Integrating Coastal and Riverine Flood Hazards on the Southern Georgia & Northern Florida Coast

June 2, 2015
EXTENT OF COASTAL SURGE STUDY

- Combined Probability Analysis
- Guidance/Examples
- Discussion
Combined Probability Analysis (CPA)

- D.2.4.5 1-Percent-Annual-Chance Stillwater Levels
  - Locations subject to flooding by both coastal and riverine mechanisms
  - Assumes extreme levels are independent, or at least widely separated in time
Combined Probability Analysis

\[ R_{P,T}(Z) = R_{P,R}(Z) + R_{P,S}(Z) \]

where:

- \( R_{P,T}(Z) \) = Total Rate of occurrence at each point of interest, \( P \), and elevation, \( Z \)
- \( R_{P,R}(Z) \) = Riverine Rate of occurrence at each point of interest, \( P \), and elevation, \( Z \)
- \( R_{P,S}(Z) \) = Surge Rate of occurrence at each point of interest, \( P \), and elevation, \( Z \)
CPA Input Data

- Coastal Stillwater Elevations (Surge)
  - ADCIRC Surge surfaces

- Riverine WSELs
  - HEC-RAS
  - HEC-2
  - SWMM
Textbook example of Combined Probability Analysis. CPA 1% WSEL increase of 0.35ft will cause whole BFEs to round up to 5. Results seem appropriate.
Textbook example of Combined Probability Analysis. CPA 1% WSEL increase of 0.55ft will cause whole BFEs to round up to 5. Results seem appropriate.
Cedar River - Node CW50015S

Textbook example of Combined Probability Analysis. CPA 1% WSEL increase of 0.35ft will cause whole BFES to round up to 5. Results seem appropriate.
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Textbook example of Combined Probability Analysis. CPA 1% WSEL increase of 0.55ft will cause whole BFIs to round up to 5. Results seem appropriate.
Textbook example of Combined Probability Analysis. CPA 1% WSEL increase of 0.55 ft will cause whole BFEs to round up to 5. Results seem appropriate.
- Total 3,215 Nodes & XS’s
- CPA Tool
  - Coastal, Combined, or Riverine
- CPA Results
  - 460 locations
  - 89 streams
PRESENTATION OF FLOOD INFORMATION IN REGULATORY PRODUCTS FOR MIXED COASTAL AND RIVERINE AREAS
Goals of Guidance

1. Differentiate floodplain based on controlling flooding type (e.g. Coastal, Riverine, Combined Coastal and Riverine)

2. Provide guidance to increase consistency, clarity, and accuracy in the data presented in the regulatory products (FIRM panels, FIS, FIRM database)
Differentiate Floodplain

- FEMA runs analytics on data
  - How many policies in the riverine floodplain?
  - How many people live in the coastal floodplain?
- Need ability to spatially query data
- No existing mechanism in floodplain data to systematically distinguish flooding types
Differentiate Floodplain—Database

- **Layer: S_Fld_Haz_Ar**
  - ZONE_SUBTY is existing field in S_Fld_Haz_Ar attribute table

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<thead>
<tr>
<th>Field</th>
<th>R/A</th>
<th>Type</th>
<th>Length/ Precision</th>
<th>Scale (SHP Only)</th>
<th>Joined Spatial / Lookup Tables or Domains</th>
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- Options added to associated domain table, D_Zone_Subtype

<table>
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<tr>
<th>Coded Value</th>
<th>Sub-Types of Flood Zones</th>
<th>Applies to Database Schema</th>
<th>Footnote</th>
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<td>FIRM, FRD</td>
<td>7</td>
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Flood Insurance Rate Map (FIRM)

- **Zone Boundary**
  - A line should be drawn to distinguish between coastal and riverine.
  - “SFHA/Flood Zone Boundary” unless the flood zones and BFEs are same, then “Other Boundary.”
  - “Other Boundary” upstream of Combined area

- **Cross Sections** should be retained in the coastal floodplain

- **Floodways**
  - Retain legacy floodways in coastal floodplains
  - Truncate at farthest downstream LiMWA
  - Option to truncate at riverine WSEL+1=coastal SWEL/BFE
# Flood Insurance Study (FIS) Floodway Data Tables

<table>
<thead>
<tr>
<th>CROSS SECTION</th>
<th>DISTANCE (FEET)</th>
<th>WIDTH (FEET)</th>
<th>SECTION AREA (SQUARE FEET)</th>
<th>MEAN VELOCITY (FEET PER SECOND)</th>
<th>REGULATORY</th>
<th>WITHOUT FLOODWAY</th>
<th>WITH FLOODWAY</th>
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</tbody>
</table>

1 Feet above U.S. Highway 101
2 Combined coastal and riverine effects from University Bay and College Creek
3 Elevation computed without consideration of backwater effects from University Bay

* Controlled by coastal flooding – see Flood Insurance Rate Map for regulatory base flood elevation
Flood Insurance Study (FIS) Profiles

- Truncate profile at upstream limit of coastal effects
- Label “Coastal Flood Effects from [coastal flooding source]”
- Label “Combined Coastal and Riverine Effects”
- If entire stream in coastal, remove profile from FIS
<table>
<thead>
<tr>
<th>CROSS SECTION</th>
<th>DISTANCE</th>
<th>WIDTH (FEET)</th>
<th>SECTION AREA (SQUARE FEET)</th>
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</table>

1 Feet above confluence with Delaware River
2 Elevation computed without consideration of backwater affects from Delaware River
3 Controlled by coastal flooding – see Flood Insurance Rate Map for regulatory base flood elevation
Conclusion

- Massive, complex CPA effort in Duval County led to development of CPA Tool
  - Required riverine and coastal engineering expertise to develop
  - Tool increases efficiency and consistency
- Coastal/riverine flood information guidance benefits mapping partners, end users, and the NFIP
  - Improved consistency in Riverine & Coastal flood hazard communication
  - Intended to make local floodplain management easier

Photo: MetroJacksonville.com
Questions and Follow Up

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