Challenges and Opportunities Associated with Coastal Non-Regulatory Products in Region X

D6: Coastal Risk Communication
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Agenda

1. Mapping to Communicate Coastal Flood Risk
2. Enhanced Non-Regulatory Products
3. Creating the +1, +2 and +3 Foot Depth Grids
4. Presenting to Community Officials
5. Discussion and Questions
1 Mapping to Communicate Coastal Flood Risk

I love it when the streets near my house get flooded, because it’s the only time I can go out and walk my fish.
— Jarod Kintz

Flood damage in 136 of the world’s largest coastal cities could soar to $1tn a year by 2050. Miami, New York and New Orleans comprise 31% of total losses. — July 2013 study by Nature Climate Change
Traditional Method

**FEMA Flood Insurance Rate Maps**
- Special Flood Hazard Area – 1% Annual Chance
- May or may not list expected 1% annual chance water surface elevation

**FIRM Pros**
- Simple to use/understand (maybe)
- Regulatory
  - Impacts most people financially, requiring insurance
  - May add permit or building requirements to development
FIRM Cons

• Map Limitations
  • Feeling of safety if shown “out”
  • Requires additional information to estimate financial impacts
  • Show risk as it is expected today
  • Does not convey uncertainty
Depth Matters

- Damage Severity
- Frequency of Loss
- Cost to mitigate or build above

Water Surface – Ground = Depth
Flood Depth vs. Damage Curve

Source: FEMA 55, Coastal Construction Manual
Costs: Insurance Savings

Example 1: V Zone building, supported on piles or piers, no below-BFE enclosure or obstruction. $250,000 building coverage, $100,000 contents coverage.

<table>
<thead>
<tr>
<th>Floor Elevation Above BFE</th>
<th>Reduction in Annual Flood Premium*</th>
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<tbody>
<tr>
<td>1 foot</td>
<td>25%</td>
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<td>2 feet</td>
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<td>3 feet</td>
<td>62%</td>
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<td>4 feet</td>
<td>67%</td>
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* Compared to flood premium with lowest floor at BFE

Source: FEMA 499, Home Builder’s Guide to Coastal Construction
Risk Map: Coastal Non-Regulatory Products

- Depth Grids – Flood depth in that cell
- Annual Chance Grid – Percent annual chance of flood inundation occurring in that cell
- 30 Year Grid – Probability that the cell will be inundated during a 30 year time span (length of typical mortgage)
Depth Grids

Pros

- Easy to understand
- Provides visualization of flood risk
- Added Value
  - Estimate Impacts ($)
  - HAZUS
  - Identify Mitigation Opportunities
Depth Grids

Cons

• Primary Frontal Dune (PFD) erosion cause Negative depths in SFHA
• Only provides info for area within SFHA
• Does not address uncertainty (can be inferred)
2 Enhanced Coastal Non-Regulatory Products

What are they?
+1, +2, +3 Depth Grids

What do they show?
Depth of the Base Flood Elevation (1%-annual chance) plus 1, 2 or 3 feet
+1, +2, +3 Depth Grids

Why?
Accounts for uncertainty and shows sensitivity to elevation differences.

What they do NOT show?
The expected Base Flood Elevation after 1, 2 or 3 feet of sea level rise.
What is this Uncertainty (Don’t we know what we are doing)?

- Models
- Unaccounted in FEMA Methodology
  - Sea Level Rise
  - Land Subsidence
  - Shoreline Erosion
  - Future Wetland loss
  - Climate change
  - Effects of multiple storm events

What was once an accurate 100-year flood elevation, may no longer be so.
3 Creating the +1, +2 and +3 Foot Depth Grids

How it should be done:

Expen$ive
Creating the +1, +2 and +3 Grids
Creating the +1, +2 and +3 Grids

1. Create a FGD
2. Collect Necessary Input/Reference Data
   • Coastal Transects
   • Flood Hazard Area
   • Primary Frontal Dune
   • Aerial Imagery
   • Terrain DEMs
Creating the +1, +2 and +3 Grids

3. Edit Transect Data
   • Modify and attribute to create water surface elevation GRIDs
   • Create Attribute Fields

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<th>Shape *</th>
<th>TRAN_NO</th>
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<th>PlusTwo</th>
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Creating the +1, +2 and +3 Grids

- Setup Attribute Transfer Tool
  - Transfer from Flood Hazard Area to Transect
  - Match StaticBFE Fields
Add “Transects” to Cover Project Area

At Project Extents

Duplicates at Zone Breaks
Creating the +1, +2 and +3 Grids

- Transfer Attributes from SFHA to “Transects”
- Calculate PlusOne, PlusTwo and PlusThree Attributes
  \[(\text{PlusOne} = \text{StaticBFE} + 1)\]
Creating the +1, +2 and +3 Grids

- Modify “Transect” Geometry
- Encompass preliminary SFHA
- Extend beyond PlusThree Elevation
- Be aware of extent of elevation data
Open Coast Considerations

Extend “transect” to Primary Frontal Dune
Coastal Structures
Back Bay Areas

Extend from Primary Frontal Dune towards Bay
Velocity Zone Break

“Transects” should extend from velocity zone breaks
Creating the +1, +2 and +3 Grids

- Create transect bounding polygons
- Define areas of interest
- Add along areas not defined by boundary
Creating Grids

• Create water surface grids from “transects” and area polygons
• Subtract terrain DEM from water surface grid to get depths
Creating the +1, +2 and +3 Grids

• Review results
  • Minimal consultation with a Coastal Engineer leads to greatly improved results!

• Anomalies
  • Depths values are reasonable
  • Extent of flooding makes sense
  • Void/No Data areas make sense

• Mosaic processed areas into final project Depth Grids
4 Presenting to Community Officials

- Need explanation of what it is and what it is not
- Non-Regulatory – Don’t Panic
- Describe limitations
- Emphasize uses
- Add/compare to Tsunami Data
City of Raymond, WA
Long Beach and Ilwaco, WA
Long Beach and Ilwaco, WA
Open Coast Primary Frontal Dune

Opening in Primary Frontal Dune Needs Riverine Analysis
Ocean Park

TSUNAMI
- Tsunami Inundation

Plus 3 Depth (ft)
- High: 21.9829
- Low: 0
Coastal Counties in Washington will receive Enhanced Non-Regulatory Products by 2016
5 Discussion and Questions

• What about the Atlantic, Gulf or Great Lakes?
• What do community officials think?
• What does the public think?
• Do we need a brochure to go along with these for future reference?
Questions?