Coastal Flood Risk Study Project for Georgia

Flood Risk Review Meeting

August 20, 2015
Introductions

- **Risk MAP Project Team**
  - FEMA Region IV
  - BakerAECOM, FEMA Mapping Partner

- **Project Stakeholders**
  - Community CEOs
  - Community FPAs
  - Political Representatives
  - Other State and Federal Agencies
  - Public
Why We Are Here

- Project Review and Update
  - Data Collected
  - Modeling Approaches
    - Hurricane Surge
    - Overland Waves
- Questions and Answers
- Open Discussion of Draft Work Maps
FEMA Flood Risk Study Is Not Evacuation Study
Project Area

**NEFL Coastal Counties**

<table>
<thead>
<tr>
<th>NEFL</th>
<th>Georgia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bryan</td>
<td>Camden</td>
</tr>
<tr>
<td>Duval</td>
<td>Camden</td>
</tr>
<tr>
<td>Flagler</td>
<td>Chatham</td>
</tr>
<tr>
<td>Nassau</td>
<td>Glynn</td>
</tr>
<tr>
<td>St. Johns</td>
<td>Liberty</td>
</tr>
<tr>
<td>Volusia</td>
<td>McIntosh</td>
</tr>
</tbody>
</table>
Why the Coastal Flood Risk Study Is Being Updated

- Flood risk changes over time – Effective study based on outdated hurricane modeling and topographic data
- Ability to more accurately define risk and account for significant development in project area
- To gain a complete and current picture of coastal flood risks
- This helps community:
  - Plan for the risk
  - Communicate the risk to your citizens
  - Take action to reduce flood risk to lives and property
  - Build smarter and safer
Current surge analysis is 20 to 40+ years old

- Chatham County - Environmental Sciences Services Administration’s JPM Method – 1970 publication
- Climate data from 1965 to 1981 NOAA reports
- Glynn and Camden Counties – updated surge in 1989 using SURGE model
Your risk is better defined through

- Updated elevation data (topographic data and aerial imagery)
- New climatological data based on recent storms
- Computing resources – a lot has changed in 30 years!
- Updated coastal hazard methodologies/modeling
- Improvement in Geographic Information System (GIS) technologies to improve coastal mapping accuracy
Outreach Meetings To Date

- **Kickoff Meetings – November 8-9, 2010**

- **Technical Update Meetings – April 8, 2013**

- **Storm Surge Analysis Update Meetings – May 8, 2014**
  - Coastal Regional Council – March 2015

- **Flood Risk Review Meeting - Today**
Basic Elements of a Coastal Flood Risk Study

- Base Flood Elevation (BFE) on FIRM includes 4 components:
  1. Storm surge stillwater elevation (SWEL)
  2. Amount of wave setup
  3. Wave height above storm surge (SWEL) elevation
  4. Wave runup above storm surge elevation (where present)

Determined from storm surge model
Gathered Field Data

- Coordinated with community officials and stakeholders regarding available data
- Conducted thorough data investigation
- Conducted field investigations
Gathered LIDAR, Topographic Data

- LIDAR system-generated data
- Gathered bathymetric data
Gathered Bathymetric Data
Created Digital Elevation Model (DEM)
Seamless DEM for GA-NEFL
Hurricane Model Mesh Development
Hurricane Model Mesh Development

**GANESL STUDY EXTENT**

- Mesh Nodes
  - 2,632,740 within red
  - 2,980,548 entire mesh
Hurricane Model Mesh - Chatham County
Hurricane Model Mesh - Chatham County (Cont’d)
Hurricane Model Mesh - Chatham County (Cont’d)
Hurricane Model Mesh - Chatham County (Cont’d)
Hurricane Model Mesh - Bryan County
Hurricane Model Mesh - Bryan County (Cont’d)
Hurricane Model Mesh - Bryan County (Cont’d)
Hurricane Model Mesh - Bryan County (Cont’d)

Savage Island
Hurricane Model Mesh - Liberty County (Cont’d)
Hurricane Model Mesh - Liberty County (Cont’d)
Hurricane Model Mesh - Liberty County (Cont’d)
Riceboro, GA
Tropical Storms: 1940 - 2010
Passing within 175 nautical miles of Jacksonville
Limited data before 1940
Storm Climatology

- Review historical storms
- Pick 5 storms to validate the hurricane/surge model
- Generate hundreds of hypothetical storms
# Validation Storm Selection: Significant Surge Events

## Criteria Sorting of Storms

<table>
<thead>
<tr>
<th>1. Local Landfall</th>
<th>2. Significant WL Difference</th>
<th>3. WL Data Availability (&gt; 3 Stations)</th>
<th>4. Wave Data Availability (2 or more stations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleo</td>
<td>Dora (5.91 ft)</td>
<td>Frances (15)</td>
<td>Frances (5)</td>
</tr>
<tr>
<td>Dora</td>
<td>David (5.55 ft)</td>
<td>Charley (14)</td>
<td>Ophelia (5)</td>
</tr>
<tr>
<td>David</td>
<td>Jeanne (4.22 ft)</td>
<td>Jeanne (14)</td>
<td>Tammy (5)</td>
</tr>
<tr>
<td>Chris</td>
<td>Tammy (4.07 ft)</td>
<td>Ophelia (9)</td>
<td>Fay (5)</td>
</tr>
<tr>
<td>Edouard</td>
<td>Fay (3.99 ft)</td>
<td>Tammy (9)</td>
<td>Jeanne (4)</td>
</tr>
<tr>
<td>Tammy</td>
<td>Frances (3.85 ft)</td>
<td>Dennis 99 (8)</td>
<td>Edouard (3)</td>
</tr>
<tr>
<td>Fay</td>
<td>Gabrielle (3.82 ft)</td>
<td>Floyd (7)</td>
<td>Chris (2)</td>
</tr>
<tr>
<td></td>
<td>Floyd (3.8 ft)</td>
<td>Irene (7)</td>
<td>Dennis99 (2)</td>
</tr>
<tr>
<td></td>
<td>Ophelia (3.04 ft)</td>
<td>Fay (6)</td>
<td>Floyd (2)</td>
</tr>
<tr>
<td></td>
<td>Abby (2.93 ft)</td>
<td>David (5)</td>
<td>Irene (2)</td>
</tr>
<tr>
<td></td>
<td>Irene (2.92 ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bertha (2.62 ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bob (2.44 ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Erin (2.43 ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cleo (2.35 ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dennis 99 (2.24 ft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Validation Storm Selection: Significant Surge Events (Cont’d)

<table>
<thead>
<tr>
<th>Criteria Sorting of Storms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Local Landfall</td>
</tr>
<tr>
<td>Cleo</td>
</tr>
<tr>
<td>Dora</td>
</tr>
<tr>
<td>David</td>
</tr>
<tr>
<td>Chris</td>
</tr>
<tr>
<td>Edouard</td>
</tr>
<tr>
<td>Tammy</td>
</tr>
<tr>
<td>Fay</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Five validation storms were selected:

- Hurricane Dora (1964)
- Hurricane David (1979)
- Hurricane Frances (2004)
- Tropical Storm Tammy (2005)
- Tropical Storm Fay (2008)
Validation: Summary

- Validation completed for tides and five historical storms
- Demonstrated model capability to reproduce water levels and waves in project area
- Comparisons to available data showed reasonable agreement for water levels and waves
Hypothetical Storms

- Developed using 5 parameters
  - Central pressure
  - Radius to maximum winds
  - Forward speed
  - Storm heading
  - Holland’s B (shape parameter)

- Simulate whole range of possible storms for GA (based on historic data for area)

- Run storms on super computer

- QC results
Set up “mesh” for hurricane/surge model

Validated hurricane/surge model

Ran hundreds of hypothetical storms

Computed return periods for study area

Resulting storm surge still water elevations for the 1%-annual-chance event (ACE)
Modeling Part 2 – Overland Waves

- CHHA: Coastal High Hazard Area
- LiMWA: Limit of Moderate Wave Action
- BFE: Base Flood Elevation
- SWEL: Stillwater Flood Elevation

Wave height categories:
- Wave height ≥ 3 ft
- 3 ft > Wave height ≥ 1.5 ft
- Wave height < 1.5 ft
- BFE < 1 ft

Key concepts:
- Properly elevated (post-FIRM) building in CHHA
- Best practice - Elevated building in Coastal A Zone
- Improperly elevated (pre-FIRM) building
- Limit of SFHA
- Vegetated region
Basic Elements of a Coastal Flood Risk Study

- Normal water level
- Storm surge level
- Wave setup
- Wave action
Basic Elements of a Coastal Flood Risk Study (Cont’d)

Dune erosion (540 ft²)
Dune erosion (removal)
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” –NFIP regulations
Limit of Moderate Wave Action (LiMWA)

- FEMA Procedure Memorandum No. 50, 2008
- At present not a regulatory requirement
- No Federal Insurance requirements tied to LiMWA
- CRS benefit for communities requiring VE Zone construction standards in areas defined by LiMWA or areas subject to waves greater than 1.5 feet
Combining Riverine and Coastal Flooding

\[
\frac{1}{0.01 + 0.01} = 2\% \text{ ANNUAL CHANCE}
\]
Bryan County Transects
Chatham County Transects
Liberty County Transects
Work Maps - Example
Outreach Activities

- **Discovery**
  - Data Collection & Stakeholder Coordination
  - Kickoff Meeting
  - Discovery Meeting
  - Discovery Map, Discovery Report, & Project Charter Creation/Distribution

- **Model Validation**

- **Stillwater Level Modeling**

- **Overland Wave Modeling**

- **Work Map Production**

- **Preliminary FIRM and FIS Report**

- **Appeal and Compliance Period**

- **Effective FIRM and FIS Report**

**Technical Update Meetings (As Needed)**
- Storm Surge Analysis Update Meeting

**Preliminary Map Release Planning**
- Flood Risk Review Meeting

**CCO Meeting/Open House**
- Community FIRM/FIS Report Review

**Appeal Period**
- Appeal/Comment Review & Resolution
- Letter of Final Determination Issuance
- Resilience Meeting
www.southeastcoastalmaps.com
Open Discussion

- Technical questions ...?
- General questions about Risk MAP products?
- General questions about project schedule?
- General questions about meeting fact sheet? Other outreach resources?
- Other questions?
Coastal Flood Risk Study

Contacts

Mark Vieira, PE
(770) 220-5450
mark.vieira@fema.dhs.gov

Christina Lindemer
(770) 220-5424
christina.lindemer@fema.dhs.gov

Michael DelCharco, PE
(904) 472-0082
mdelcharco@tayloренgineering.com

Chris Mack, PE, PMP
(843) 767-4602
chris.mack@aecom.com

Todd Harris, PMP, CFM
(404) 651-8504
todd.harris@dnr.ga.us

Tom Shillock, CFM
(404) 362-2606
tom.shillock@dnr.ga.us