Barges, vulnerable to high winds and waves, have the potential to inflict substantial damage to floodwalls.

Simulation of surge and waves requires details about winds and geographic features to produce accurate results.

Today's sophisticated modeling provides detailed insight into how water surrounding a complex physical system responds to an equally complex hurricane wind system. In the future, such modeling will be helpful in designing hurricane protection.

Meteorological designations alone, such as the Saffir-Simpson Scale of hurricane intensity, are insufficient for developing design criteria or evaluating hurricane protection system performance.

Accuracy of current models for calculating the effects of wetlands and marshes on storm surge and waves is uncertain.

There is a great need for hardened, self-powered instruments that can reliably capture changes in wind, wave and water level conditions throughout a storm.

Characterizing hurricane hazards using the Standard Project Hurricane concept is no longer recommended. Probabilistic methods have replaced it to guide the Corps' designs. It appears that the severity and frequency of hurricanes in the northern Gulf of Mexico may be increasing. Changes in the hurricane climate can alter the risk of flooding, so original design criteria and level of protection provided by the structures should be reevaluated. In 1979, the SPH was redefined as more severe than the original 1965 SPH, but no action was taken to modify the structures to accommodate changes in the assessment of hazard.

For more information on this topic, please refer to Volume IV of the IPET Report.

IPET Report Summaries

The Storm

Hurricane Katrina had degraded into a Category 3 storm when it passed through New Orleans the morning of August 29, 2005. Twenty-four hours earlier the storm had been the largest, most intense Category 5 hurricane ever documented in the northern Gulf of Mexico, producing record waves 55 feet high. Katrina's intensity and size throughout its history, combined with the extreme waves generated during its most intense phase, produced storm surges of up to 28 feet, the largest ever observed in the Gulf of Mexico.

The U.S. Army Corps of Engineers established the Interagency Performance Evaluation Task Force (IPET) in fall 2005 to provide scientific and engineering answers to questions about the hurricane protection system's performance during Hurricane Katrina. Volume IV of

the nine-volume IPET report addresses the question, what conditions of storm surge and waves were used as the basis for designing the greater New Orleans hurricane protection system, and how do they compare to the actual storm surge and waves generated by Hurricane Katrina?

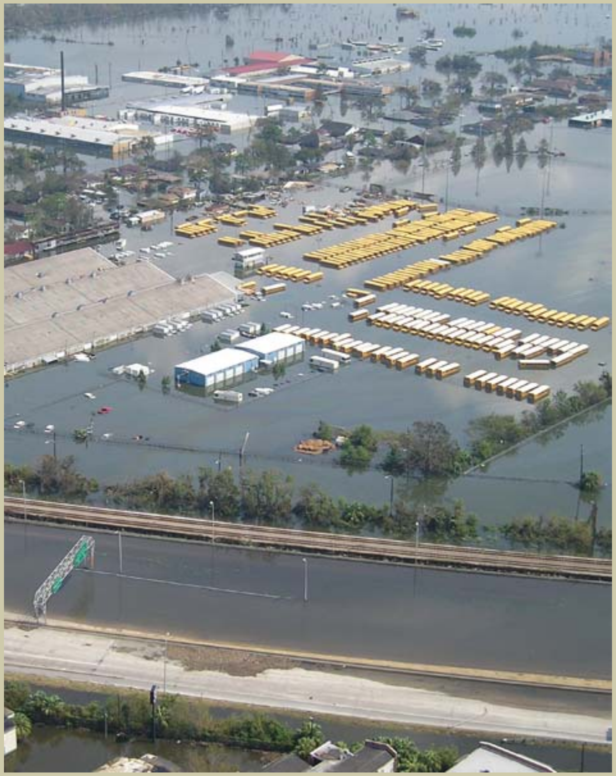
Findings and Lessons Learned

Katrina generated much more powerful waves and greater storm surge than described by the Standard Project Hurricane (SPH), the specific hazard conditions for which the hurricane protection system was designed. The storm's surge, coupled with energetic, long-period wave conditions, overwhelmed the hurricane protection system in many places.

Surge in Lake Ponchartrain and waves and water levels in some other parts of the New Orleans area were comparable to the hurricane protection system design criteria. But elsewhere in the hurricane protection system, Katrina's surge, waves and water levels significantly exceeded design expectations.

Wave periods along Plaquemines Parish levees, the Gulf Intracoastal Waterway (GIWW) and the Mississippi River Gulf Outlet (MRGO) were approximately three times those considered in the Standard Project Hurricane, dramatically increasing damages from wave run-up and overtopping.

The MRGO channel, trending toward the southeast, has little influence on the water level inside the Industrial Harbor Navigation Canal (IHNC) during storms. The channel into the IHNC from the GIWW, however, has a very large influence on storm water levels.



Water pushed by surge and waves attained very high velocities as it cascaded over the tops and down the landward sides of exposed levees in Plaquemines Parish and along the MRGO. Small differences in water levels make substantial differences in overtopping rates, and variations in wave direction significantly affect water velocities along overtopped levees.

For the complete report, visit https://ipet.wes.army.mil