream Geometry, Channel Patterns and Channel Types", *Proceedings of the Third Congress of the Asian and Pacific Regional Division of the International Association for Hydraulic Research*, Bandung, Indonesia, Volume C, August, 308-322.

Chang, H. H., 1983, "Meander Path Model", *Proceedings of the D. B. Simons Symposium on Erosion and Sedimentation*, Colorado State University, Ft. Collins, Colo., July 27-29, pp. 3.35-3.51.

Chang, H. H., 1983, "Plan Geometry of River Meanders", *Frontiers in Hydraulic Engineering, Proceedings of the Hydraulics Division Specialty Conference*, ASCE, Massachusetts Institute of Technology, August 9-12, 133-140.

Chang, H. H., 1983, "Width Formation of Alluvial Rivers", *Proceedings of the Second International Symposium on River Sedimentation*, Nanjing Hydraulic Research Institute, Nanjing, China, October 11-16, 724-729.

Chang, H. H., Osmolski, Z., and Smutzer, D., 1985, "Computer-Based Design of River Bank Protection", in *Hydraulics and Hydrology in the Small Computer Age, Proceedings of Hydraulics Division Conference*, ASCE, Orlando, Florida, August 13-16, 426-431.

Chang, H. H., 1986, "River Channel Responses during Floods," *Proceedings of the Third International Symposium on River Sedimentation*, Jackson, Miss., April, 144-149.

Chang, H. H., and Osmolski, Z., 1987, "Fluvial Design of Structural Flood Control for Santa Cruz River", *Proceedings of Computational Hydrology '87*, Lighthouse Publications, pp. B1-B5.

Chang, H. H., and MacArthur, R. C., 1987, "Modeling Sediment Yield Affected by In-Stream Sand Mining", *Hydraulic Engineering, Proceedings of National Conference on Hydraulic Engineering and Engineering Hydrology Symposium*, pp. 451-456, August 3-7, Williamsburg, Virginia.

Chang, H. H., Jennings, M. E., and Jordan, P. R., 1988, "Use of Calibrated Model for Continuous Record of Fluvial Sediment Load", *Professional Paper*, U. S. Geological Survey.

Chang, H. H., 1988, "On the Cause of River Meandering", *Proceedings of the Intern. Conf. on River Regime*, May 18-20, Wallingford, England, 83-94.

Chang, H. H., 1988, "Introduction to FLUVIAL-12 - Mathematical Model for Erodible Channels", in *Twelve Selected Computer Stream Sedimentation Models Developed in the U. S.*, S. S. Fan, Editor, Published by Federal Energy Regulatory Commission, 353-412.

Thorne, C. R., Chang, H. H., and Hey, R. D., 1988, "Prediction of Hydraulic Geometry of Gravel-Bed Streams Using the Minimum Stream Power Concept", *Proceedings of Intern. Conf. on River Regime*, May 18-20, Wallingford, England, 29-40.

Chang, H. H., 1988, "Simulation of River Channel Changes Induced by Sand Mining", *Proceedings of Intern. Conf. on Fluvial Hydraulics*, IAHR, May 30-June 3, Budapest, Hungary.

Cao, S-Y and Chang, H. H., 1988, "Entropy as a Probability Concept in Energy-Gradient Distribution", *Proceedings of the National Conference on Hydraulic Engineering*, August 8-12, Colorado Springs, CO.

Yang, X-Q. and Chang, H. H., 1988, "Mathematical Modeling of Compound Channel with High Sediment Concentration", *Proceedings of the National Conference on Hydraulic Engrg.*, August 8-12, Colorado Springs, CO.

Chang, H. H., 1988, "Processes Governing Meander Bend Migration", *Proceedings of the National Conference on Hydraulic Engrg.*, August 8-12, Colorado Springs, CO.

Chang, H. H. and Osmolski, Z., 1988, "Fluvial Design of River Bank Protection", *Hydrosoft*, Computational Mechanics Publications, U. K. 1(2), 88-92.

Chang, H. H., 1989, "Background and Applications of FLUVIAL-12", *Sediment Transport Modeling, Proceedings of the 1989 National Conference on Hydraulic Engineering*, August 14-18, New Orleans, 648-652.

Chang, H. H., Dawdy, D., Edwards, K., Faltas, M., James, D., Korsten, E., Lenaburg, R., and Slosson, J., "Erodible Channel Models: State of the Art Review", *Proceedings of the International Symposium on the Hydraulics and Hydrology of Arid Lands*, July 30-Aug. 3, 1990, San Diego, CA.

Chang, H. H., 1991, "Simulation of Bed Topography in a Meandering River", *Proceedings of the Fifth Interagency Sedimentation Conference*, Las Vegas, NV, March 21-28.

Chang, H. H., 1991, "Computer Simulation of River Channel Changes Induced by Sand Mining", *Proceedings of International Conference on Computer Applications in Water Resources*, July 3-6, Taipei, Taiwan, Vol. 1, 226-234.

Jones, N. and Chang, H. H., 1991, "Fluvial Recharge of Sand Mining Pit", *Proceedings of the 1991 National Conference on Hydraulic Engineering*, Nashville, TN, July 29-August 2.

Chang, H. H., 1992, "Overview of Erodible Channel Models", *Proceedings of Seminar on Mathematical Modeling of Alluvial Rivers*, UNDP/UNESCO, Kathmandu, Nepal, April 14-18, 1992.

Chang, H. H., Jennings, M. E., and Olona, S., 1992, "Computer Simulation of River Channel Changes on a Point Bar", *Proceedings of the 1992 National Conference on Hydraulic Engineering*, Baltimore, MD, August 3-5.

Bakall E., Moncrief, J., Walters, J., and Chang, H. H., 1993, "Emergency Protection, San Luis Rey River Aqueducts", *Proceedings of the 1993 National Conference on Hydraulic Engineering*, San Francisco, CA, July 25-30, pp. 962-967.

Chang, H. H., Harris, C., Lindsay, W., Nakao, S. S., and Kia, R., 1993, "Selecting Sediment Transport Equation for Scour Simulation at Bridge Crossing", *Proceedings of the 1993 National Conference on Hydraulic Engineering*, San Francisco, CA, July 25-30, pp. 1744-1949.

Thomas, W. A., Chang, H. H., and Holly, F. M., 1993, "Computational Modeling of Sedimentation Processes", *Proceedings of the 1993 National Conference on Hydraulic Engineering*, San Francisco, CA, July 25-30.

Chang, H. H., Ergun, B., Moncrief, J., and Frieauf, D., "Fluvial Evaluation of Design for Aqueduct Protection", *Proceedings of the International Symposium, East-West, North-South Encounter on the State-of-the-Art in River Engineering Methods and Design Philosophies*, Vol. 1, pp. 325-333, May 16-20, 1994, State Hydrologic Institute, St. Petersburg, Russia.

Chang, H. H., Harrison, L., Lee, W., and Tu, S., 1994, "Numerical Modeling for Sediment-Pass-Through Operations of Reservoirs", *Proceedings of the 1994 National Conference on Hydraulic Engineering*, Buffalo, NY, August 1-5.

Chang, H. H., Grove, R., and Pearson, D. C., 1994, "Fluvial Simulation of an Ephemeral River", *Proceedings of the International Symposium on River Waterfront Development*, Nile Research Institute, Egypt, Sept. 15-17.

Tu, S., Geary, G., Lee, W., and Chang, H. H., 1995, "Operation Rule to Maintain Long-Term Sediment Balance in Reservoirs", *Proceedings of Hydro Power of 95*.

Tu, S., Geary, G., Lee, W., and Chang, H. H., 1995, "Development of Reservoir Operation Rules to Control Sedimentation, A Numerical Model Study", *Proceedings of the 15th United States Committee on Large Dams Annual Meeting*, San Francisco, May 15-19, 1995

Chang, H. H., Harrison, L., Lee, W., and Tu, S., 1995, "Fluvial Modeling for Sediment-Pass-Through Operations of Reservoirs", *Water Resources Engineering, Proceedings of the First International Conference on Water Resources Engineering*, pp. 1178-1183, San Antonio, Texas, August 14-18.

Chang, H. H., Dunn, D. D., and Vose, J., 1995, "Simulation of General Scour at US-59 Bridge Crossing on the Trinity River in Texas", *Water Resources Engineering, Proceedings of the First International Conference on Water Resources Engineering*, pp. 623-628, San Antonio, Texas, August 14-18.

Chang, H. H. and Pearson, Daniel, 1995, "Flushing and Recharge of Inlet Channel for an Ephemeral Coastal River", *Proceedings of the 4th International Conference on Estuarine and Coastal Modeling*, October 26-28, San Diego.

Chang, H. H. and Fan, S-S., 1996, "Reservoir Erosion and Sedimentation for Model Calibration", *Proceedings of the Sixth Interagency Sedimentation Conference*, Las Vegas. This paper is also in *Reservoir Sedimentation, Proceedings of the St. Petersburg Workshop*, Bruk and Zebidi, Editors, UNESCO, Paris, 1996, pp. 265-272.

Chang, H. H., 1966, "Scour Study for Bridge Design on Temecula Creek", *Proceedings of North American Water and Environment Congress '96*, June 22-28, Anaheim, California.

Chang, H. H., 1966, "Simulation of Channel Changes Induced by a Reservoir", *Proceedings of North American Water and Environment Congress '96*, June 22-28, Anaheim, California.

Chang, H. H., 1997, "Modeling of Reservoir Sedimentation", *Proceedings of the Third Conference on Exchanging Technologies and Information in Water Resources Across the Taiwan Strait*, July 28-30, Beijing, China, pp543-552.

Chang, H. H., 1997, "Routing of Tailings in a Stream Channel", *Proceedings of the 27th International Association for Hydraulic Research Congress*, August, 1997, San Francisco.

Chang, H. H., 1998, "Evaluation of Flood Impacts", *Proceedings of the Annual Conference for the State Floodplain Managers Association*, San Diego, CA, March 1998.

Wight, J., Chang, H. H., and Walters, J., "GIS Provides SDG&E Speedy Assessment of El Nino Flood Damage Potential", *Proceedings of the Annual Conference for the State Floodplain Managers Association*, San Diego, CA, March 1998.

Chang, H. H. and Abcarius, Jack, "Hydraulic Design of Bridge with Erodible Road Embankments", *Proceedings of the 1998 International Water Resources Engineering Conference*, Memphis, Tennessee, August, 1998.

Chang, H. H., "Modeling Floodplain Changes Below Seven Oaks Dam", *Proceedings of the 2000 Water Resources Engineering Conference*, ASCE, Minneapolis, Minnesota, August, 2000.

Harding, M.V., Forrest, C.L., and Chang, H.H., "Caltrans Erosion Control Pilot Study", *Proceedings of Soil Erosion Research for the 21st Century*, ASAE, January 3-5, 2001, Honolulu, Hawaii.

Chang, H.H., “Sediment Transport Modeling for Stream Channel Scour Below a Dam”, *Proceedings of Soil Erosion Research for the 21st Century*, ASAE, January 3-5, 2001, Honolulu, Hawaii.

Chang, H.H., “Modeling of Morphological Changes of an Ephemeral Stream”, *Proceedings of the Seventh Federal Interagency Sedimentation Conference*, Reno, Nevada, March 25-29, 2001.

Harding, M.V., Forrest, C.L., and Chang, H.H., “The Effects of Soil Roughness on Rainfall-Induced Erosion”, *Proceedings of 33rd Annual Conference and Expo*, International Erosion Control Association, Feb. 25 - March 1, 2002, Orlando, Florida.

Forrest, C.L., Harding, M.V., Gardner, N., and Chang, H.H., “Caltrans Erosion Control Pilot Study”, *Proceedings of 33rd Annual Conference and Expo*, International Erosion Control Association, Feb. 25 - March 1, 2002, Orlando, Florida.

Chang, H. H., “Fluvial Modeling of Ventura River Responses to Matilija Dam Removal”, *Proceedings of the ASCE 2005 Watershed Management Conference*, Williamsburg, Virginia, July 2005.

Chang, H. H., “River Morphology and River Channel Changes”, *Proceedings of the Conference on River and Coastal Investigation and Planning*, Taichung, Taiwan, September 7-10, 2005.

IX. TECHNICAL REPORTS

Chang, H. H., 1967, “Hydraulics of Rivers and Deltas”, Ph.D. Dissertation, Colorado State University, Ft. Collins, Colorado, 176 pp.

Chang, H. H., 1968, “Flow Analysis Inside Thrust Reversers”, Engineering Report 24-2287, Rohr Corp., Chula Vista, California.

Chang, H. H., and Scotchie, J. P., 1969, “Analysis of Subsonic Flow Surrounding a Fully Deployed Thrust Reverser”, Engineering Report 24-2288, Rohr Corp., Chula Vista, California.

Chang, H. H., 1969, “Work Statement and Technical Approach of In-Flight Thrust Reversers”, Engineering Report 24-2299, Rohr Corp., Chula Vista, California.

Chang, H. H., 1969, “Development of the Rohr/SDSU Water Table as an Experimental Tool for Compressible Flows”, Engineering Report 24-2297, Rohr Corp., Chula Vista, California.

Chang, H. H., 1970, “Analysis of Thrust Reverser Internal Flow and Aerodynamic Loads”, Engineering Report 832-318, Rohr Corp., Chula Vista, California.

Chang, H. H., and Cummings, D. P., 1970, “Water Table Experimental Study of Cascade Thrust Reverser Parameters”, TN 823-033, Rohr Corp., Chula Vista, California.

Chang, H. H., Simons, D. B., and Brooks, R. H., 1970, “Mechanics of Aggrading and Degradation Channels”, National Fall Meeting, American Geophysical Union, San Francisco.

Duvvuri, T., Chang H. H., and Prior, B. W., 1972, "Analytical Study of In-Flight Thrust Reversers, Vol. 1 - Final Technical Report and Vol. 2 - User's Manual and Source Listings for Computer Programs", Technical Report AFFDL- TR-72, Air Force Flight Dynamics Lab., Air Force Systems Command, Wright Patterson Air Force Base, Ohio.

Chang, H. H., 1972, "Design Manual for Stable Earth Channel", Dept. of Sanitation and Flood Control, Public Works Agency, County of San Diego.

Chang, H. H., 1972, "Evaluation of Sedimentation and Erosion in the Flood Plains of San Diego County", Dept. of Sanitation and Flood Control, Public Works Agency, County of San Diego.

Chang, H. H., 1974, "Flood Plain Sedimentation and Erosion, Phase III", Dept. of Sanitation and Flood Control, Public Works Agency, County of San Diego, 78 pp.

Chang, H. H., 1974, "Flood Plain Sedimentation and Erosion, Phase IV", Dept. of Sanitation and Flood Control, Public Works Agency, County of San Diego, 77 pp.

Chang, H. H., 1975, "Flood Plain Sedimentation and Erosion, Phase V", Dept. of Sanitation and Flood Control, Public Works Agency, County of San Diego, 87 pp.

Chang, H. H., and Hill, J. C., 1975, "Numerical Modeling of Flood Channel Deformation", Spring Annual Meeting, American Geophysical Union, Washington, D. C., June 16-19.

Chang, H. H., 1975, "Flood Plain Sedimentation and Erosion, Phase IV", Dept. of Sanitation and Flood Control, Public Works Agency, County of San Diego, 77 pp.

Chang, H. H., 1976, "Estimation of Sand Influx into the Ocean from a Flood Channel", Workshop on Sediment Management for Southern Calif. Mountains, Coastal Plains and Shoreline, California Institute of Technology, March 15-16.

Chang, H. H., 1976, "User's Manual for Generalized Computer Program with Versions Fluvial-1 and Fluvial-3", Dept. of Sanitation and Flood Control, Community Services Agency, County of San Diego, 52 pp.

Chang, H. H., 1977, "Dam Failure Inundation Report and Map for an Enlarged Rattle-snake Reservoir", Lowry and Associates, Irvine, Calif.

Chang, H. H., and Decker, G., 1978, "Erosion Study of San Diego River near Lakeside Sewage Treatment Plant", Dept. of Sanitation and Flood Control, Public Works Agency, County of San Diego.

Chang, H. H., 1979, "Stable Alluvial Canals for Water Conveyance", presented at the annual meeting of the Transportation Research Board, National Research Council, Washington, D. C., January 15-19.

Chang, H. H., 1979, "Evaluation and Mitigation of Stream-Bed Erosion at the Bridge Crossing of Magnolia Avenue", Report for the Dept. of Transportation, County of San Diego.

Chang, H. H., and Hill, J. C., 1981, "A Case Study for Erodible Channel Using a Mathematical Model", report for Special Study of Computer-Based Flood and Sediment Routing Models for National Research Council, National Academy of Sciences.

Chang, H. H., 1981, "Hydraulic and Sediment Transport Effects on the Lakeside Trunk Sewer", report for the Office of County Counsel, County of San Diego.

Chang, H. H., 1981, "The City of Poway Floodwater Detention Basin Study", SDSU Civil Engineering Series No. 81143, 109 pp.

Chang, H. H., 1981, "Repair Abutments at Three Bridge Sites, MCB Camp Pendleton", Graves Engineering, Inc., San Diego, Calif., 41 pp.

Chang, H. H., and Hill, J. C., 1982, "Computer-Based Flood and Sediment Routing Model", report for Committee on Hydrodynamic Models, National Research Council, National Academy of Sciences, Washington, D. C., 85 pp.

Chang, H. H., 1982, "Overview of Design Methods for Alluvial Channels", in Lecture Notes for Applied Sedimentation and River Engineering, edited by Chang, H. H., SDSU Civil Engineering Series 82121.

Chang, H. H., and LaCava, J., 1982, "Santa Margarita River Levee Study", report for Western Division, Naval Facilities Engineering Command, San Bruno, Calif.

PRC Toups and Chang, H. H., 1982, "Carmel Valley Basin Analysis", report for Carmel Valley Home and Property Owners' Assoc., 32 pp.

Chang, H. H., Editor, 1983, "Applied Sedimentation and River Engineering", SDSU Civil Engineering Series 83215.

Chang, H. H., 1983, "River Hydraulics", San Diego State University Syllabus, No. 301, 120 pp.

Chang, H. H., and Clark, R. 1983, "Proposed Sesko Sand Extraction in San Luis Rey River", PRC Toups Corp., La Jolla, Calif.

Chang, H. H., 1983, "Mathematical Modeling of Alluvial Channels", report for the National Science Foundation (Grant No. CEE-8209029), SDSU Civil Engineering Series No. 83158, 55 pp.

Chang, H. H., and Hill, J. C., 1983, "Modeling of Flood Plain Changes", Specialty Conference of the Irrigation and Drainage Division, ASCE, Jackson, Wyoming, July 20-22.

Chang, H. H., and Hu, D. P., 1983, "Computer Modeling of Width Formation for Alluvial Rivers", ASCE National Convention, Houston, Texas, October 17-21.

Chang, H. H., 1984, "Slope Protection for Mar Lado Subdivision and Bridge Pier Scour at Foussat Street, Oceanside, California", report for William Lee Company.

Chang, H. H., 1984, "Mathematical Modeling of Alluvial Channels", report for the National Science Foundation (Grant No. CEE-8209029), SDSU Civil Engineering Series No. 84155.

Chang, H. H., 1984, "Sediment Study for Carmel Valley Village", report for Carlsberg Construction Co., Inc., 42 pp.

Chang, H. H., 1984, "Fluvial Study for Rillito River: from La Cholla to Craycroft", report for the Dept. of Transportation and Flood Control District, Pima County, Arizona, 162 pp.

Vasquez, F. M., and Chang, H. H., 1985, "Design Concept Report: Silvercroft Wash between Speedway Boulevard and Grant Road", VEA Ltd., Tucson, Arizona.

Phillips, B., and Chang, H. H., 1985, "Design Report for E7605M: Repairs to Santa Margarita River Dike", Marine Corps Air Facility, Camp Pendleton, California, A-E Contract No. N62474-85-C-8279, Robert Bein, William Frost & Associates, Newport Beach, Calif.

Chang, H. H., 1985, "Computer-Based Design of Bank Protection in Curved Channels", presented at the Hydraulic Conference for the Highway Community, Ft. Collins, Colorado, June 24-28.

Chang, H. H., 1985, "Drainage Design Report for the Channelization of the Santa Cruz River between Ina Road and Cortaro Road", Cella Barr Associates, Tucson, Arizona.

Chang, H. H., 1985, "Hydraulic and Sediment Studies for Sand Removal and Flood Channel Improvement Plan, Upper San Diego River Lakeside", report for Woodward Sand and Materials Company, 45 pp.

Chang, H. H., 1985, "Analysis of Hydrological Impacts from Proposed Development and Channel Improvements in Spring Valley", Stevens Planning Group, Inc.

Chang, H. H., 1985, "Engineering of River Sedimentation", SDSU Civil Engineering Series No. 85144, 212pp.

Chang, H. H., 1985, "Flushing of Entrance Channel for Coastal Lagoons: Mathematical Simulation", West Coast Regional Coastal Design Conference, Oakland, Calif., Nov. 6-8.

Chang, H. H., 1986, "Modeling of Movable Bed Streams", Western State High Risk Flood Areas Symposium, March 24-26, Las Vegas, Nevada.

Chang, H. H., 1986, "Dynamic Modeling of Alluvial Rivers", invited lecture at the U. S. Geological Survey, Menlo Park, Calif., 1986.

Chang, H. H., 1986, "Hydraulic Design of Flood control Channel for San Vicente Creek," report for Dept. of Public Works, County of San Diego, (County Contract No. 23278-E).

Chang, H. H., 1986, "Sediment Study for Buena Vista Creek," report for the City of Vista.

Chang, H. H., 1986, "Users Manual for Generalized Computer Program FLUVIAL-12.

Chang, H. H., 1986, "Computer-Aided Design for Santa Cruz River between Valencia and Speedway," report for Pima County, Arizona.

Chang, H. H., 1986, "Hydraulic and Fluvial Studies for Channelization of Moosa Canyon Creek at Brookside Farms," report for Brookside Farms, Bonsall, Calif.

Stow, D. A., and Chang, H. H., 1987, "Numerical Simulation of Coastal Entrance Channel Processes in Southern California," presented at the Asso. of American Geographers Conference, Portland, Oregon, April 24.

Chang, H. H., and Osmolski, Z., 1987, "Hydraulic Design of Structural Flood Control for Santa Cruz River," presented at Floodplains '87, Conference of the State Flood Plain Managers, Seattle, Wash., June 9-12.

Chang, H. H., 1987, "Hydraulic and Fluvial Studies for Demetrie Wash", rept. for McGovern, MacVitte and Associates, Tucson, Arizona.

Cooper, A. and Chang, H. H., 1987, "Flood Plain Management Study for Moosa Canyon Creek, County of San Diego," prepared for the County of San Diego, 159 pp.

Chang, H. H. and Brown, W., 1987, "Identifying and Managing Debris-Flow Hazard and Erodible Channels in the Western U. S.", invited short course at the Arizona Floodplain Management Association meeting, Wickenburg, Arizona, September 17-18.

Chang, H. H., 1988, "Fluvial Sand Source for South Central California Coast", prepared for Beach Erosion Authority for Control Operations and Nourishment, via Noble Consultants, Irvine, Calif., 65 pp.

Chang, H. H., 1988, "Hydraulic and Fluvial Studies for Channelization of Canada del Oro Wash and Linear Park Development", prepared for McGovern, MacVittie, Lodge & Associates, Tucson, Arizona, 88 pp.

Chang, H. H., 1988, "Fluvial Study for Bank Protection of Sycamore Creek in Poway", prepared for Oceanview Development, Solana Beach, Calif., 62pp.

Chang, H. H., 1988, "Fluvial Study for Channelization of Temecula Creek at Rancho Village Assessment District", prepared for Rancho Pacific Engineering Corporation, Temecula, Calif., 123pp.

Chang, H. H., 1988, "Sediment Study for Flood Control Plan of Bullhead City, Arizona", prepared for Kaminski-Hubbard Engineering, Inc., Phoenix, 89pp.

Chang, H. H., 1988, "Test and Calibration of FLUVIAL Model Using Missouri River Data", prepared for Waterway Experiment Station, U. S. Army Corps of Engineers, Vicksburg, Mississippi.

Chang, H. H., 1988, "Fluvial Study for Channelization of Santa Gertrudis Creek", prepared for Rancho Pacific Engineering Corporation, Temecula, Calif., 113pp.

Chang, H. H., 1988, "Fluvial Study for Sand Recovery in Upper Sweetwater Reservoir", prepared for Sweetwater Authority, Chula Vista, CA, 78pp.

Webb, C. K., Stow, D. A., and Chang, H. H., 1988, "Coastal Inlet Processes in Southern California", Annual Meeting of the Association of American Geographers, Phoenix, AZ.

Webb, C., Stow, D., and Chang, H. H., 1988, "Flushing of Tijuana Estuary - Modeling Study", presented at the 1988 Annual Meeting and Conference, California Shore and Beach Preservation Association, November 2-4, San Diego.

Chang, H. H., 1988, "Development of Bank Protection for Alisal Ranch Golf Course", prepared for the Alisal, Solvang, California.

Chang, H. H., 1989, "Drainage Study/Design for Coffee-Webb Industrial Park", prepared for Snipes-Dye Associates, Lemon CA., 33pp.

Chang, H. H., 1989, "Hydraulic Design of Drop Structures and Streambed Stabilizers for Temecula Creek", prepared for Ranpac Engineering Corp., Temecula, CA. 102pp.

Chang, H. H. and Stow, D., 1989, "Fluvial Sand Delivery by the Santa Clara River", presented at the Workshop on Coastal Sedimentation, May 22-23, Catalina Island, CA.

Stow, D. and Chang, H. H., 1989, "Inlet Dynamics - Southern California", presented at the Workshop on Coastal Sedimentation, May 22-23, Catalina Island, CA.

Chang, H. H., 1989, "Hydrology Study for Northeastern Carlsbad", prepared for Hofman Planning Group.

Chang, H. H., 1989, "Sediment Study for Calavera Lake Creek in Carlsbad, for Sediment Detention Basins at Rancho Carlsbad", prepared for Hofman Planning Group.

Chang, H. H., 1989, "Sedimentation", Chapter III, Carmel Valley Restoration and Enhancement Project, by Nolte and Associates for California Dept. of Transportation.

Chang, H. H., 1989, "Hydrological Design of Floodwater Detention Basin for La Costa Southwest", prepared for Fieldstone/La Costa Associates, Carlsbad.

Chang, H. H., 1990, "Drainage Study for Encinitas Creek", prepared for Fieldstone/La Costa Associates, Carlsbad.

Chang, H. H., 1990, "Hydrological Delineation for the Waters of the United States for Temecula Creek", prepared for Ranpac Engineering Corp., Temecula, CA.

Chang, H. H., 1990, "Hydrology Study for Coyote Wash, Imperial County, California, prepared for Jaykim Engineers, Diamond Bar, CA.

Chang, H. H. and Nolte & Associates, 1990, "Calibration Study of FLUVIAL-12 Model Using Data from San Luis Rey River", prepared for the San Diego County Water Authority, 45pp.

Chang, H. H. and Nolte & Associates, 1991, "Assessment of Sand and Gravel Mining Impacts on

San Luis Rey River near Aqueduct Crossings”, prepared for the San Diego County Water Authority, 186pp.

Chang, H. H., 1991, “Evaluation of Water Quality Management using Instream Flow Regulation”, project report for San Diego River Live Stream Discharge Study, prepared for Environmental and Energy Services Co. and City of San Diego.

Chang, H. H., 1991, “Mathematical Modeling of Bridge Scour”, invited lecture at the Region 6 Bridge Inspection and Management Conference, Federal Highway Administration, May 29-31, Arlington, TX

Chang, H. H., 1991, “Evaluation of Impacts of Proposed Sand and Gravel Extraction in Brazos River on I-59 Bridge”, prepared for the Texas State Dept. of Highways and Public Transportation, Austin, TX.

Chang, H. H., 1991, “Control of Lagoon Siltation Associated with Land-Side Sediment Sources”, invited lecture at San Dieguito Lagoon Restoration Technical Workshop, December 12.

Chang, H. H., 1992, “River Channel Scour at Three Proposed Pipeline Crossings on the Otay River”, prepared for CWP Geosciences, San Diego, CA.

Chang, H. H., 1992, “Impacts of Proposed Sand and Gravel Extraction in the San Luis Rey River at Pala by JB Sand”, prepared for JB Unlimited Sand Project, Escondido, CA, 155pp.

Chang, H. H., 1993, “Drainage Study for Ramona”, prepared for the County of San Diego, 225pp.

Chang, H. H., 1993, “Design Report for Permanent Protection of the San Luis Rey River Aqueduct Crossings, Fluvial Study for Probable Maximum Flood”, prepared for Parsons Brinckerhoff and San Diego County Water Authority, 77 pp.

Chang, H. H., 1994, “Numerical Modeling for Sediment-Pass-Through Operations of Reservoirs on North Fork Feather River”, prepared for Pacific Gas & Electric Company, San Francisco, 225pp.

Chang, H. H., 1994, “Validation of FLUVIAL-12 Model Using Data from the San Dieguito River”, prepared for Southern California Edison Company, Rosemead, California, 123pp.

Chang, H. H., 1994, “Dam Breach and Inundation Map for Eastlake Greens Reservoir”, prepared for Otay Water District, 92pp.

Chang, H. H., 1995, “Hydraulic and Sedimentation Impacts of Lagoon Restoration for San Dieguito River”, prepared for Southern California Edison Company, Rosemead, California, 224pp.

Chang, H. H., 1996, “Drainage Study for Rainbow”, prepared for the County of San Diego, 225pp.

Chang, H. H., 1996, “Sediment Modeling for Clark Fork River and Silver Bow Creek in Montana”, prepared for the Atlantic Richfield Company in connection with the case U.S. versus ARCO, et al., No. CV-89-039-BU-PGH, 232 pp.

Chang, H. H., 1997, “Hydraulic and Fluvial Study for Wetland Restoration in the San Dieguito

River”, prepared for the Southern California Edison Company, 155pp.

Chang, H. H., 1999, “Santa Ana River/Mentone Fan Hydrological Study”, prepared for Department of Fish and Game, Conservation Planning Division, Long Beach, California, 123pp.

URS Greiner Woodward Clyde Consultants and Chang, H.H., 1999, “Laboratory Manual Soil Erosion Laboratory & Outdoor Test Plots, A January 29, 255pp.

Chang., H. H., 1999, “San Diego County Alluvial Studies”, in Section 4.5, Riverine Erosion Hazard Areas - Mapping Feasibility Study published by the Hazard Study Branch, Federal Emergency Management Agency, Washington, D. C..

URS Greiner Woodward Clyde Consultants and Chang, H.H., 1999, “Soil Stabilization for Temporary Slopes, A prepared for Caltrans, Sacramento, CA, November.

Chang, H.H., 2000, “Fluvial Study for Serrano Creek (Facility No. F19),” prepared for Public Facilities and Resources Department, County of Orange, CA

Chang, H.H, 2000, “Sediment Yield Study for Muddy Canyon and Los Trancos Canyon”, prepared for the Irvine Community Development Company, Newport Beach, CA.

Chang, H. H., 2001, “Fluvial Study to Determine Failure of Bridge No. 504.1 of Burlington Northern and Santa Fe Railroads in Kingman, Arizona”, prepared for Jardine, Baker, Hickman & Houston, 3300 North Central Street, Suite 600, Phoenix, AZ 85012.

Chang, H. H., 2002, “Calleguas Creek Watershed Sediment Study”, prepared for Ventura County Flood Control District, Ventura, CA.

Chang, H. H., 2003, “Fluvial Modeling Study for Ventura River Responses to Matilija Dam Removal and Related Issues”, prepared for Ventura County Flood Control District, Ventura, CA.

Chang, H. H., 2004, “Fluvial Modeling Study of Feather River Responses to Oroville Dam and Related Issues”, prepared for California Department of Water Resources, Northern District.

Chang, H.H., 2007, “Hydraulic and Scour Studies for Willow Street Bridge Project”, prepared for Simon Wong Engineering.

Chang, H.H., 2008, “Fluvial Study of Serrano Creek Channel Stabilization, Trabuco Road to Rancho Parkway (Facility No. F19)”, prepared for Public Works/Flood Control Division, County of Orange.

Chang, H.H., 2008, “Hydraulic Requirements for SARI Pipeline Protection along Channel Bank and at River Crossing of the Santa Ana River below Prado Dam”, prepared for County of Orange Resources and Development Management Department.

X. TECHNICAL TRAINING COURSES TAUGHT

Lecturer of the short course “Background and Applications of the HEC-2 Program for Water-Surface Profiles”, offered to engineers of the County of San Diego and the City of San Diego, January 21-26,

1973.

Coordinator and principal lecturer of the short course, “Applied Sedimentation and River Engineering,” attendance: 61, Shelter Island, San Diego, January 14-17, 1982.

Coordinator and principal lecturer of the short course, “Applied Sedimentation and River Engineering,” attendance: 56, Shelter Island, San Diego, January 18-21, 1984.

Lecturer of the course “River Processes and Engineering”, offered to engineers and researchers at the Central Water and Power Research Station, Poona, India, Dec. 27, 1985 to January 18, 1986. The course was financially supported by UNDP for which the instructor was a consultant.

Guest lecturer of the two-day short course “Hydrology of Flood Control”, July 1986 and July 1987

Lecturer of the short course “Identifying and Managing Debris-Flow Hazard and Erodible Channels in the Western U. S.”, for the Arizona Floodplain Management Association meeting, Wickenburg, Arizona, September 17-18, 1987.

Lecturer of the two-day short course “River Engineering”, offered to the engineers of the City of Tucson, March 3-4, 1988.

Guest lecturer on “Alluvial Fan and River Channels”, at the workshop on Analysis and Evaluation of Mud Flow and Alluvial Fan Flooding, West Consultants, 1988.

Lecturer of the three-day short course “River Processes and Sedimentation”, offered to the faculty and graduate students of the Civil Engineering Department, Clarkson University, Potsdam, New York, May 30-June 2, 1988.

Lecturer of the three-day short course “Sedimentation Engineering”, invited by and offered at Queensland University of Technology, Attendance: 28, Brisbane, Australia, July 12-14, 1989.

Lecturer of the three-day workshop “River Sedimentation Modeling Using the GFLUVIAL Program”, sponsored by the U. S. Geological Survey, attended by 20 professionals from the U.S. Geological Survey and Federal Highway Administration, Denver, Colorado, April 10-12, 1990.

Lecturer of the short course “Background and Applications of the HEC-2 Program”, offered by invitation at Ranpac Engineering Corporation, Temecula, CA. June, 1990.

Guest lecturer of the three-day short course “Water-Surface Profile Computation Using HEC-2”, sponsored by Continuing Education Service, ASCE, New York, course offered at San Diego, July 26-28, 1990.

Lecturer and Rapporteur at the four-day seminar on Mathematical Modeling of Alluvial Rivers, UNDP/UNESCO Regional Training Program on Erosion and Sedimentation for Asia, Kathmandu, Nepal, April 14-17, 1992.

Lecturer at the Hydrology Training Program sponsored by the City of Carlsbad, Calif., on floodplain management, erosion control and desilting basins, May 5, 1992.

Lecturer at the workshop on Hydraulic Engineering, sponsored by the Chinese National Science Foundation and National Cheng Kung University, Tainan, Taiwan, July 6-10, 1992

Lecturer at the training course on river engineering at Yangtze Scientific Institute, Wuhan, China, May 1998.

Lecturer at the three-day workshop “Applications in Stormwater Management”, sponsored by the American Society of Civil Engineers, San Diego, CA, November 10-12, 1999.

Invited Senior Visiting Scholar by the Chinese National Academy of Sciences to present a series of lectures on river modeling at the Nanjing Hydraulic Research Institute, December 16 to 23, 2000.

Invited Senior Visiting Scholar by the Institute of Mountain Hazard and Environment, Chinese National Academy of Sciences to present a series of lectures on river modeling in Kunming, China, June 4-10, 2001.

Invited lecturer for a two-day short course on river engineering at Ventura County Flood Control District, CA, February 20-21, 2002.

Invited lecturer for a week long short course on river hydraulics and river engineering at Administrative Bureau of River Valley, Kuerle, South Xinjiang, China, May 25 to June 3, 2005.

Invited lecturer for a week long short course on river hydraulics and river engineering at Lanzhou China, August 16-23, 2005.

XI. INVITED LECTURES

Invited speaker at the Mission Valley Planning Commission, the San Diego City Planning Commission, and the San Diego City Council on the topic “First San Diego River Improvement Project”, 1980.

Invited speaker on the FLUVIAL model: at the University of Alaska, 1984; the Pima County, Arizona, 1986; U.S. Geological Survey at Menlo Park, CA, 1986; U.S. Army Corps of Engineers at Cincinnati, 1987; the Second Seminar on Stream Sedimentation Models, Sedimentation Committee, Federal Interagency Advisory Committee on Water Data, Denver, CO, October 19-20, 1988.

Invited speaker at the International Symposium on River Sedimentation, 1980, 1984, and 1986.

Invited speaker on the topic “Erodible Channel Modeling,” at the Seminar on Stream Channel Erosion Protection, sponsored by the Federal Emergency Management Agency, Colorado Springs, August 27-28, 1987.

Invited speaker on the topic “Modeling General Scour at Bridge Crossings”, at the Second Bridge Engineering Conference, Transportation Research Board, Minneapolis, Minnesota, September 24-26, 1984.

Invited speaker on the topic “River Morphology and Responses to Alterations”, at the Seminar on Stream Channel Erosion Protection by the Federal Emergency Management Agency, Colorado Springs, August 27-28, 1987.

Invited speaker at the Geological Science Seminar, SDSU, Dec. 2, 1987.

Invited speaker on the topics of “Analytical River Morphology” and “Computer-Aided River and Sedimentation Engineering”, at Yangtze River Research Institute, Wuhan; IWHR and Qinghua University, Beijing; Hohai University and Nanjing Hydraulic Research Institute, Nanjing, October 17-October 28, 1987.

Invited speaker on “River Engineering”, Nolte and Associates, San Jose, California, November 16, 1987.

Invited dinner meeting speaker on the topic “Bridge Scour”, the Hydraulic Engineer's Meeting, California Dept. of Transportation, Los Angeles, September 29-30, 1988.

Invited speaker on the topic “Sediment Transport Modeling”, at the U. S. and China Bilateral Symposium on Flood Forecasting”, sponsored by National Weather Service, NOAA, March 28-31, 1989, Portland, Oregon.

Invited speaker at the Bilateral Workshop on Understanding Sedimentation Processes and Model Evaluation, National Research Council, Washington, D. C., December 16-18, 1991.

Invited speaker on the topic “Design of Intakes for Sediment Exclusion”, Royal Institute of Technology, Stockholm, Sweden, May 14, 1993.

Invited speaker at the Bilateral Workshop on Understanding Sedimentation Processes and Model Evaluation, National Research Council, Washington, D. C., July 23-24, 1993.

Invited panel expert on Flood Control and Sedimentation Issues on Three Gorges Dam Project in China, Sponsored by Chinese Institute of Engineers/USA, Chinese American Environmental Protection Association, International River Networks, San Francisco, July 28, 1993.

Invited panel expert at the Forum on China's Three-Gorges Project, Sponsored by Chinese Institute of Engineers/USA, San Francisco Bay Area Chapter, San Francisco, October 30, 1993.

Invited speaker on Flood Control and River Sedimentation at the Technical Workshop on San Dieguito Lagoon Restoration, Santa Barbara, CA, January 28, 1994.

Invited speaker on Reservoir Sedimentation at the International Coordinating Committee on Reservoir Sedimentation, May 20, 1994, St. Petersburg, Russia.

Invited keynote speaker at the International Symposium on River Waterfront Development on Computer-Aided Design for River Channel Stabilization, Nile Research Institute, Egypt, Sept. 16, 1994.

Invited speaker at the Aerospace and Mechanical Engineering Colloquium, San Diego State

University, on Numerical Modeling of River Channel Dynamics, October 20, 1994.

Invited speaker at the California Coastal Commission in San Francisco, on Flushing and Recharge of Inlet channel for the San Dieguito River, March 17, 1995.

Invited speaker at the HEC-6/FLUVIAL-12 Workshop sponsored by the Floodplain Mangers Association Conference, on FLUVIAL-12 Modeling, March 30, 1995, Anaheim, California.

Invited speaker at the International Reservoir Sedimentation Workshop, on Modeling for Sediment-Pass-Through Operations of Reservoirs, San Francisco, August 2, 1995.

Invited speaker at the Floodplain Management Association Conference, on San Dieguito Lagoon Restoration, Anaheim, CA, March 28, 1996.

Invited speaker at the Joint Power Authority workshop for San Dieguito Lagoon, on River Channel Responses to Lagoon Restoration, San Diego, CA, January 16, 1997.

Invited speaker at the Science Advisory Board, County of San Diego, on Application of Computer Models in San Diego County, August 11, 1997.

Invited speaker at the Board of Supervisors, County of San Diego, on Evaluation of Flood Impacts for El Nino Year, October 4, 1997.

Invited speaker at luncheon honoring ARCS scholars and donors, on San Dieguito Lagoon Restoration, San Diego State University, November 11, 1997.

Invited speaker at Wuhan University on river modeling, Wuhan, China, May 1998.

Invited speaker at the ASCE Student Chapter meeting, on Sediment Issues in Lagoon Restoration, San Diego State University, February 9, 1999.

Invited speaker at the U. S. Fish and Wildlife Services, on Applications of Fluvial Geomorphology to Environmental Assessments, Carlsbad, California, February 11, 1999.

Invited speaker at the bi-monthly meeting of the U.S.-China Peoples= Friendship Association on Three Gorges Dam Project, San Diego, California, September 11, 1999.

Invited speaker at the SDSU student chapter of ASCE on Three Gorges Dam Project, San Diego, California, October 18, 1999.

Invited speaker on Special Studies and Issues Relating to Sediment Transport and Channel Scour in the Western U. S., at the seminar on Applications in Stormwater Management, sponsored by ASCE, San Diego, California, November 11, 1999.

Invited speaker on Stabilization of Serrano Creek, to the engineers of the Public Facilities and Resources Department, County of Orange, February 15, 2000.

Invited speaker on Floodplain Mapping Relating to Riverine Erosion, at the Annual Conference for

the Association for State Floodplain Managers, San Diego, CA, February 29, 2000.

Invited speaker on Three Gorges Dam in China, at the Young Member Forum of ASCE, San Diego, March 21, 2000.

Invited speaker on Riverine Erosion and Lateral Migration, at the Southwest River Management Restoration Conference for the Arizona Floodplain Management Association, Phoenix, AZ, April 4, 2000.

Invited speaker on Environmental Impacts of Three Gorges Dam, at the College of Engineering seminar, University of California at San Diego, April 21, 2000.

Invited speaker on River Modeling, at the Tibetan Hydrologic Insinuate, Lahsa, Tibet, China, May 26, 2000.

Invited speaker on Mountain Stream Dynamics, at the Institute of Mountain Hazards and Environment, Chinese Academy of Sciences and Ministry of Water Resources, Chengdu, China, June 2, 2000.

Invited speaker on Legal Aspects of River and Sedimentation Engineering, Sichuan University, Chengdu, China, June 5, 2000.

Keynote speaker on Floodplain Mapping for an Erodible Channel, at the plenary session of the Association of State Floodplain Managers, September 14, 2000, Sacramento, CA.

Invited speaker on Serrano Creek Modeling at the workshop on Stream Bank Stabilization for the Millennium, sponsored by Serrano Creek Conservancy, Lake Forest, CA, October 3, 2000.

Invited speaker on San Dieguito Lagoon Restoration at the ASCE Student chapter seminar SDSU, April 10, 2001.

Invited speaker on Three Gorges Dam at the San Diego Chinese Scientists and Engineers Association seminar, April 28, 2001.

Invited key note speaker on Three Gorges Dam at the ASCE Arizona Chapter seminar, Phoenix, Arizona, September 28, 2001.

Invited speaker on Sediment Modeling of River Channels at the College of Engineering Seminar, San Diego State University, October 1, 2001.

Invited speaker on Modeling of Fluvial Morphological Processes at the seminar on Applications in Stormwater Management, sponsored by ASCE, San Diego, California, January 10, 2002.

Invited speaker on Modeling River Channel Changes at the Civil Engineering Seminar, Pennsylvania State University, University Park, PA, February 27, 2002.

Invited speaker on Map Modernization at the Semi-Annual Conference for the Association of State Floodplain Managers, San Diego, CA, April 9, 2002.

Invited speaker on Three Gorges Dam at the seminar of the Metropolitan Wastewater Department, City of San Diego, January 22, 2004.

Invited Speaker on River Modeling at Water Resources Research Institute and Tsinghua University in Beijing on March 24, 2004, and at Yangtze River Scientific Institute in Wuhan, China on March 28, 2004.

Invited Keynote Speaker on “River Morphology and River Channel Changes”, at the Conference on River and Coastal Investigation and Planning, Taichung, Taiwan, September 8, 2005.

Invited speaker on “River Morphology and River Channel Changes” at the National Taiwan University in Taipei Taiwan on September 7, 2005 and at Cheng Kung University in Tainan Taiwan on September 9, 2005.

Invited speaker on “River Morphology and River Channel Changes”, at the International Symposium on River Regulation and Development, Tianjin University, October 13, 2008.

XII. GRANTS AND CONTRACTS

Principal Investigator, “Rohr-SDSU Water Table Research Project,” awarded by Rohr Corporation, Chula Vista, California, amount \$22,000, Sept. 1968 - Sept. 1969.

Co-Investigator, “Study Program for Derivation of Techniques to Predict Performance of In-Flight Thrust Reversers”, awarded by the Aeronautical System Division, U. S. Air Force, \$150,000, November 1970 to September 1971.

Principal Investigator, “Development of Hydrological Methods for Watershed and Flood Plain Analyses”, awarded by Public Works Agency, County of San Diego, amount \$41,180, 1972-1975.

Principal Investigator, “The City of Poway Floodwater Detention Basin Study,” awarded by the City of Poway, California, amount \$23,000, March 1 to August 31, 1981.

Coordinator of short course, “Applied Sedimentation and River Engineering,” total income \$25,000, January 1982.

Principal Investigator, “Computer-Based Flood and Sediment Routing Models,” awarded by the National Academy of Science, amount \$10,000, August 1981 - January 1982.

Co-Principal Investigator, “Acquisition of Research Equipment to Improve Capabilities of Civil Engineering Faculty to Carry Out Research in Computational Methods and Computer Needs,” awarded by the National Science Foundation, amount \$17,490, May 1982.

Principal Investigator, “A Mathematical Model for Erodible Channels with Width Variation,” awarded by the National Science Foundation (Grant No. CEE-8209029), amount \$95,711, November 15, 1982 - November 14, 1985.

Coordinator of short course, “Applied Sedimentation and River Engineering,” total income \$20,000, January 1984.

Principal Investigator, “Computer-Aided Stream-Gaging of Fluvial Sediment,” awarded by the U. S. Geological Survey, \$3,000, June, 1986.

Principal Investigator, “Maintenance of Entrance Channels for Coastal Lagoons and River Mouths,” awarded by the National Sea Grant College Program, estimated total amount \$150,000, October 1, 1986 to September 30, 1989.

Principal Investigator, “Sea Grant Traineeship”, awarded by the National Sea Grant College Program, \$30,000, October 1, 1986 to September 30, 1989.

Principal Investigator, “Computer-Based Design for Bank Protection”, awarded by the Waterway Experiment Station, U. S. Army Corps of Engineers, Vicksburg, MS, \$ 38,760, 1987.

Principal Investigator, “An Investigation of the Causes of Accelerated Channel Erosion and Development of Countermeasures for Bridge Stabilization on Stony Creek”, awarded by California Dept. of Transportation, April 1, 1990 to March 31, 1992, \$ 300,000.

Principal Investigator, “Computerized Gravel Transport Model of Cottonwood Creek”, awarded by the California Department of Water Resources, June, 1991, \$ 5,500.

Principal Investigator, “Numerical Modeling Study of Rock Creek, Cresta, and Poe Reservoir System on the Feather River”, awarded by the Pacific Gas and Electric Company, San Francisco, CA, 1993-94, \$ 143,000.

Principal Investigator, “Environmental Impact Assessment for Gravel and Sand Mining on Sisquoc and Santa Maria Rivers”, awarded by the County of Santa Barbara, CA, 1993-95, \$ 98,000.

Principal Investigator, “Environmental Impact Assessment for San Dieguito Wetlands Restoration”, awarded by the Southern California Edison Company, Los Angeles, CA, 1993-96, \$ 358,000.

Principal Investigator, “Computer Visualization of Hydrodynamic Models”, awarded by the U.S. Navy, 1994-97, \$ 300,000.

Principal Investigator, “Environmental Study for Tailings Delivery along Silver Bow Creek and the Clark Fork River in Montana”, awarded by the Atlantic Richfield Company, Los Angeles, CA, 1995-96, \$ 185,000.

Principal Investigator, “Caltrans Erosion Control Pilot Study”, awarded by the California Department of Transportation, February 1998- January 2001, \$ 525,000.

Principal Investigator, “Santa Ana River/Mentone Fan Hydrological Study”, awarded by the California Department of Fish and Game, April 1998 - March 1999, \$ 37,300.

Principal Investigator, “Research and Cooperation Relating to Yangtze River Bed Evaluation Downstream of the Three Gorges Dam”, awarded by the Bureau of Science/Technology, Changjiang Water Resources Commission, China, May 1998.

Principal Investigator, “Caltrans Slope Stability Study”, awarded by the California Department of Transportation, September 1999- November 1999, \$ 65,000.

Principal Investigator, “Laboratory and Field Test Correlation for Temporary Soil Stabilization”, awarded by the California Department of Transportation, May 2001- June 2002, \$ 153,600.

XIII. CONSULTING EXPERIENCES

I have been involved in professional consulting since joining San Diego State University in 1967. Within the general areas of hydraulics, hydrology, and sedimentation, I have been active in the flood plain mapping, channel design, hydrological simulation, watershed analysis, and river channel erosion and sedimentation. I am the author of over 100 technical reports and several computer models for river morphology and fluvial river hydraulics. Among the professional activities, I have taught short courses on river and sedimentation engineering, hydrology for flood control, and the use of the HEC-2 and the FLUVIAL-12 programs. I have served as a consultant for consulting firms, local, state, and federal governmental agencies, National Research Council and the United Nations. An outline of technical activities is given below.

Channel Design - I have been responsible in many channel design projects, including the First San Diego River Improvement Project, the Rillito River Levee Design (18 miles), the Elfin Forest channel design, Santa Cruz River levee design (40 miles), San Vicente Creek channel design, high velocity channel and energy dissipator of Bullhead City, Arizona, and environmental channel of Carmel Valley. In addition, I have served as a consultant to assist other engineers on design projects.

Hydrological Simulation - I have made the Floodwater Detention Basin Study for the City of Poway, Rattlesnake Dam Breach Study, and numerous designs and investigations involving hydrological simulation. I am well familiar with such programs as TR-20 and HEC-1. I have also served as an expert witness involving flood damages.

River and Sediment Studies - I have developed the FLUVIAL-12 model for simulating river hydraulics, sediment transport, and river channel changes. This model has been applied to the rivers listed below. This model was adopted by Academia Sinica in 1998 as the model for the Yangtze River. Data collection and model calibration were made in several cases. I have also made studies of sediment yields from many natural and disturbed watershed, and sediment deliveries by river channels.

Sweetwater River upstream of Sweetwater Reservoir, Upper San Diego River near Old Mission Dam, Otay River near the Beyer Way bridge, San Dieguito River near Rancho Santa Fe, San Dieguito River mouth in Del Mar, San Luis Rey River in Oceanside, San Elijo Lagoon in Del Mar, San Luis Rey River near Pala, Upper San Diego River in Santee and Lakeside, Otay River near the I-805 bridge crossing, Los Chollas Creek in San Diego, South Chollas Creek in San Diego, Canada Del Oro Wash in Tucson, Rillito River in Tucson, San Lorenzo River in Santa Cruz, California, Salt River in Phoenix, Santa Cruz River in Tucson, Pantano Wash in Tucson, Santa Margarita River at Camp Pendleton, San Mateo River at Camp Pendleton, Trabuco Creek in Orange County, San Juan Creek in Orange County, Tanana River near Fairbanks in Alaska, Tanana River near Nenana in

Alaska, Escondido Creek in Vista, Buena Vista Creek in Carlsbad and Vista, Yellow River and Yangtze River in China, Santa Clara River in Ventura, Fall River in Colorado, Missouri River in Iowa and Nebraska, Temecula Creek in Riverside.

XIII. REFERENCES

Dr. James P. Bennett, U. S. Geological Survey, MS 413, Box 25046, Federal Center, Denver, CO 80225-0046, Tel. (303) 236-4992

Dr. Pierre Julien, Department of Civil Engineering, Colorado State University, Ft. Collins, CO 80523, Tel. (970) 491-8450, FAX (970) 491-7008

Dr. Carl Nordin, Engineering Research Center, CSU Foothills Campus, Ft. Collins, CO 80523, Tel. (970) 223-5347, FAX (970) 491-8671

Dr. William Yeh, Civil Engineering Department, 5732-B Boelter Hall, UCLA, Los Angeles, CA 90095, Tel. (310) 825-2300, FAX (310) 825-7581

Dr. George W. Annandale, Director, Water Resources Engineering, Golder Associates, Inc., 200 Union Boulevard, Suite 304, Lakewood, CO 80228, Tel (303) 980-0540, FAX (303) 985-2080.

Dr. C. Ted Yang, U. S. Bureau of Reclamation, P. O. Box 25007, D-3210, Denver, CO 80225

Dr. Bruce Westermo, Associate Professor of Civil Engineering, San Diego State University, San Diego, CA 92182

Professor Philip E. Johnson, Department of Civil Engineering, San Diego State University, San Diego, CA 92182

RESUME OF HOWARD H. CHANG, Ph.D., P.E.

Present Position: Professor of Civil Engineering, San Diego State University

Telephone: (858) 756-9050, (629) 594-6380

Date of Birth: November 12, 1939

I. EDUCATION

B.S. in Civil Engineering, National Cheng Kung University, Taiwan, China, 1962.

M.S. in Civil Engineering, Colorado State University, 1965.

Ph.D. in Civil Engineering (Hydraulics, Hydrology, Sedimentation), Colorado State University, 1967.

II. MEMBERSHIP IN HONORARY AND PROFESSIONAL SOCIETIES

Chi Epsilon Fraternity (Civil Engineering Honorary)

Tau Beta Pi Society (Engineering Honorary)

Sigma Xi (Scientific Research)

Phi Kappa Phi (Scholarship)

Phi Beta Delta (International Scholars)

American Men of Science (1971)

American Society of Civil Engineers

Professional Civil Engineer, California and Arizona

Sedimentation Committee of the American Society of Civil Engineers, 1977-1981

Chairman of the Civil Engineering Department, San Diego State University, 1976-1979

Who's Who in Technology Today, 1982-83

International Who's Who in Engineering, 1st Edition, Cambridge, England, 1984

Who's Who in California, 1989

National Research Council, National Academy of Sciences, 1984-1987

Associate Editor, Journal of Hydraulic Engineering, ASCE, 1985-1987

Task Committee on Flood Hazard Analysis on Alluvial Fans, ASCE, 1987-1989; Chairman
of subcommittee on erodible channels

International Scientific Committee, International Symposium on Sediment Transport
Modeling, 1989

Conference Chairman, 1990 National Conference on Hydraulic Engrg., ASCE, San Diego

Expert Consultant to Committee on Glen Canyon Environmental Studies, Water Resources
and Technology Board, National Academy of Sciences, Washington, D. C. 1991

III. AWARDS

Outstanding Civil Engineering Achievement Award, co-recipient of this award with the Flood Plain Management Program of the County of San Diego, awarded by the San Diego Section of ASCE, 1982.

Outstanding Service Award, for service on the Board of Directors of the San Diego State University Foundation, October 1985.

Outstanding Civil Engineering Project Award, on the hydraulic design of environmental flood control channel *First San Diego River Improvement Project*, awarded by the San Diego Section of ASCE, 1990.

IV. CONSULTING EXPERIENCES

I have been involved in professional consulting since 1967. Within the general areas of hydraulics, hydrology, and sedimentation, I have been active in the flood plain mapping, channel design, hydrological simulation, watershed analysis, and river channel erosion and sedimentation. I am the author of over 100 technical reports and several computer models for river morphology and fluvial river hydraulics. Among the professional activities, I have taught short courses on river and sedimentation engineering, hydrology for flood control, and the use of the HEC-2 and the FLUVIAL-12 programs. I have served as a consultant for consulting firms, local, state, and federal governmental agencies, and the United Nations. An outline of technical activities is given below.

Channel Design: I have been responsible in many channel design projects, including the First San Diego River Improvement Project, the Rillito River Levee Design (18 miles), the Elfin Forest channel design, Santa Cruz River levee design (40 miles), San Vicente Creek channel design, high velocity channel and energy dissipator of Bullhead City, Arizona, and environmental channel of Carmel Valley. In addition, I have served as a consultant to assist other engineers on design projects.

Hydrological Simulation: I have made the Floodwater Detention Basin Study for the City of Poway, Rattlesnake Dam Breach Study, and numerous designs and investigations involving hydrological simulation. I am well familiar with such programs as TR-20 and HEC-1. I have also served as an expert witness involving flood damages.

River and Sediment Studies: I have developed the FLUVIAL model for simulating river hydraulics, sediment transport, and river channel changes. This model has been applied to the rivers listed below. Data collection and model calibration were made in several cases. I have also made studies of sediment yields from many natural and disturbed watershed, and sediment deliveries by river channels.

Santa Clara River: Delivery of sand to the beach as affected by sand and gravel mining, dams, and Freeman diversion, 1987.

Ventura River: River hydraulics, sediment transport, sand delivery to the beach, mitigation methods for sand delivery, 1990.

Other studies cover Sweetwater River upstream of Sweetwater Reservoir, Upper San Diego River near Old Mission Dam, Otay River near the Beyer Way bridge, San Dieguito River near Rancho Santa Fe, San Dieguito River mouth in Del Mar, San Luis Rey River in Oceanside, San Elijo Lagoon in Del Mar, San Luis Rey River near Pala, Upper San Diego River in Santee and Lakeside, Otay River near the I-805 bridge crossing, Los Chollas Creek in San Diego, South Chollas Creek in San Diego, Canada Del Oro Wash in Tucson, Rillito River in Tuscon, San Lorenzo River in Santa Cruz, California, Salt River in Phoenix, Santa Cruz River in Tucson, Pantano Wash in Tucson, Santa Margarita River at Camp Pendleton, San Mateo River at Camp Pendleton, Trabuco Creek in Orange County, San Juan Creek in Orange County, Tanana River near Fairbanks in Alaska, Tanana River

near Nenana in Alaska, Escondido Creek in Vista, Buena Vista Creek in Carlsbad and Vista, Yellow River and Yangtze River in China, Santa Clara River in Ventura, Fall River in Colorado, Missouri River in Iowa and Nebraska, Temecula Creek in Riverside.

V. BOOK PUBLICATIONS

Chang, H. H., *Fluvial Processes in River Engineering*, John Wiley & Sons, February 1988, 432 pp. Known adoptions as a graduate text: Johns Hopkins University, University of Colorado, Clarkson University, University of Canterbury in New Zealand, South Dakota State University, Chengdu University, Clemson University, University of Nebraska. The Chinese translation is published by the Science Press, Beijing, 1990.

Chang, H. H. and Hill, J. C., Editors, *Hydraulic Engineering*, Proceedings of the 1990 National Conference on Hydraulic Engineering, American Society of Civil Engineers, New York, NY, 1204 pp.

VI. JOURNAL PUBLICATIONS AND TECHNICAL REPORTS

Over 100 publications in refereed journals, conference proceedings, and technical reports. Most publications are in the general areas of hydraulics, hydrology and sedimentation. They deal with channel design, hydrological simulation, sediment transport, and river studies.

VII. TECHNICAL TRAINING COURSES TAUGHT

Lecturer of the short course “Background and Applications of the HEC-2 Program for Water-Surface Profiles”, offered to engineers of the County of San Diego and the City of San Diego, January 21-26, 1973.

Coordinator and principal lecturer of the short course, “Applied Sedimentation and River Engineering,” attendance: 61, Shelter Island, San Diego, January 14-17, 1982.

Coordinator and principal lecturer of the short course, “Applied Sedimentation and River Engineering,” attendance: 56, Shelter Island, San Diego, January 18-21, 1984.

Lecturer of the course “River Processes and Engineering”, offered to engineers and researchers at the Central Water and Power Research Station, Poona, India, Dec. 27, 1985 to January 18, 1986. The course was financially supported by UNDP for which the instructor was a consultant.

Guest lecturer of the two-day short course “Hydrology of Flood Control”, July 1986 and July 1987

Lecturer of the short course “Identifying and Managing Debris-Flow Hazard and Erodible Channels in the Western U. S.”, for the Arizona Floodplain Management Association meeting, Wickenburg, Arizona, September 17-18, 1987.

Lecturer of the two-day short course “River Engineering”, offered to the engineers of the City of Tucson, March 3-4, 1988.

Guest lecturer on “Alluvial Fan and River Channels”, at the workshop on Analysis and Evaluation of

Mud Flow and Alluvial Fan Flooding, West Consultants, 1988.

Lecturer of the three-day short course “River Processes and Sedimentation”, offered to the faculty and graduate students of the Civil Engineering Department, Clarkson University, Potsdam, New York, May 30-June 2, 1988.

Lecturer of the three-day short course “Sedimentation Engineering”, invited by and offered at Queensland University of Technology, Attendance: 28, Brisbane, Australia, July 12-14, 1989.

Lecturer of the three-day workshop “River Sedimentation Modeling Using the GFLUVIAL Program”, sponsored by the U. S. Geological Survey, attended by 20 professionals from the U.S. Geological Survey and Federal Highway Administration, Denver, Colorado, April 10-12, 1990.

Lecturer of the short course “Background and Applications of the HEC-2 Program”, offered by invitation at Ranpac Engineering Corporation, Temecula, CA. June, 1990.

Guest lecturer of the three-day short course “Water-Surface Profile Computation Using HEC-2”, sponsored by Continuing Education Service, ASCE, New York, course offered at San Diego, July 26-28, 1990.

Howard H. Chang, Ph.D. P.E.

Dr. Chang is the president of Howard H. Chang Consultants and a registered civil engineer in California and Arizona. Within the general consulting areas of hydraulics, hydrology, and sedimentation, he has been active in flood plain mapping, channel design, river channel erosion and sedimentation, hydrological simulation, and watershed analysis. He is the author of over 100 technical papers, several computer models for river morphology and fluvial river hydraulics, and the book *Fluvial Processes in River Engineering* published by John Wiley & Sons in 1988.

Address P.O. Box 9492, Rancho Santa Fe, CA 92067

Phone: (858) 756-9050

Education

Colorado State University

Ph. D. in Civil Engineering

Colorado State University

M. S. in Civil Engineering

National Cheng Kung University

B. S. in Civil Engineering

Professional Registration

Civil Engineer: Arizona, California

Professional Activities

Among the professional activities, he has taught short courses on river and sedimentation engineering, hydrology for flood control, and the use of the HEC-2 and FLUVIAL programs. He has also served as a consultant for consulting firms, local, state and federal governmental agencies, and United Nations. Other experiences are given as follows:

* **Channel Design** - Dr. Chang has been responsible in the hydraulic design of many channel projects, including the First San Diego River Improvement Project, the Rillito River Levee Design (18 miles), channelization of the Santa Cruz River (40 miles), high velocity channel and energy dissipator of Bullhead City, Arizona. In addition, he has served as a consultant to assist other

engineers on such design projects.

* **Hydrological Simulation** - Dr. Chang has done the City of Poway floodwater detention basin study, Rattlesnake Dam breach study, and numerous investigations involving hydrological simulation. He is well familiar with such programs as TR-20 and HEC-1.

* **River and Watershed Studies** - Dr. Chang has developed and applied the FLUVIAL model extensively to over 100 river projects, including the Salt River, the San Diego River, the San Luis River, the Santa Cruz River in Tucson, Trabuco Creek, the Yangtze River in China, and the Tanana River in Alaska. The studies covered general scour at bridge crossings, river responses to gravel and sand mining, reservoir sedimentation, fluvial design for bank protection, and so on. The FLUVIAL model was evaluation by the National Academy of Sciences. Dr. Chang has also made studies of sediment yields from many natural and disturbed watersheds and sediment deliveries by river channels, including the Santa Clara River and Buena Vista Creek. He has also tested and calibrated the FLUVIAL model using six different data sets.

HOWARD CHANG

- (1) Expert Consultant to the Yangtze Science Institute in Wuhan, China, technology transfer for studying river channel changes affected by the Three Gorges Dam Project which is the largest engineering project in the world.
- (2) Member of the Editorial Board, International Journal of Sediment Research, since 1999, Beijing, China
- (3) Principal Investigator, ACaltrans Erosion Control Pilot Study”, awarded by the California Department of Transportation, February 1998- January 2001, \$ 525,000.
- (4) Principal Investigator, ALaboratory and Field Test Correlation for Temporary Soil Stabilization”, awarded by the California Department of Transportation, October 2000- June 2001, \$ 134,000.
- (5) Invited speaker on Serrano Creek Modeling at the workshop on Stream Bank Stabilization for the Millennium, sponsored by Serrano Creek Conservancy, Lake Forest, CA, October 3, 2000.
- (6) Invited speaker on San Dieguito Lagoon Restoration at the ASCE Student chapter seminar SDSU, April 10, 2001.
- (7) Invited speaker on Three Gorges Dam at the ASCE Arizona Chapter seminar, Phoenix, Arizona, September 28, 2001.
- (8) Invited Senior Visiting Scholar by the Institute of Mountain Hazard and Environment, Chinese National Academy of Sciences to present a series of lectures on river modeling in Kunming, China, June 4-10, 2001.

Publications

Chang, H. H., Grove, R., and Pearson, D., AModeling Changes in an Ephemeral Coastal River”, *Journal of Floodplain Management*, Floodplain Management Association, May 2001.

Chang, H. H., Tanious, S., and Pearson, D., "Flood Level Computation for Ephemeral Coastal Streams", *Journal of Floodplain Management*, Floodplain Management Association, 2001.

Harding, M.V., Forrest, C.L., and Chang, H.H., "Caltrans Erosion Control Pilot Study", *Proceedings of Soil Erosion Research for the 21st Century*, ASAE, January 3-5, 2001, Honolulu, Hawaii.

Chang, H.H., "Sediment Transport Modeling for Stream Channel Scour Below a Dam", *Proceedings of Soil Erosion Research for the 21st Century*, ASAE, January 3-5, 2001, Honolulu, Hawaii.

Chang, H.H., "Modeling of Morphological Changes of an Ephemeral Stream", *Proceedings of the Seventh Federal Interagency Sedimentation Conference*, Reno, Nevada, March 25-29, 2001.