

Soorgul Wardak, Ph.D., P.E.
Senior Engineer

Professional Profile

Dr. Soorgul Wardak is a Senior Engineer in Exponent's Civil Engineering practice. He has more than 30 years of teaching, research, and professional experience in hydraulics, hydrology, water quality modeling, water resources modeling, and groundwater engineering. He has worked on numerous projects such as numerical simulation of unsteady flow in the lower Sacramento River Bypass System for the National Weather Service, Hydro-Electric Potential Study of Mekong River in Thailand for the United Nations, and a flood insurance study for FEMA in San Diego County, California. In addition to these projects, Dr. Wardak has developed several computer programs for use in hydrologic, hydraulic and sedimentation engineering. Moreover, Dr. Wardak's doctoral work focused on solutions to two-dimensional non-linear partial differential unsteady flow equations using the Alternating Direction Implicit (ADI) method. His Post-Doctoral research included effects of highway construction on fresh groundwater in the Outer Banks of North Carolina. Dr. Wardak has also developed a model for the Neuse River Estuary in North Carolina that consisted of flow dynamics and water quality modeling.

Dr. Wardak has been supervising design projects for civil engineering seniors at the University of California at Irvine (UCI) since 2000 and has taught professional engineer (PE) licensure courses in California. Currently, he is teaching part time at California State University at Pomona, California. He was also selected by the University of Wyoming to teach a training course on Irrigation and Water Resources Engineering in Peshawar, Pakistan in March 1992. His teaching experience includes college level courses such as Fluid Mechanics, Hydraulics, Engineering Mechanics, Water Resources Engineering, Water Supply, Groundwater Hydrology, Open Channel Design, Introduction to Engineering, Senior Project Design, and Fundamentals of Computer Programming in FORTRAN. Dr. Wardak has excellent working knowledge of HEC-1, HEC-2, HEC-RAS, HEC-6, HEC-HMS, Advanced Engineering Software (AES), HYDRA, WSPG, SacCalc, and MORA modeling.

Academic Credentials and Professional Honors

Post Doctoral Fellow, Biological and Agricultural Engineering, North Carolina State University, 1976–1978
Ph.D., Civil Engineering, North Carolina State University, 1976
M.S., Civil Engineering, Asian Institute of Technology, Bangkok, Thailand, 1970
B.S., Civil Engineering, Kabul University (*with honors*), Afghanistan, 1966

Recipient of full assistantship at North Carolina State University towards Doctorate, 1972–1975; USAID Scholar for M.S. Program at Asian Institute of Technology; Certificate of Appreciation by UCI for guiding senior civil engineering student projects

Licenses and Certifications

Registered Professional Engineer, California, #52913

Languages

Pashto, Persian (Farsi)

Publications

Wardak S. Improving shallow wells for Afghan refugees. Publication of UNCHR, DACCAR/UNCHR, Peshawar, Pakistan, 1987.

Skaggs RW, Wardak S. Approximate methods for characterizing groundwater movement on Narrow Islands. Department of Biological and Agriculture Engineering, North Carolina State University, Raleigh, NC, 1978.

Skaggs RW, Wardak S. Transient groundwater movement beneath Barrier Islands. Department of Biological and Agriculture Engineering, North Carolina State University, Raleigh, NC, 1978.

Amein M, Wardak S. Water quality model of Neuse River Estuary. Publication of NOAA, NCSU at Raleigh, NC, 1975.

Wardak S. Implicit numerical solution of unsteady flows in open channel and shallow water basins. Ph.D. Thesis, North Carolina State University, Raleigh, NC, 1975.

Amein M, Wardak S. Numerical simulation of unsteady flow in the Lower Sacramento River Bypass System. Publication of NOAA, North Carolina State University, Raleigh NC, 1974.

Wardak S. Forces from submerged jets. M.S. Thesis, Asian Institute of Technology, Bangkok Thailand, 1970.

Presentations and Published Abstracts

Shrestha PL, Hamilton D, Jordan N, Lyle JE, Doroudian M, Shaller PJ, Wardak S, Cydzik K, Medellin J. Inland flood hazard analysis and mitigation. Poster, ASCE-EWRI World Environmental & Water Resources Conference, Honolulu, HI, May 12–16, 2008.

Wardak S, Murillo B, Hamilton D, Shrestha PL, Doroudian M, Cydzik K, Medellin J, Shaller PJ. Sedimentation analysis in an open channel network for existing and proposed development conditions. Poster, ASCE-EWRI World Environmental & Water Resources Conference, Honolulu, HI, May 12–16, 2008.

Murillo B, Wardak S, Hamilton D, Shrestha P. Sedimentation analysis in an open channel network for existing and proposed development conditions. International Conference on Water, Environment, Energy and Society, 2007.

Wardak S. Challenges in rebuilding Afghanistan. ASCE International Conference, California State University Fullerton, CA, July 2004.

Books Reviewed

Mechanics of Solids. W. Pilkey and O. Pilkey, QPI Series, 1974.

Selected Project Experience

Dr. Wardak has extensive experience in both hydrologic and hydraulic modeling including: analysis, planning, and hydraulic design.

Hydrologic and Hydraulic Modeling

Performed a numerical simulation of unsteady flow in the lower Sacramento River Bypass System. The study was conducted for flood forecasting purposes.

Conducted a hydraulic analysis for Mirasera Flood Control Channel in Riverside County California, which included a drop structure, two sediment basins, and culvert crossing modeling.

Responsible for hydraulic and sediment transport analyses using HEC-RAS and HEC-6 to model a braided flow network within Tujunga Wash. Developed an open channel flow network for both existing and post-developed conditions. Identified locations for both existing and developed conditions, where there may be excessive sedimentation or erosion. Provided recommendations on how to prevent such problems in a particular location. Also, provided design recommendations for drainage patterns on the constructions of on-site bridges and channel conveyances.

Developed hydrologic models for six major watersheds in south Orange County to assess the hydrologic and sedimentation/erosion impacts associated with a variety of alternatives for the Foothill Transportation Corridor-South. The major watersheds included San Mateo, San Juan, San Onofre, Trabuco Creek Watershed, Oso Creek Watershed, and Prima Deshescha Watershed. The plans required identification of hydrologic criteria, extensive hydrologic modeling using HEC-1 program and the WMS processor. All input data to the hydrologic model were obtained using GIS.

Water Quality

Developed a dynamic water quality model for Neuse River Estuary consisting of two principal parts. The first part employed an implicit method for the solution of the shallow water hydrodynamic equations. The objective of this part of the work was to obtain the values for discharge, velocity, and depth in the estuary under the action of freshwater inflow, surface runoff, wind and tides. The second part of the model used an explicit method for the solution of the unsteady mass-balance equation (equation of mass transport). The model was tested using field data for ammonia, nitrates and dissolved oxygen.

Applied the Hydrologic Simulation Program FORTRAN (HSPF) to water quality modeling of Chesapeake Bay, Water Quality Group, North Carolina State University, Raleigh, NC

FEMA Mapping

Developed flood insurance rate maps for 27 creeks in San Diego County. Maps were based on identification of floodplain/floodways for each creek and labeling of different rate zones.

Conducted flood plain study using HEC-RAS for both existing and proposed golf course conditions. It was determined that the proposed improvements did not affect flow in Trabuco Creek such that any significant degradation or aggradations of the main channel would occur.

Restoration of Natural System

Conducted a peer review of the preliminary engineering studies and EIR for Bolsa Chica Wetland. These engineering studies included diversion structure analysis, tidal and two-dimensional flow and water quality analysis within the wetlands.

Peer review of the San Gorgonio River hydraulic and fluvial modeling. The purpose of the study was to investigate an effective alternative for restoration of the creek after gravel mining operation. A sediment management approach was recommended for restoration of the gravel-mining pit

Groundwater

Analyzed the effects of highway construction on the fresh groundwater in the Outer Banks of North Carolina. Study was part of an analysis of all environmental effects of the highway construction.

Conducted study of transient groundwater movement beneath the Barrier Islands, Department of Bio and Agriculture Engineering, North Carolina State University, Raleigh, NC.

Academic Appointments

- Civil and Environmental Engineering Affiliate, Department of Civil and Environmental Engineering, University of California, Irvine, 2000–present
- Associate Professor, Department of Civil Engineering, College of Engineering, Kabul University, Afghanistan, 1978–1985
- Chairman for the Center of Engineering Consulting Services and Applied Research (CECSAR), College of Engineering, Kabul University, Afghanistan, 1980–1982

Peer Reviewer

- *Journal of Hydrologic Engineering*

Professional Affiliations

- American Society of Civil Engineers—ASCE