

## **COMPREHENSIVE SURGE PROTECTION FOR THE GALVESTON BAY COMPLEX**

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On September 13, 2008, Hurricane Ike came ashore near the east end of Galveston Island in Texas. Ike's strong Category 2 winds and especially its Category 4-equivalent storm surge, devastated the Galveston Bay region and Ike is ranked as the third costliest hurricane to make landfall in the United States. Two storm surge barriers that mitigated damage and loss of life and property were the existing Seawall constructed after the 1900 Galveston storm and the Texas City Barrier constructed after Hurricane Carla. Unlike Hurricane Katrina, when the media and the power of political process focused on the difficulties in New Orleans, the impact of Ike on the Houston/Galveston region was quickly forgotten as attention turned to the US presidential race and the worldwide financial meltdown.

Despite the initial lack of attention, Hurricane Ike may well be a watershed storm. It has already changed how NOAA classifies hurricanes by giving more credence to surge potential. Moreover, the devastation caused by Ike clearly pointed out the vulnerability of the Houston/Galveston area to hurricane storm surge and triggered ideas on regional approaches to suppressing surge for this urbanized region. Researchers from Texas A&M University at Galveston and the SSPEED Center, headquartered at Rice University, have teamed with hurricane experts at Jackson State University to better understand the hurricane surge threat and to develop and test surge suppression strategies to protect people, places and sensitive ecosystems.

In particular, the SSPEED Center at Rice University and Texas A&M University at Galveston have been studying different but compatible strategies for surge suppression

for the Galveston Bay Region. SSPEED had been concentrating its efforts on suppressing surge using barriers and non-structural alternatives internal to the Bay system, while Texas A&M has concentrated on methods to stop the surge at the coast using a continuous coastal barrier – the “Ike Dike” concept.

The “Ike Dike”, a coastal barrier, would protect the Houston-Galveston region by stopping much water as practical at the coast by preventing it from entering Galveston Bay. The project would extend the protection afforded by the existing Galveston Seawall along the rest of Galveston Island and along the Bolivar Peninsula, with a 17ft high, dune covered revetment near the beach or by raising the coastal highways. The addition of flood gates at Bolivar Roads, the entrance to the Houston, Texas City, and Galveston ship channels, and at San Luis pass on the west end of Galveston Island would complete a coastal spine. At about a 17ft height, the Ike Dike approach should provide an effective barrier against the n majority of hurricane surges into the Bay for storms experienced over the last century. However as the Jackson State modelling has shown, there are powerful Gulf hurricanes, such as Camille, that would cause strong residual surges in the Bay. SSPEED has taken the lead in studying additional in-bay barriers that would reduce the residual surge and other measures such as land-use changes that would reduce the surge risk.

The coastal spine and in-bay barriers could be built using existing, proven technology such as the gates and barriers now in use in the Netherlands and in the recently completed Greater New Orleans Barrier. Greater New Orleans is now protected by a 133 mile parameter of levees, flood walls and gated barriers. The total cost of Greater New Orleans Hurricane and Storm Risk Reduction System so far is \$14.5 billion dollars. The strategy is to keep massive surges from entering the system by shortening the outer protection needed by using 4 gated passages. The System was started in 2008 and achieved 100-yr surge event protection in June 2011. When compared to New Orleans Barrier, the Ike Dike is a much simpler and less costly project yet would protect a much larger industrial base and population.

Both Texas A&M Galveston and the SSPEED Center will continue their research efforts, while collaborating with each other, with an eye towards ultimately combining their various strategies to achieve the best overall solution for the region from an economic, environmental and social perspective. In addition to its research partnership with Rice's SSPEED Center, Texas A&M University at Galveston has also formed strategic partnerships with the Bay Area Houston Economic Partnership and the Bay Area Coastal Protection Alliance to foster research and public outreach. So far the University's surge suppression concept has been endorsed by over 40 cities and economic development organizations in the Galveston Bay region.