Region IV Coastal Analysis and Mapping Project – Southeastern United States

The Federal Emergency Management Agency (FEMA) Region IV Office in Atlanta has undertaken a multiyear coastal engineering analysis and mapping effort to better identify, quantify, and communicate flood hazards and associated risks in coastal areas of Alabama, Florida, Georgia, South Carolina, and North Carolina. FEMA is working with the State and regional entity partners listed below and officials of affected communities in the coastal counties to perform flood risk studies and provide affected communities with new National Flood Insurance Program (NFIP) maps.

- Alabama Department of Economic and Community Affairs;
- Florida Division of Emergency Management;
- Georgia Department of Natural Resources;
- North Carolina Division of Emergency Management;
- North Carolina Floodplain Mapping Program;
- Northwest Florida Water Management District;
- South Carolina Department of Natural Resources; and
- Suwannee River Water Management District.

An integral component of each flood risk study is the development of state-of-the-art Digital Elevation Models (DEMs). The DEMs are produced by merging the best available topographic and bathymetric data, including recent Light Detection and Ranging (LIDAR) system-generated data and bathymetric data from multiple sources (National Ocean Survey, U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration). By integrating new or updated topographic and bathymetric datasets with state-of-the-art modeling techniques, FEMA will provide citizens and community officials with accurate, up-to-date flood hazard and risk information.

The FEMA coastal flood risk study process is guided by the procedures described in FEMA’s Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update. To view or download that document, please visit the FEMA website https://www.fema.gov/media-library/assets/documents/34953.

This Fact Sheet provides an overview of the two phases of a coastal flood risk study: (1) storm surge and wave modeling and (2) wave hazard analysis and mapping. For more information on flood risk study components, please visit the Region IV Coastal Analysis and Mapping Web Portal: www.southeastcoastalmaps.com.

Coastal Flood Zones

Within the coastal Special Flood Hazard Area (SFHA), there are two primary zones: Zone VE and Zone AE. Zone VE is used to designate the areas exposed to wave heights of 3 feet or greater, also known as “Coastal High Hazard Areas.” Zone AE is used to designate areas subject to wave heights less than 3 feet; the areas subject to wave heights of at least 1.5 feet but less than 3 feet are referred to as “Coastal A Zones.”

Base Flood Elevations, or BFEs, will vary in each zone. Changes in flood zones and BFEs can have a significant impact on building requirements and flood insurance costs. Because waves can diminish in size over short distances, particularly where the ground is steep, BFEs can differ dramatically.

LiMWA and Community Rating System

Post-disaster assessments and wave tank research have shown that waves as small as 1.5 feet can cause significant structural damage. For all coastal studies, FEMA now maps the limit of the 1.5-foot wave as an informational layer; this boundary line is known as the Limit of Moderate Wave Action, or LiMWA.

The NFIP Community Rating System, or CRS, provides credits for communities requiring VE zone construction standards in areas defined by LiMWA or areas subject to waves between 1.5 and 3 feet. More information on the CRS can be found on the FEMA website: www.fema.gov/national-flood-insurance-program/community-rating-system.
Storm Surge and Wave Modeling

The rise in water level associated with the passage of a major storm such as a hurricane is called storm surge. Determining the magnitude of the storm surge is challenging, because it is affected by many variables, including storm size and intensity, storm track and speed, atmospheric pressure, offshore water depths, and landfall location. To address all combinations of these variables, FEMA Project Teams use specialized computer models and high-powered computers to simulate hundreds of hurricane events and compute surge elevations for the 1-percent-annual-chance (100-year) and 0.2-percent-annual-chance (500-year) events. FEMA validates these models using historic storm and tide data. The results from the storm surge and wave modeling are new stillwater flood elevations (SWELs) that include storm surge and wave setup (additional elevation of water due to waves breaking near the shore). Project Teams use the SWELs for the next phase of the study.

Wave Hazard Analysis and Mapping

Using the updated stillwater elevations, Project Teams perform an overland wave hazard analysis to determine Base Flood Elevations (BFEs) and produce updated digital Flood Insurance Rate Maps (FIRMs) and accompanying Flood Insurance Study (FIS) reports. Components of the overland wave hazard analysis are discussed below.

- **Defining transects to represent regional land use, vegetative cover, building obstructions, and terrain variability along the shoreline.** Transects are cross-sections taken perpendicular to the shoreline that represent a segment of coast with similar characteristics. Transect profiles are generated based on the DEMs. Project Teams conduct field reconnaissance to identify and verify features such as dunes, building types, and vegetation type.

- **Overland wave modeling to define coastal hazard areas and establish BFEs.** Project Teams model overland propagation of waves using the Wave Height Analysis for Flood Insurance Studies (WHAFIS) computer program, which is accessible through the FEMA website: [https://www.fema.gov/wave-height-analysis-flood-insurance-studies-version-40](https://www.fema.gov/wave-height-analysis-flood-insurance-studies-version-40). Where flooding intersects a shore protection structure or other steep feature, Project Teams perform analyses of wave runup (uprush of waves on a slope or structure) and overtopping (passing of water over the top of a structure as a result of wave runup).

- **Mapping of coastal hazard areas.** Project Teams use overland wave modeling results to identify the areas subject to wave heights of 3 feet or greater. The teams map these areas, along with the Primary Frontal Dune (PFD), as Zone VE, also referred to as the Coastal High Hazard Area (CHHA). The PFD is a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach. The PFD is subject to erosion and overtopping from high tides and waves during major coastal storms.