Rhode Island Hurricane Evacuation Study
Hurricane Surge Inundation Maps
July 2009

Study Purpose. The purpose of the Hurricane Evacuation Study Program is to develop tools and information that will assist Federal, State and Local Emergency Management Officials in planning for and responding to hurricanes.

Funding. Hurricane Evacuation Study funds are provided by the Federal Emergency Management Agency, the U.S. Army Corps of Engineers and the States. Local community officials and agencies provide valuable data and coordination throughout the study at their own expense.

Authority. The Authority for the U.S. Army Corps of Engineers' participation in this study is Section 206 of the Flood Control Act of 1960 (Public Law 86-645). The Federal Emergency Management Agency's participation is authorized by the Disaster Relief Act of 1974 (Public Law 93-288). These laws authorize the allocation of resources for planning activities related to hurricane preparedness.

SLOSH Model. The Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model was developed by the National Weather Service to calculate potential surge heights from hurricanes. The SLOSH models for the Rhode Island Hurricane Evacuation Study were run by the Storm Surge Group, National Hurricane Center, National Centers for Environmental Prediction, National Oceanic and Atmospheric Administration, Miami Florida. The SLOSH model calculates the hurricane surge elevation that would result from over 500 combinations of hurricane category, landfall location, forward speed, and direction. This study used the BOS SLOSH model basin.

Hurricane Category. One of the earlier guides developed to describe the potential storm surge generated by hurricanes is the Saffir/Simpson Hurricane Scale, which assigns a Hurricane Category according to the maximum sustained wind speed within the hurricane. It was developed by Herbert Saffir, Dade County, Florida, Consulting Engineer, and Dr. Robert H. Simpson, former Director of the National Hurricane Center. A condensed version of the Saffir/Simpson Hurricane Scale is shown in the table below.

Saffir/Simpson Hurricane Scale	
Category	Maximum Sustained Wind Speed (mph)
1	74-95
2	96-110
3	111-130
4	131-155
5	> 155

Hurricane Surge Inundation Maps. The Hurricane Surge Inundation Maps for the Rhode Island Hurricane Evacuation Study were prepared by the U.S. Army Corps of Engineers, New England District. These maps were developed using GIS software by overlaying the hurricane surge water surface elevations from the SLOSH model on top of ground elevations from FEMA LiDAR data to show which areas would be inundated (flooded) by hurricane storm surge.

For each hurricane category, the hurricane surge elevation that results from the worst-case combination of hurricane landfall location, forward speed, and direction at each location along the coast was used in preparing the hurricane surge inundation mapping. This was done for two reasons. First, it is difficult to predict in advance at what location that the hurricane will make landfall. Second, for Emergency Management Planning purposes, it is best to plan for the worst-case, and adjust Emergency Management activities based on actual conditions.

Therefore hurricane surge inundation areas shown on this map depict the inundation that can be expected to result from a worst case combination of hurricane landfall location, forward speed, and direction for each hurricane category; and assumed peak hurricane surge arriving at mean high water.

There is one map for each of the 21 Rhode Island coastal communities. When printed at their full size, the maps are 27" wide x 20" tall. The maps were produced at scales ranging from 1" = 2,000 feet to 1" = 6,000' as needed to fit one community on each map.

Accuracy. Users of the Hurricane Surge Inundation Maps should recognize that there are accuracy limitations inherent to each of the data sources that were used to create the maps. The SLOSH model hurricane surge elevations have an accuracy of +/- 20%. The vertical accuracy of all the elevation datasets varies. The horizontal accuracy is no worse than approximately +/- 3 meters, and the horizontal accuracy is no worse than approximately +/- 3 meters. The RIGIS basemap data, such as the rivers, streams, and ponds is suitable for mapping at scales not more detailed than 1" = 2,000'. The TeleAtlas highway, streets, and railroad data was observed to align well with the Spring 2003 and Spring 2004 RI color 2 foot resolution orthophotos.

Therefore, the maps should be used as a general guide, rather than an absolute representation, as to which areas can expect to be inundated (flooded) by worst-case hurricane storm surge for a particular hurricane category. In addition, users should note that there may be areas that are not shown to be inundated by hurricane surge, but are in fact surrounded by hurricane surge. Those areas may become isolated by hurricane surge.

GIS Layers. Five Hurricane Surge Inundation GIS layers were developed for this project - one each of the five coastal Rhode Island counties (Washington, Kent, Providence, Bristol and Newport). These layers are included on this CD ROM, and are fully documented with metadata (information on how the layers were developed).

Map Notes. Below are the notes that appear on the Hurricane Surge Inundation maps.

1. Hurricane surge elevations were determined by the National Hurricane Center using the BOS SLOSH model basin, and assumed peak hurricane surge arriving at mean high water.

2. The hurricane surge inundation areas shown on this map depict the inundation that can be expected to result from a worst case combination of hurricane landfall location, forward speed, and direction for each hurricane category.

3. The source of basemap transportation features such as roads and railroads is Tele Atlas 2008. The source of other basemap features is the Rhode Island Geographic Information System (RIGIS).

4. The horizontal projection of this map is Rhode Island State Plane NAD83 feet. All elevation data was referenced to the NAVD88 vertical datum.

5. The primary ground elevation data source was a photogrammetrically derived Digital Terrain Model created by the Rhode Island Department of Transportation (RIDOT). This data was supplemented with several other elevation data sources listed below:

-FEMA Map Mod LiDAR, portions of Washington County
(Terrapoint LLC, 2006)
-South Kingston, Cranston, and Charlestown Digital Terrain Models
(EarthData International, 2001,2006)
-Providence Digital Terrain Model (Sanborn, 2004)
-Narragansett and Middletown Digital Terrain Models
(Chas. H. Sells, Inc., 2005)
-ACE/FEMA/NOAA LiDAR (Fugro Pelagos, Inc., 2005)