Florida Statewide Regional Evacuation Study Program

Directional Atlas

Broward County

Volume 10-11
Book 1E
WNW-WSW Directional Storms
Florida Division of Emergency Management
South Florida Regional Council

South Florida Region

2015

Includes Hurricane Evacuation Study
This Atlas is part of Volume 10 of the Statewide Regional Evacuation Study Program (SRESP), and one of three sets of county books in the South Florida Storm Tide Directional Atlas series. Book 1 covers Broward County; Book 2 covers Miami-Dade County; and Book 3 covers Monroe County. In each county, the primary volume presents an overview of the study and the methodology, while the Appendices, numbered from A to E, include the surge inundation maps for each of five directional storm clusters. The Atlas maps identify those areas subject to potential storm tide flooding from the five categories of hurricane on the Saffir-Simpson Hurricane Wind Scale, as determined by the National Oceanic and Atmospheric Administration (NOAA) numerical storm surge model, Sea, Lake and Overland Surges from Hurricanes (SLOSH). Volume 10 is unique in that it is based on the direction the storm is heading and depicts the resulting surge of storms approaching from that specific directional angle.

The Storm Tide Directional Atlas series supplements the original hazards analysis for storm tides (Volume 7-11) and depth (Volume 9-11), and enhances a key component of the SRESP. The Technical Data Report (Volume 1-11) was built upon the original storm tide analysis and includes the evacuation zones and population estimates, results of the evacuation behavioral data, shelter analysis and evacuation transportation analysis. The study, which provides vital information to state and local emergency management, forms the basis for county evacuation plans. The final study documents are available on the Internet at http://www.sfregionalcouncil.org/sresp.htm.

This Atlas series was produced by the South Florida Regional Council with funding from the Federal Emergency Management Agency, through the Florida Division of Emergency Management.
CREDITS AND ACKNOWLEDGEMENTS

Funding was provided by the Florida Legislature with funds from the Federal Emergency Management Agency (FEMA), through the Florida Division of Emergency Management (FDEM), 2555 Shumard Oak Boulevard, Tallahassee, 32399, www.floridadisaster.org. Local match was provided by the counties of Broward, Miami-Dade and Monroe.

The Council acknowledges and extends its appreciation to the following agencies and people for their cooperation and assistance in the development of this Atlas:

**National Oceanic and Atmospheric Administration** (NOAA/TPC-NHC) for the SLOSH numerical storm surge model developed by the late Chester L. Jelesnianski, the development of the 2009 Biscayne Bay and Florida Bay Basins under the management of Jamie Rhome, and for the storm tide computation and interpretation provided by the NOAA Storm Surge Modeling team.

**Florida Division of Emergency Management**
- Bryan Koon, Director
- Andrew Sussman, Hurricane Program Manager
- Richard Butgereit, GIS Manager

**Northeast Florida Regional Council**
- Elizabeth Payne, Project Manager

**Florida Emergency Preparedness Association**
For their support in this statewide effort

**County Emergency Management Agencies**
- Miguel Ascarrunz, Director, Broward County Emergency Management Division
- Curtis Sommerhoff, Director, Miami-Dade County Department of Emergency Management and Homeland Security
- Irene Toner, Director, Monroe County Emergency Management Department
A. Storm Tide Directional Atlas

The surge inundation limits (directional maximum surge heights minus the ground elevations) are provided as GIS shape files and graphically displayed on maps in the *Directional Storm Tide Atlas for the South Florida Region*. The *Atlas* was prepared by the South Florida Regional Council under contract to the State of Florida, Division of Emergency Management, as part of this study effort. The maps prepared for the *Atlas* consist of base maps (1:24000) including topographic, hydrographic and highway files (updated using 2008 county and state highway data). Detailed shoreline and storm tide limits for each category of storm were determined using the region's geographic information system (GIS).

The purpose of the maps contained in this Atlas is to reflect a worst probable scenario of the hurricane storm tide inundation for a given cluster of compass directions that a storm would be heading and to provide a basis for the hurricane evacuation zones and study analyses. While the storm tide delineations include the addition of an astronomical mean high tide and tidal anomaly, it should be noted that the data reflects only stillwater saltwater flooding. Local processes such as waves, rainfall and flooding from overflowing rivers, are usually included in observations of storm tide height, but are not surge and are not calculated by the SLOSH model. It is incumbent upon local emergency management officials and planners to estimate the degree and extent of freshwater flooding as well as to determine the magnitude of the waves that will accompany the surge.

Although the methodology used for surge determination in this Atlas does the most to reduce inconsistencies and human subjectivity, factors remain in the data itself that could show variations from previous efforts and results. Whenever a SLOSH basin is changed in any way, results can vary. Using MEOW (Maximum Envelope of Water) data as we do in this directional atlas, instead of the MOM (Maximum of Maximums) data, and choosing directional subsets of the maximums (MOMs) will indeed produce different results than other atlases – and this was expected. Other factors can include different elevation model data, as well as number and scope of selected SLOSH basin grid cells. Also, any data that is beyond the original extent or boundary of the basin is interpolation influenced by the modeling trend up to that location, and hand adaptation of basin extensions.

Figure 1 shows the projected surge inundation for each category of storm for storms moving in a WSW-WNW direction. Figure 2 provides an index of the WSW-WNW directional map series for Broward County.

B. Points of Reference

County emergency management agencies selected reference points, which include key facilities or locations critical for emergency operations. The Table 1 includes the map identification number, descriptions of the selected points, and the elevation of the site. The elevation is based on the digital elevation data provided by LiDAR. It should be noted that if the site is large, elevations may vary significantly. Table 1 also provides the storm tide value from the SLOSH value and the depth of inundation (storm tide value minus the ground elevation) at the site.
Figure 1  Directional WSW-WNW Storm Surge for Broward County

Legend
Surge Zones
Cat
1
2
3
4
5
### Table 1  Selected Points of Reference, WSW-WNW Direction - Broward County

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<sup>1</sup> Depth refers to the depth of inundation at the site (storm surge value minus the ground elevation)

<sup>2</sup> Surge refers to the storm surge value from the SLOSH Model
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Figure 2  WSW-WNW Atlas Map Index
This page intentionally left blank.
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on sea water storm tide height at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximums surge heights over LiDAR based digital elevation.
3. The Points of Reference are locations determined to be relevant to emergency management officials.

Datum = NAD 1983, 1,000-m USNG

↑

Printed Pages in Yellow

ATLAS LEGEND

HOSPITAL

Points of Reference

City Limits

Evacuation Route

NHD Lakes

Storm Tide
Category

Level 1

Level 2

Level 3

Level 4

Level 5

SW-WNW

Storm Tide

Broward, 2015

Map Plate 20
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012

Please consult with local authorities.

This map is for emergency planning purposes only. Management implementation is local responsibility.

Notes:
1. Storm Tides are based on still water storm tide heights and are derived from Maximum of Maximum surge heights over LIDAR based digital DEM Data.
2. The Points of Reference are selected and determined to be relevant to emergency management officials.
3. Levels of Storm Tides are derived from Maximum of Maximum surge heights over LIDAR based digital DEM Data.

Datum = NAD 1983, 1,000-m USNG

US National Grid
160,000-m Square ID
NJ
Grid Zone Designation
17R

ATLAS LEGEND

Storm Tide Category
Level 1
Level 2
Level 3
Level 4
Level 5

Points of Reference
\nEvacuation Route
\nNHD Lakes

SW-WNW
Storm Tide
Broward, 2015
Scale 1:24,000
Map Plate 38

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on still water storm tide height at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximums surge heights over LIDAR based digital elevation.
3. The Points of Reference are locations determined to be relevant to emergency management officials.

Datum = NAD 1983, 1,000-m USNG

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
The Points of Reference are locations determined to be at high tide with no wave elevation. Maximum surge heights over LIDAR based digital levels are calculated to be higher than the points of reference.

Notes:
1. Surge limits are based on the worst storm surge height at each site.
2. Total Storm Tide limits were derived from Maximum surge heights over LIDAR-based digital levels.
3. The Points of Reference are published in this report for reference to emergency management officials.

ATLAS LEGEND

HOSPITAL

Points of Reference

City Limits

Evacuation Route

NHD Lakes

Storm Tide Category

Level 1

Level 2

Level 3

Level 4

Level 5

This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012

SW-WNW Storm Tide
Broward, 2015

Scale 1:24,000

Map Plate 53
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities.
Please consult with local authorities.

Notes:
1. Surge limits are based on 5 ft water above mean low height at high tide with no wave setup.
2. Storm Tide limits were derived from maximum surge heights over LIDAR based digital elevation above NAVD88.
3. The Points of Reference are selected to ensure they are relevant to emergency management officials.
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
Please consult with local authorities.

This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012.
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012

Notes:
1. Surge limits are based on still water storm tide height at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum surge heights over LIDAR based digital elevation. The Points of Reference are locations determined to be still water storm tide height at high tide with no wave setup.
3. The Points of Reference are locations determined to be still water storm tide height at high tide with no wave setup.

Map Plate 59

Scale: 1:24,000

2,000 Feet

Level 1
Level 2
Level 3
Level 4
Level 5

Evacuation Route
NHD Lakes
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on still water storm tide height above NAVD88 at high tide with no wave setup.
2. Total Storm Tide limits were derived from maximum surge heights over LIDAR based digital elevation models.
3. The Points of Reference are locations determined to be relevant to emergency management officials.
Please consult with local authorities.

Datum = NAD 1983, 1,000-m USNG

Notes:
1. Surge limits are based on deep water storm surge height at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum Surges heights over LIDAR based digital elevation models.
3. The Points of Reference are based on the data available to emergency management officials.

Maximums surge heights

2. Total Storm Tide limits were

Notes:
1. Surge limits are based on deep water storm surge height at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum Surges heights over LIDAR based digital elevation models.
3. The Points of Reference are based on the data available to emergency management officials.

Maximums surge heights

2. Total Storm Tide limits were derived from Maximum Surges heights over LIDAR based digital elevation models.

The Points of Reference are based on the data available to emergency management officials.
1. Surge limits are based on still water elevation plus height of still water storm tide height at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum surge heights over LIDAR based digital elevation above NAVD88.
3. The Points of Reference are based on determination to be relevant to emergency management officials.

Notes:

Datum = NAD 1983, 1,000-m USNG

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on still water storm tide height with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximums surge heights over LIDAR based digital elevation.
3. The Points of Reference are locations determined to be relevant to emergency management officials.

Datum = NAD 1983, 1,000-m USNG

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on still water storm tide height at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum surge heights over LIDAR based digital elevation.
3. The Points of Reference are locations determined to be relevant to emergency management officials.

Datum = NAD 1983, 1,000-m USNG

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on still water above the high tide level at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum surge height over LIDAR-based digital elevation models.
3. The Points of Reference are locations determined to be relevant to emergency management officials.

ATLAS LEGEND

HOSPITAL

Points of Reference
City Limits
Evacuation Route
NHD Lakes

Storm Tide Category
Level 1
Level 2
Level 3
Level 4
Level 5

Broward, 2015
Scale: 1:24,000
Map Plate 94
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on still water storm (no wind) and are determined with no wave setup.
2. Total Storm Tide limits were derived from maximum Maximum surge heights over LIDAR-based digital.
3. The Points of Reference are located determined to be relevant to emergency management officials.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012.
Map Plate 118

**ATLAS LEGEND**

- Points of Reference
- City Limits
- Evacuation Route
- NHD Lakes

**Storm Tide Category**

- Level 1
- Level 2
- Level 3
- Level 4
- Level 5

**Notes:**
1. Surge limits are based on still water storm tide heights at high tide with no wave setup.
2. Total Storm Tide limits were derived from maximum measured surge heights over LIDAR and digital elevation data.
3. The Points of Reference are intended for use by local emergency management officials.

This map is for emergency planning purposes only. Hurricane evacuation decision making and growth management implementation are local responsibilities. Please consult local authorities.

Datum = NAD 1983, 1,000-m USNG

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
Please consult with local authorities.

This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Datum = NAD 1983, 1,000-m USNG

Maximum surge heights derived from Maximum of still water storm tide height

Surge limits are based on

Notes:
1. Surge limits are based on still water storm tide height and mean lower low water (MLLW) at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum surge height over LIDAR based digital elevation model (DEM).
3. The Points of Reference are located determined to be relevant to emergency management officials.

ATLAS LEGEND

HOSPITAL
Points of Reference
City Limits
Evacuation Route
NHD Lakes

Storm Tide Category
Level 1
Level 2
Level 3
Level 4
Level 5

Map Plate 140

Scale 1:24,000

Notes:
1. Surge limits are based on still water storm tide height and mean lower low water (MLLW) at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum surge height over LIDAR based digital elevation model (DEM).
3. The Points of Reference are located determined to be relevant to emergency management officials.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012

US National Grid
100,000-m Square ID
NK

Grid Zone Designation
17R

Datum = NAD 1983, 1,000-m USNG

This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Maximum surge heights derived from Maximum of still water storm tide height

Surge limits are based on

Notes:
1. Surge limits are based on still water storm tide height and mean lower low water (MLLW) at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum surge height over LIDAR based digital elevation model (DEM).
3. The Points of Reference are located determined to be relevant to emergency management officials.

ATLAS LEGEND

HOSPITAL
Points of Reference
City Limits
Evacuation Route
NHD Lakes

Storm Tide Category
Level 1
Level 2
Level 3
Level 4
Level 5

Map Plate 140

Scale 1:24,000

Notes:
1. Surge limits are based on still water storm tide height and mean lower low water (MLLW) at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum surge height over LIDAR based digital elevation model (DEM).
3. The Points of Reference are located determined to be relevant to emergency management officials.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012

US National Grid
100,000-m Square ID
NK

Grid Zone Designation
17R

Datum = NAD 1983, 1,000-m USNG

This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.
Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012

Notes:
1. Surge limits are based on all water above low tide height above NAVD88 at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum surge height and LIDAR based digital.
3. The Points of Reference are located and determined solely relevant to emergency management officials.

ATLAS LEGEND
HOSPITAL
Points of Reference
City Limits
Evacuation Route
NHD Lakes

Storm Tide Category
Level 1
Level 2
Level 3
Level 4
Level 5

Datum = NAD 1983, 1.00-m USGS

This map is for emergency planning purposes only, hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Broward, 2015
Map Plate 141

Scale 1:24,000
0 2,000 Feet

Sw-Wnw Storm Tide

Us National Grid
160,000-M Square ID
NK

Grid Zone Designation
17R

Downtown Pompano Beach
Pompano Beach Airport
Pompano
BEACH
Hillsboro
BEACH
Broward County

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
Please consult with local authorities.

Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.
Funding was provided by the Florida Legislature with funding from the Federal Emergency Management Agency (FEMA) through the Florida Division of Emergency Management. Local match was provided by the South Florida Regional Council and the counties of Broward, Miami-Dade and Monroe.

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