

A HISTORY OF HYDRAULIC MODELING AT THE WATERWAYS EXPERIMENT STATION

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The disastrous Mississippi River flood of 1927 recorded over 300 deaths, over 600,000 displaced persons, and more than \$1B in damages. It was also the impetus for founding the nation's federal hydraulics laboratory, the Waterways Experiment Station (WES) in 1929. WES now is one of the four geographic laboratory sites that comprise the U.S. Army Corps of Engineers' Engineer Research & Development Center (ERDC). WES was established by order of the 31st Chief of Engineers, Major General Edgar Jadwin. His instructions were for it to be constructed at a site in Memphis, TN. In November 1929, Major General Lytle Brown, the 32nd Chief of Engineers, directed that the new station be located in Vicksburg, MS, not Memphis. His logic was that it should be near the headquarters of the Mississippi River Commission, which was being moved from St Louis to Vicksburg. In addition, Vicksburg was home to the Vicksburg District and Lower Mississippi Valley Division of the Corps. MG Brown also selected the name, "U. S. Waterways Experiment Station." By the end of 1930, a main brick laboratory building had been completed and research had begun at the then 147 acre tract four miles south of Vicksburg. The first studies focused on sediment transport and potential silting rates behind proposed flood control reservoirs in the Mississippi Valley. The first hydraulic model study began in 1930 and its subject was proposed redesign of Lock and Dam #37 on the Ohio River. This was followed in late 1930 by experiments on a distorted scale physical model (1:1,200 horizontally; 1:48 vertically) of the Illinois River backwater area. This was a rather crude model, dug directly into the loess soil. It was over 600 feet in length, then the largest hydraulic model in the world. In subsequent years, modeling technology improved by the addition of molded concrete representations and increased size. These models were typically constructed inside metal hangar-type shelters so tests could be conducted free from weather effects. This technology reached its peak with construction of the Chesapeake Bay Model in 1977. The model covered 8.6 acres and was housed in a shelter that covered 14.5 acres. In the outdoor physical model arena, the Mississippi Basin Model, located on 822 acres of land near Clinton, MS, covered some 200 acres when completed in 1966. Along the way, data collection techniques and technology improved greatly. Requirements went from hundreds, to dozens of technicians needed to collect data and finally, with computer linked sensors, to one or two staff operating a model. Along the way, computer applications came on the scene in the mid 1970's. Numerical advances proceeded to unfold as computer power increased. First, through larger and larger main frame computers to today's massively parallel high performance machines that are capable of rapidly computing results over millions of nodes representing a model domain. This paper conducts a review of the inception and progress of hydraulic modeling at the Waterways Experiment Station site over the past 83 years, and offers insight into future directions and capabilities.