Introduction

The terms in this Glossary will be encountered regularly by people who are actively involved in, or otherwise interested in, the coastal engineering analysis and flood hazard mapping effort in the Southeastern United States. This would include:

- Federal Emergency Management Agency (FEMA) staff;
- Federal, State, and regional entities;
- Community officials;
- Citizens; and
- Other public- and private-sector stakeholders that are actively involved in the National Flood Insurance Program (NFIP) and the Risk Mapping, Assessment, and Planning (Risk MAP) program.

Additional terms related to coastal engineering analyses and flood hazard mapping are provided in Subsection D.2.16 of FEMA's Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update (PDF).

For Additional Information

For additional information about the coastal analysis and mapping effort in the Southeastern U.S., please visit www.southeastcoastalmaps.com.

For additional information about the Risk MAP program, please visit https://www.fema.gov/risk-mapping-assessment-and-planning-risk-map.

Glossary of Frequently Used Coastal Mapping Terms

**ADCIRC Coastal Circulation and Storm Surge Model** - A system of computer programs for solving time-dependent, free surface circulation and transport problems in two and three dimensions. These programs use the finite element method in space allowing the use of highly flexible, unstructured grids.

**Advisory Base Flood Elevations (ABFEs)** - The updated 1-percent-annual-chance stillwater elevations that FEMA developed, following Hurricane Katrina, for coastal parishes in Louisiana and coastal counties in Mississippi (and for coastal communities in New Jersey following Superstorm Sandy) to provide communities with advisory building elevations for reference during the reconstruction process.

**Armor Layer** - The protective layer on a breakwater or seawall composed of "armor units."

**Armor Units** - A relatively large quarrystone or concrete shape that is selected to fit specified geometric characteristics or density.

**Artificial Nourishment** - The process of replenishing a beach with material (usually sand) obtained from another location.

**Astronomical Tide** - The tidal levels and character that would result from gravitational effects of the Earth, Sun, and Moon without any atmospheric influences.

**Backrush** - The seaward return of the waves following the uprush of the waves.

**Backshore** - The zone of the shore or beach lying behind the upper swash zone.

**Bathymetric Chart** - A topographic map of the bed of an ocean, sea, or other large body of water, with depths indicated by contours (isobaths) drawn at regular intervals.

**Bathymetry** - The measurement of depths of water in oceans, seas, or other large bodies of water; also information derived from such measurements.
Beach - The zone of unconsolidated material that extends landward from the low water line to the place where there is marked change in material or physiographic form, or to the line of permanent vegetation (usually the effective limit of storm waves).

Beach Berm - A nearly horizontal plateau on the beach face or backshore, formed by the deposition of beach material by wave action or as part of a beach nourishment effort.

Beach Erosion - The carrying away of beach materials by wave action, tidal currents, littoral currents, or wind.

Beach Face - The section of the beach that is normally exposed to the action of the wave uprush.

Beach Head - The cliff, dune, or seawall looming above the landward limit of the active beach.

Beach Nourishment - The replacement of beach sand removed by erosion; also referred to as beach replenishment or sand replenishment.

Beach Profile - A cross-section taken perpendicular to a given beach contour; the profile may include the face of a dune or seawall, and it may extend over the backshore, across the foreshore, and seaward underwater into the nearshore zone.

Berm Breakwater - A rubble mound structure with horizontal berm of armor stones at about sea level that is allowed to be shaped or reshaped by the waves.

Bluff - A high, steep bank or cliff.

Breakaway Wall - A wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces, without causing damage to the elevated portion of the building or supporting foundation system.

Breakwater - A structure protecting a shore area, harbor, anchorage, or basin from waves.

Central Pressure Index (CPI) - The estimated minimum barometric pressure in the eye (approximate center) of a particular hurricane. The CPI is considered the most stable index to intensity of hurricane wind velocities in the periphery of the storm; the highest winds are associated with storms having the lowest CPI.

Coast - A strip of land of indefinite width (may be several kilometers) that extends from the shoreline inland to the first major change in terrain features.

Coastal A Zone - An area of special flood hazards landward of the Coastal High Hazard Area that is subject to wave heights that are less than 3 feet but greater than or equal to 1.5 feet. These moderate waves can cause significant damage to structures, although the damage would not be as severe as the damage caused by the 3-foot or greater breaking waves in the Coastal High Hazard Area. These areas are designated Zone AE on the Flood Insurance Rate Map.

Coastal Barrier Resources System (CBRS) - A system of protected coastal areas (including the Great Lakes). The areas within the CBRS are defined as depositional geologic features consisting of unconsolidated sedimentary materials; subject to wave, tidal, and wind energies; and protecting landward aquatic habitats from direct wave attack.

Coastal Base Flood Elevations (BFEs) - The 1-percent-annual-chance flood elevations shown on a FIRM within the Coastal High Hazard Area. Coastal BFEs can be calculated using the following equation: Stillwater Flood Elevation + Wave Height = Coastal BFE.

Coastal Erosion - The wearing away of land and the removal of beach or dune sediments by wave action, tidal currents, wave currents, drainage, or high winds.
Coastal Flooding - Flooding that occurs along the Great Lakes, the Atlantic and Pacific Oceans, and the Gulf of Mexico.

Coastal Flood Risk Study - A term used to describe the engineering analysis of flood hazards along the Gulf or Atlantic coast of Alabama, Florida, Georgia, South Carolina, or North Carolina performed by FEMA Region IV staff, partners, and/or contractors using the ADCIRC computer model, with the results of that analysis being reflected on the FIRM panels and FIS report materials for the affected communities.

Coastal High Hazard Area (CHHA) - An area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high-velocity wave actions from storms or seismic sources.

Coastal Processes - A collective term covering the action of natural forces on the shoreline and nearshore seabed.

Coastal Zone Management (CZM) - The integrated and general development of the coastal zone. Coastal Zone Management is not restricted to coastal defense works, but includes also a development in economical, ecological, and social terms. Coastline Management is a part of Coastal Zone Management.

Coastline - Technically, the line that forms the boundary between the coast and the shore; commonly, the line that forms the boundary between the land and the water, especially the water of a sea or ocean.

Deep Water - Water so deep that surface waves are little affected by the ocean bottom. Generally, water deeper than one-half the surface wavelength is considered deep water.

Deep Water Wave - A wave in water the depth of which is greater than one-half the wave length.

Duration - In wave forecasting, the length of time the wind blows in nearly the same direction over the fetch, or "generating area."

Embankment - An indentation in the shoreline forming an open bay.

Erosion - The process by which floodwaters lower the ground surface in an area by removing upper layers of soil.

Erosion Analysis - The analysis of the short- and long-term erosion potential of soil or strata, including the effects of flooding or storm surge, moving water, wave action, and the interaction of water and structural components.

Estuary - The part of a river that is affected by tides; the region near a river mouth in which the fresh water of the river mixes with the salt water of the sea.

Eye - The roughly circular area of comparatively light winds that encompasses the center of a severe tropical cyclone. The eye is either completely or partially surrounded by the eyewall cloud.

Eyewall/Wall Cloud - An organized band or ring of cumulonimbus clouds that surround the eye, or light-wind center of a tropical cyclone. Eyewall and wall cloud are used synonymously.

Foreshore - The part of the shore, lying between the crest of the seaward berm (or upper limit of wave wash at high tide), and the ordinary low-water mark, that is ordinarily transverse by the uprush and backrush of the waves as the tides rise and fall.

Frontal Dune - A ridge or mound of unconsolidated sandy soil, extending alongshore landward of the sand beach and defined by relatively steep slopes abutting markedly flatter and lower regions on each side. See Primary Frontal Dune.

Generating Area - In wave forecasting, the continuous area of water surface over which the wind blows in nearly a constant direction.
**High Water (HW)** - The maximum height reached by a rising tide; also called the high tide. The height may be solely due to the periodic tidal forces or it may have superimposed upon it the effects of prevailing meteorological conditions.

**Higher High Water (HHW)** - The higher of the two high waters of any tidal day.

**High-Velocity Wave Action** - A condition in which wave heights or wave runup depths are greater than or equal to 3.0 feet.

**Holland B Coefficient** - A parameter used in some hurricane wind models to control the peakedness of the hurricane wind profile.

**Hurricane** - A tropical cyclone, formed in the atmosphere over warm ocean areas, with a well-defined counter-clockwise circulation and sustained winds of 74 miles per hour or higher.

**Jetty** - A wall built out into the water to restrain currents or protect a structure. Jetties are built at the mouths of rivers or tidal inlets to help deepen and stabilize a channel.

**Joint Probability Method-Optimal Sampling (JPM-OS)** - A statistical procedure for selecting the optimal configuration of hypothetical hurricanes required to develop storm surge frequency curves.

**Key** - A cay, especially one of the low, insular banks of sand, coral, and limestone off the southern coast of Florida.

**Limit of Moderate Wave Action (LiMWA)** - A line within the SFHA designated Zone AE on a FIRM that marks the inland limit of the area inundated by the 1-percent-annual-chance, 1.5-foot breaking wave. The LiMWA is provided on the FIRM, for informational purposes, because these moderate waves can cause damage to structures; the damage would not be as severe as the damage caused by the 1-percent-annual-chance, 3-foot breaking waves.

**Marsh** - A wetland dominated by herbaceous or nonwoody plants often developing in shallow ponds or depressions, river margins, tidal areas, and estuaries.

**Mean High Water (MHW)** - The average height of the high waters over a 19-year period.

**Mean Higher High Water (MHHW)** - The average height of the higher high waters over a 19-year period.

**Mean Low Water (MLW)** - The average height of the low waters over a 19-year period.

**Mean Lower Low Water (MLLW)** - The average height of the lower low waters over a 19-year period.

**Mean Sea Level (MSL)** - The average height of the surface of the sea for all stages of the tide over a 19-year period, usually determined from hourly height readings.

**Monochromatic Waves** - A series of waves generated in a laboratory; each wave has the same length and period.

**Otherwise Protected Area (OPA)** - An undeveloped coastal barrier within the boundaries of an area established under Federal, State, or local law, or held by a qualified organization, primarily for wildlife refuge, sanctuary, recreational, or natural resource conservation purposes.

**Oversplash** - The water that splashes over the top of a breakwater, seawall, etc.

**Overtopping** - The passing of water over the top of a structure as a result of wave runup or surge action.

**Overwash** - The mass of water representing the part of the wave advancing up a beach that runs over the highest part of a berm or other structure and that does not flow directly back to the sea or lake in which the wave originated.
Primary Frontal Dune (PFD) - A continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms. The inland limit of the PFD occurs at the point where there is a distinct change from a relatively steep to a relatively mild slope. See also: Frontal Dune.

Radius of Maximum Winds - The distance from the eye of a hurricane, where surface and wind velocities are zero, to the place where surface wind speeds are maximum.

RUNUP - A DOS-based program that uses stillwater flood elevation, shore profile and roughness, and incident wave condition input information to compute a wave runup elevation that is consistent with the most detailed guidance available.

Saffir-Simpson Scale - A scale (Categories 1 through 5) that measures a hurricane’s intensity to give an estimate of the potential property damage and flooding expected. Windspeed is the determining factor in the scale.

Sea, Lake, and Overland Surge from Hurricanes (SLOSH) Model - A computerized model run by the National Hurricane Center to estimate storm surge heights and winds resulting from historical, hypothetical, or predicted hurricanes (by taking into account pressure, size, forward speed, track, winds).

Seawall - A solid barricade, often concrete or stone, built at the water’s edge to protect the shore and to prevent inland flooding. Generally built parallel to the shore, a seawall is typically more massive and capable of resisting greater wave forces than a bulkhead.

Sediment - Fragmental material that originates from the weathering of rocks and is transported by, suspended in, or deposited by water or air or is accumulated in beds by other natural occurrence.

Sediment Cell - A length of coastline in which interruptions to the movement of sand or shingle along the beaches or near shore sea bed do not significantly affect beaches in the adjacent lengths of coastline.

Self-Sustaining Beach - A beach that has either natural or engineered sand retention and that can be stable through the continued supply of natural sediment sources, without and mechanical nourishment needed over a long period.

Shore - The narrow strip of land in immediate contact with the sea, including the zone between high and low water lines.

Shoreline Management - The development of strategic, long-term and sustainable coastal defense and land-use policy within a sediment cell.

Significant Wave - A statistical term relating to the 1/3 highest waves of a given wave group and defined by the average of their heights and periods.

Significant Wave Height - The average of the 1/3 highest waves of a given wave group.

Significant Wave Period - An arbitrary period generally taken as the period of 1/3 highest waves of a given wave group.

Simulating WAVes Nearshore (SWAN) Model - A third-generation, stand-alone (phase-averaged) model for the simulation of waves in waters of deep, intermediate, and finite depth. It is also suitable for use as a wave hindcast model.

Slough - A small muddy marshland or tidal waterway which usually connects other tidal areas.

Sounding - A measured depth of water. On hydrographic charts, the soundings are adjusted to a specific plane of reference called a sounding datum.
Steady State Irregular Wave (STWAVE) - An easy-to-apply, flexible, robust, half-plane model for nearshore wind-wave growth and propagation.

Stillwater Flood Elevation (SWEL) - Projected elevation that floodwaters would assume in the absence of waves caused by winds.

Stillwater Flood Level (SWFL) - Rise in the water surface above normal water level on the open coast due to the action of wind stress and atmospheric pressure on the water surface.

Storm Surge - The water that is pushed toward land from the high winds of a major storm (e.g., hurricane, tropical storm). Storm surge is usually estimated by subtracting the normal or astronomic high tide from the observed storm tide. (For additional information, see the National Hurricane Center's Introduction to Storm Surge, NOAA's storm surge with floodwall protection animation, or FEMA's storm surge analysis video.)

Storm Tide - The combined effect of storm surge, existing astronomical tide conditions, and breaking wave setup.

Swale - The depression between the beach ridges.

Swash - The rush of water up onto the beach face following the breaking of a wave.

Swell - Wind-generated waves that have traveled out of their generating area.

Tidal Benchmark - A benchmark whose elevation has been determined with respect to mean sea level at a nearby tide gage; the tidal bench mark is used as reference for that tide gage.

Transect - Cross section taken perpendicular to the shoreline to represent a segment of coast with similar characteristics.

Tropical Cyclone - A warm-core non-frontal synoptic-scale cyclone, originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation about a well-defined center.

Tropical Depression - A tropical cyclone with some rotary circulation at the water surface, with maximum sustained windspeeds of up to 39 miles per hour. The tropical depression is the second phase in the development of a hurricane.

Tropical Disturbance - A tropical cyclone that maintains its identify for at least 24 hours and is marked by moving thunderstorms and with slight or no rotary circulation at the water surface. Winds are not strong. It is a common phenomenon in the tropics and is the first discernible phase of hurricane development.

Tropical Storm - A tropical cyclone with maximum sustained (1-minute average) winds of 39 to 73 miles per hour.

Undeveloped Coastal Barrier - Any land area adjacent to the Atlantic Ocean, Pacific Ocean, or Great Lakes, where flood insurance will not be available for new or substantially improved structures. These areas are protected by law to discourage development and to preserve dunes, beaches, and wildlife habitats.

Velocity Zone/V Zone - See Coastal High Hazard Area (CHHA).

Wave - A ridge, deformation, or undulation of the water surface.

Wave Amplitude - The magnitude of the displacement of a wave from a mean value. An ocean wave has an amplitude equal to the vertical distance from stillwater level to wave crest.

Wave Crest - The highest part of a wave; that part of the wave above the stillwater level.

Wave Crest Elevation - The elevation of the crest of the wave.

Wave Crest Length - The length of a wave along its crest, sometimes called crest width.
Wave Forecasting - The theoretical determination of future wave characteristics, usually from observed or predicted meteorological phenomena.

Wave Generation - The creation of waves by natural or mechanical means; the creation and growth of waves caused by a wind blowing over a water surface for a certain period of time. The area involved is called the “generating area” or “fetch.”

Wave Height - The vertical distance between the highest part of the wave (wave crest) and the lowest part of the wave (wave trough).

Wave Height Analysis for Flood Insurance Studies (WHAFIS) - A DOS-based program that uses representative transects (selected considering major topographic, vegetative, and cultural features) to compute wave crest elevations in a given study area.

Wave Hindcasting - The use of historical synoptic windfields to calculate characteristics of waves that probably occurred at some past time.

Wave Propagation - The transmission of waves through water.

Wave Runup - The rush of wave water up a slope or structure.

Wave Runup Depth - The vertical distance between the maximum wave runup elevation and the eroded ground elevation.

Wave Runup Elevation - The elevation, referenced to NGVD29, NAVD88, or other datum, reached by wave runup.

Wave Setup - The increase in the stillwater surface near the shoreline, due to the presence of breaking waves.

Wave Steepness - The ration of the wave height to the wave length.

Windfield - The three-dimensional spatial pattern of winds.

Wind Waves - The waves being formed and built up by the wind; any wave generated by wind.