RESEARCH PAYS OFF

Ship Simulation Saves $4 Million on Brownsville Channel

US Army Corps of Engineers
Waterways Experiment Station

The U.S. Army Corps of Engineers, Waterways Experiment Station (WES), operates the Corps' only marine simulator (Figure 1) in Vicksburg, Mississippi. The WES Ship/Tow Simulator's primary mission is to evaluate proposed modifications to federally authorized commercial navigation channels. The simulator is a "real-time" (i.e., events require the same amount of time on the simulator as they do in real life) numerical model of navigation conditions at a project site. Mariners from the project site travel to WES and operate the simulator to participate in the design and evaluation of the proposed navigation channel improvements.

Problem

In 1989 the U.S. Army Engineer District in Galveston, Texas, was completing the design to deepen and widen the Brownsville Ship Channel (Figure 2). The controlling depth was proposed to be deepened from 10.8 to 12.6 meters (36 to 42 feet), and the 24-kilometer (15-mile) Laguna Madre Reach was to be widened from 60 to 90 meters (200 to 300 feet). In addition a difficult turn between the entrance channel and Laguna Madre Reach required design consideration. Typically WES conducts a ship simulator navigation study to design and assist in

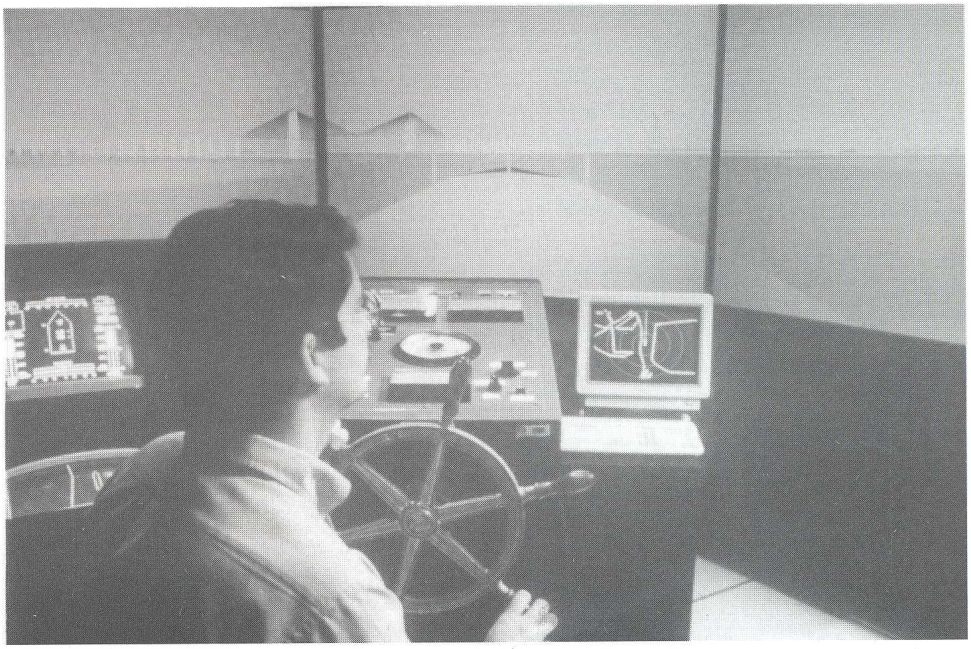

FIGURE 1 Marine simulator operated by the U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi.

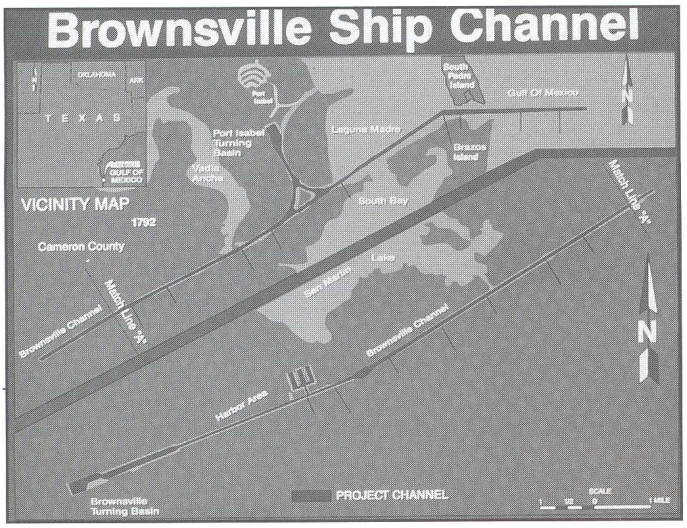

FIGURE 2 Plans to deepen and widen Brownsville Ship Channel are nearing completion.

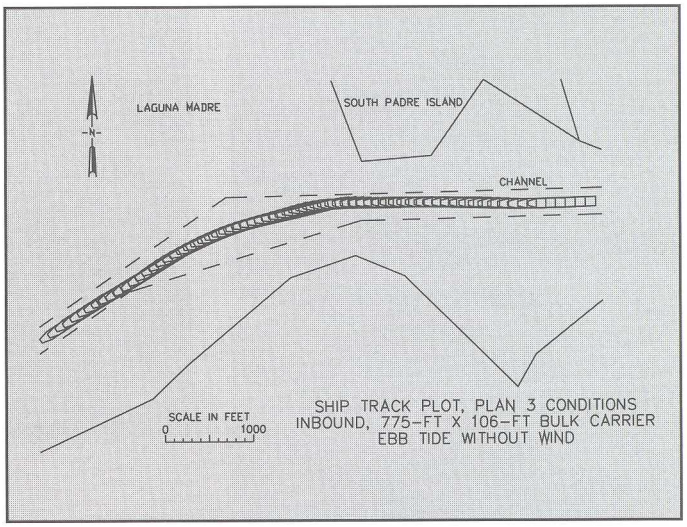

FIGURE 3 Ship track plot.

the evaluation of the proposed improvements, with the local ship handlers or pilots traveling to WES for simulation testing. However, there are only two licensed pilots for the Port of Brownsville, and because of their workloads they were unable to travel to WES for testing.

Solution

WES developed a portable version of the simulator to take to Brownsville for the study. The portable version used the same hydrodynamic model to calculate vessel movement as the full-size WES Ship/Tow simulator. A graphics computer displayed the visual scene on a 610-millimeter (24-inch) color monitor. A personal computer calculated the vessel hydrodynamics and another computer displayed the project radar on two monitors. The three computers were connected with serial cables. The cost to develop the portable simulator was approximately $30,000.

Application

The portable simulator was set up at the port's main office. The Brownsville pilots participated in the simulation model validation (the adjustment of the data bases for the simulation model until existing navigation conditions are reproduced) and test program. Simulation test runs were conducted under the existing and proposed model conditions (Figure 3).

Results from the proposed conditions were compared with results for the existing conditions.

Benefits

Construction of the Brownsville Ship Channel improvements is expected to be completed in May 1995. Results from the simulator study reduced the original $38.8 million estimate by approximately $4 million. The primary savings were from reducing the recommended width of the 24-kilometer (15-mile) Laguna Madre Reach from 90 to 75 meters (300 to 250 feet).

Other benefits of the portable simulator include increased accessibility for other customers facing situations similar to that of the U.S. Army Engineer District in Galveston. A radar-only version of the portable simulator was used for the port of Grand Haven, Michigan.

For further information on the Brownsville Ship Channel Project contact George Alcala, U.S. Army Engineer District, Galveston, CESWG-PM-J, 2000 Fort Point Road, Galveston, Texas 77553. (telephone 409-766-6388). For further information on the Waterways Experiment Station Ship/Tow Simulator, contact Dennis Webb, U.S. Army Corps of Engineers, Waterways Experiment Station, CEWES-HR-N, 3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199 (telephone 601-634-2455).

Suggestions for "Research Pays Off" topics are welcome. Contact G. P. Jayaprakash, Transportation Research Board, 2101 Constitution Avenue, N.W., Washington, D.C. 20418 (telephone 202-334-2952).