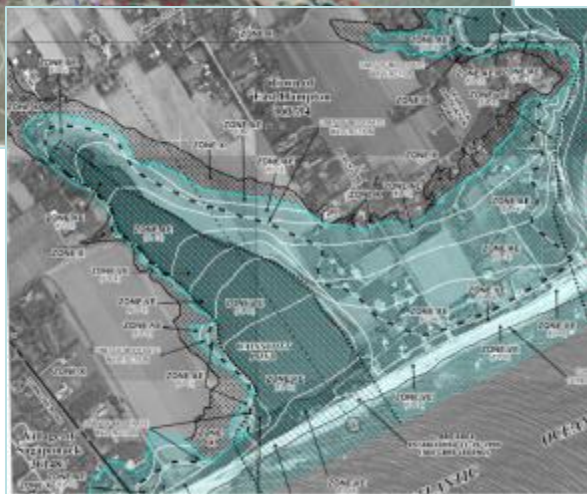
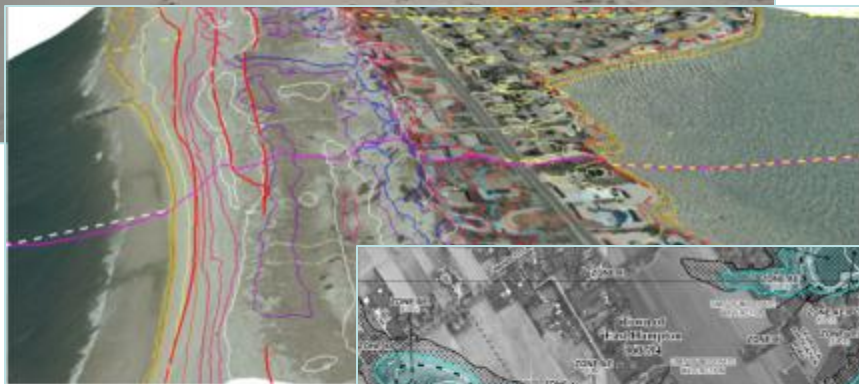


Coastal Hazard Analysis and Mapping - Delaware River and Bay



Delaware River Basin Commission Flood Advisory Committee September 2012 Meeting

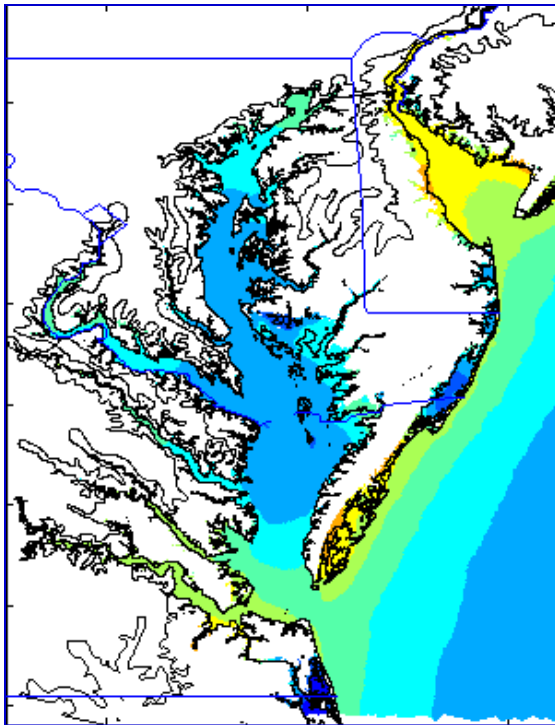


Matt Shultz

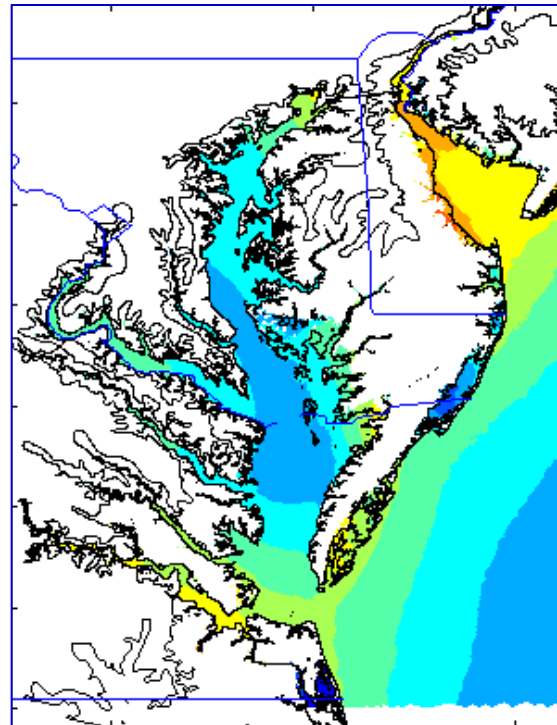
Risk Assessment, Mapping, and Planning
Partners (**RAMPP**)

Updated 1%-annual-chance water levels

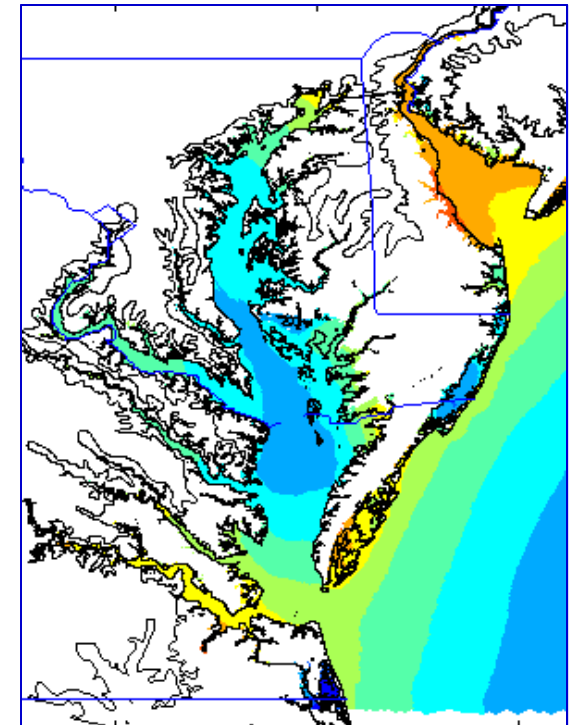
Hurricanes



Extratropicals

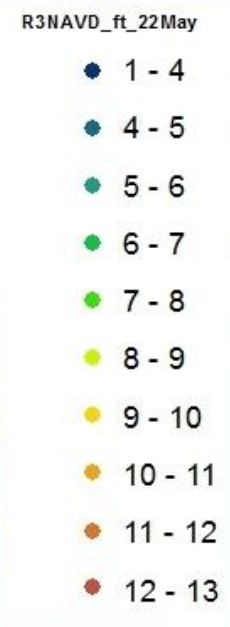
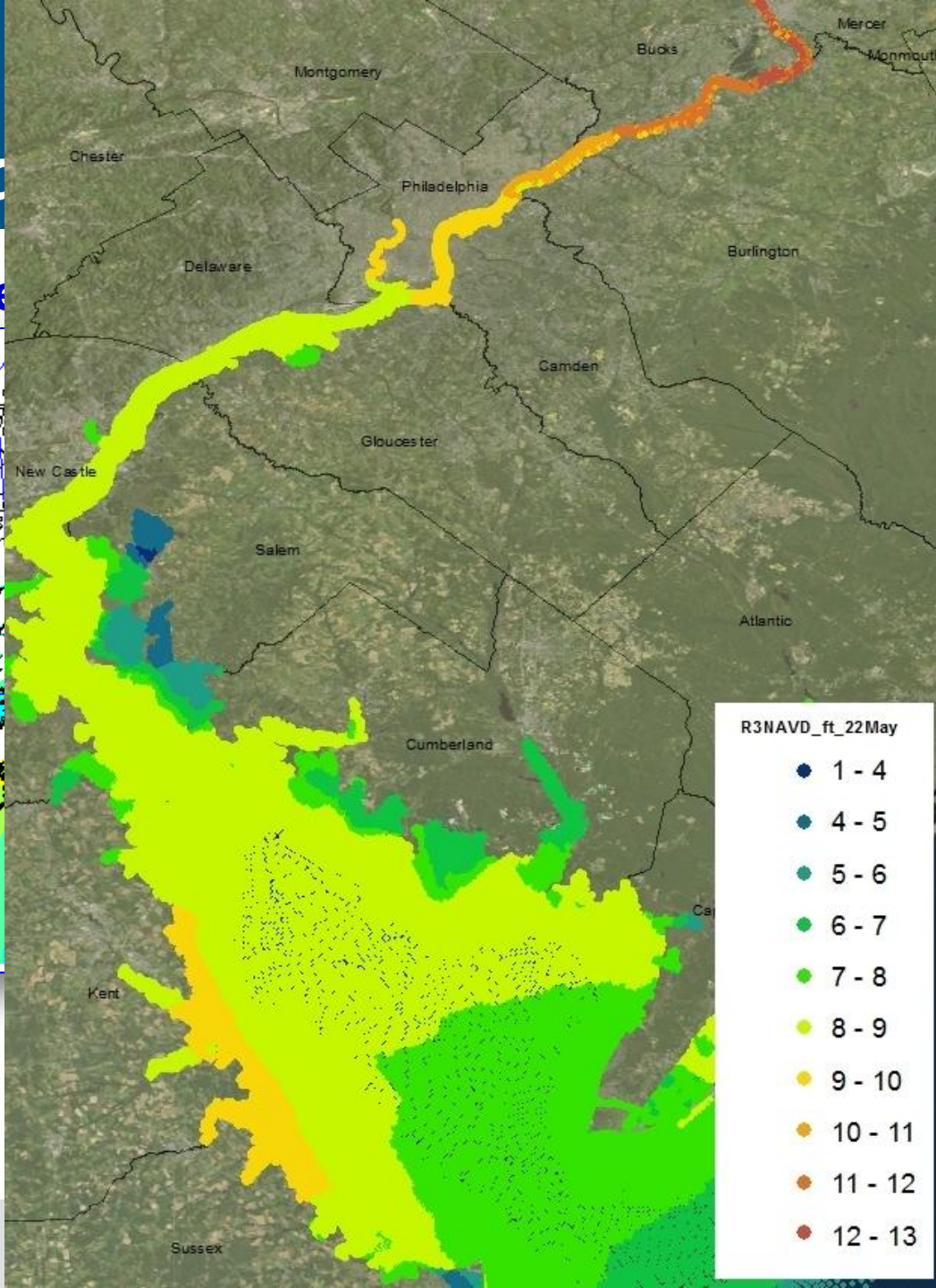
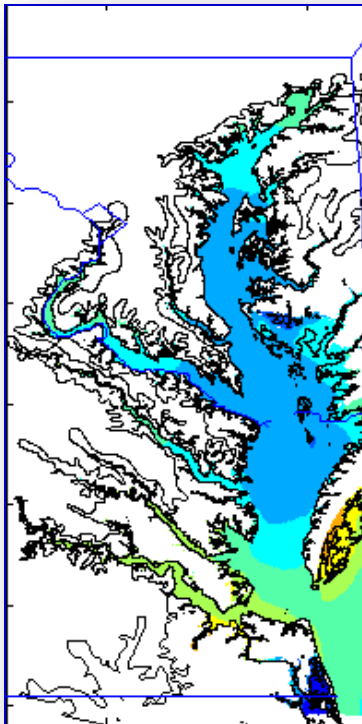


Combined



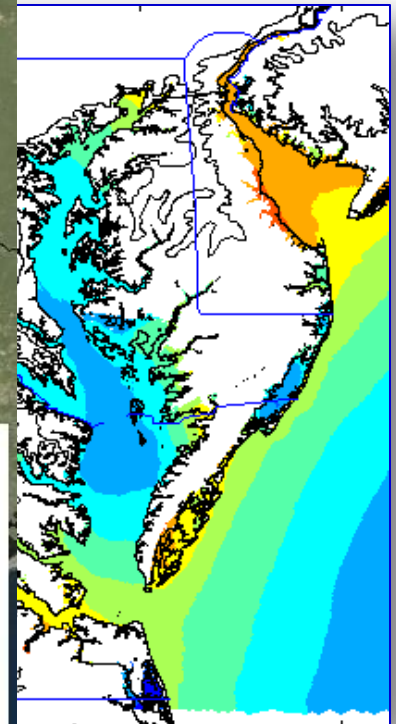
Updated

Hurricane



levels

Combined

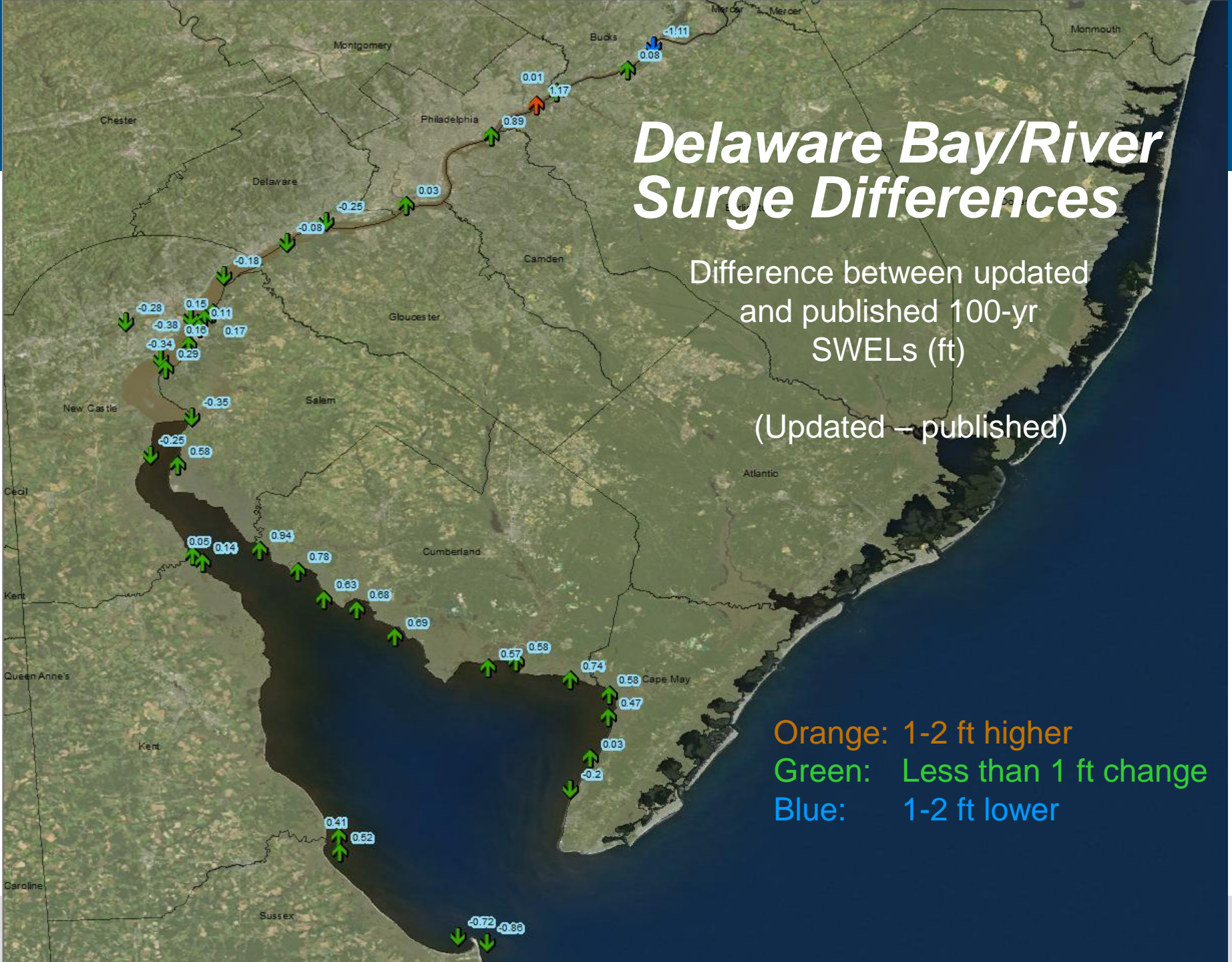


Delaware Bay/River Surge Differences

Difference between updated and published 100-yr SWELs (ft)

(Updated – published)

- Orange: 1-2 ft higher
- Green: Less than 1 ft change
- Blue: 1-2 ft lower

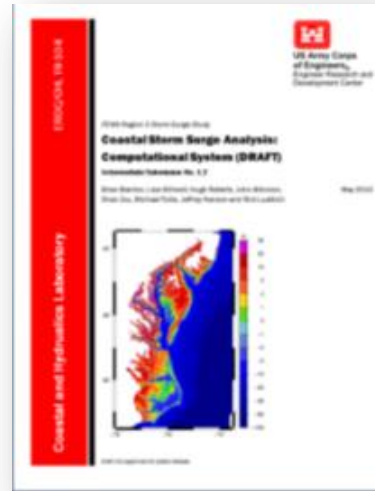


Storm Surge Study Results

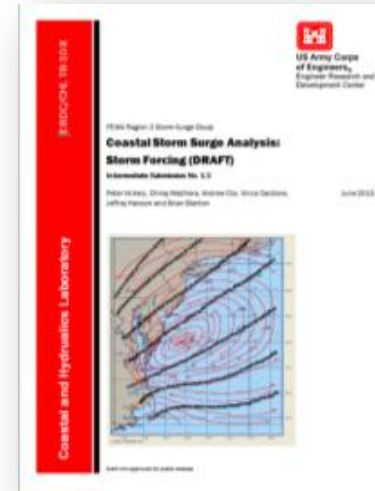
1.1 DEM



1.2 Modeling System



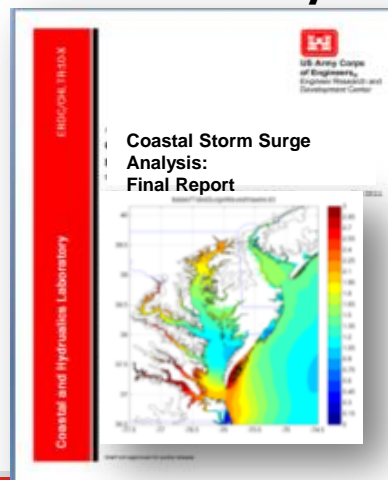
1.3 Storm Forcing



2. Model Validation

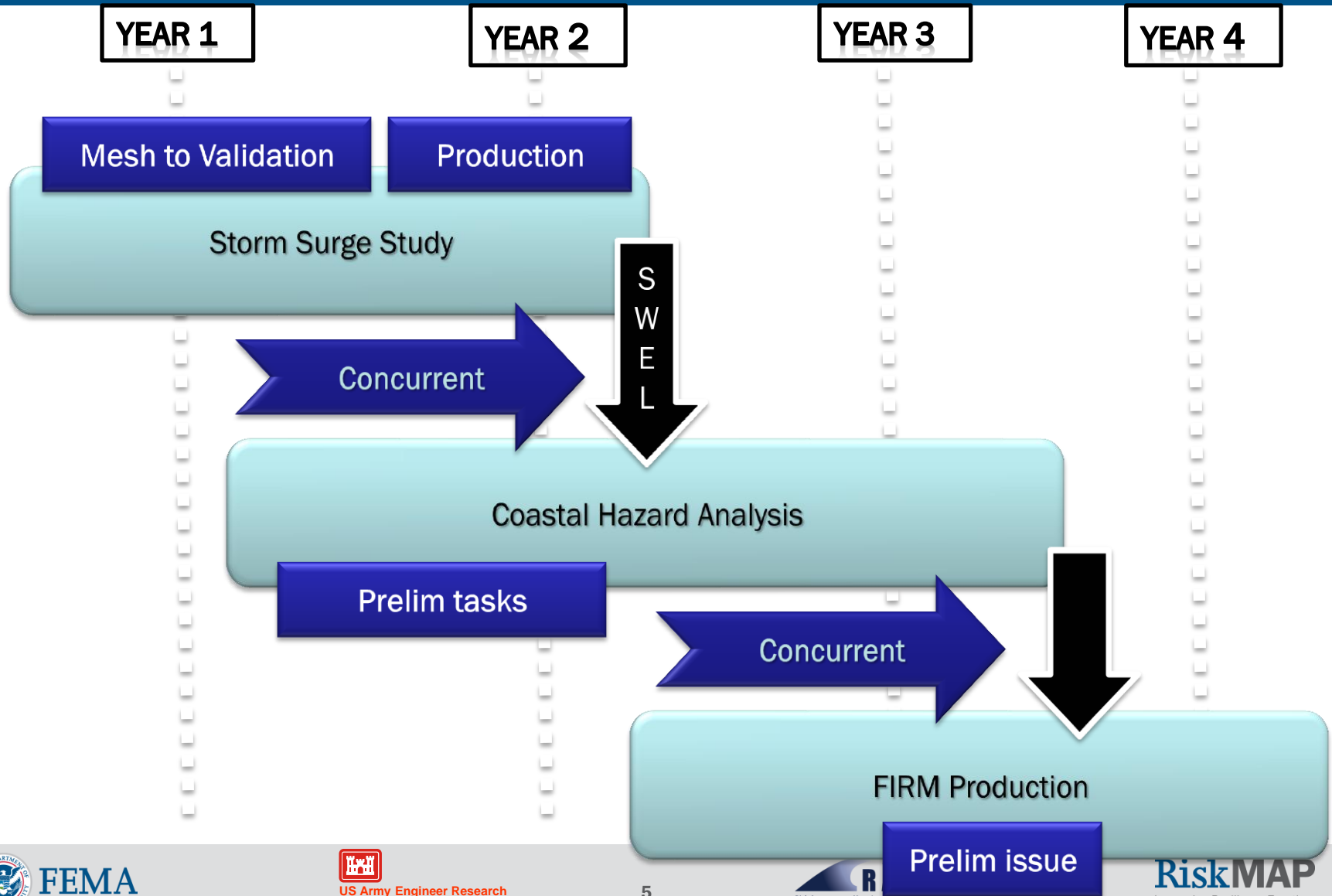


3. Final Analysis



- Methods and results
- Multi-tiered review
- Released as formal reports
- Available at www.r3coastal.com and <http://dodreports.com>

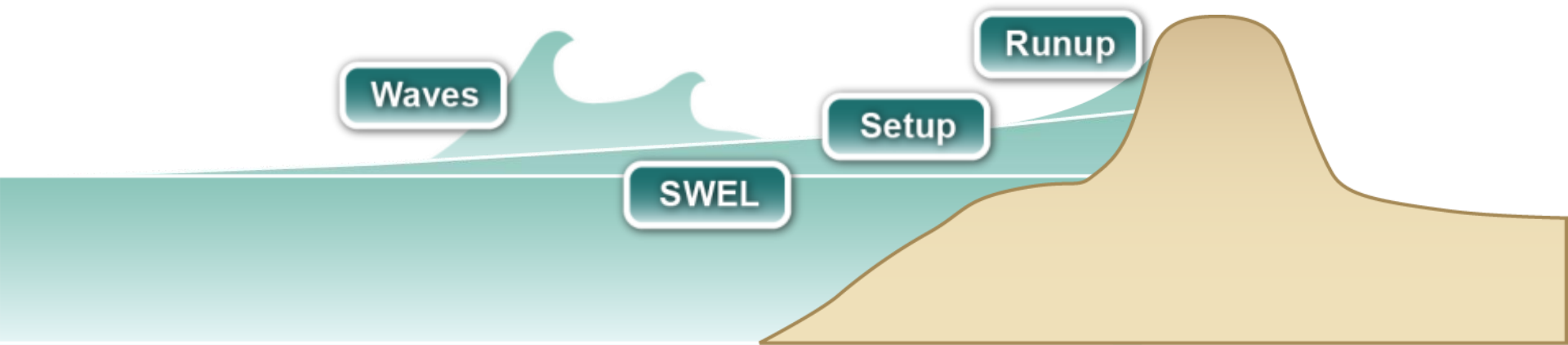
Project Life-cycle



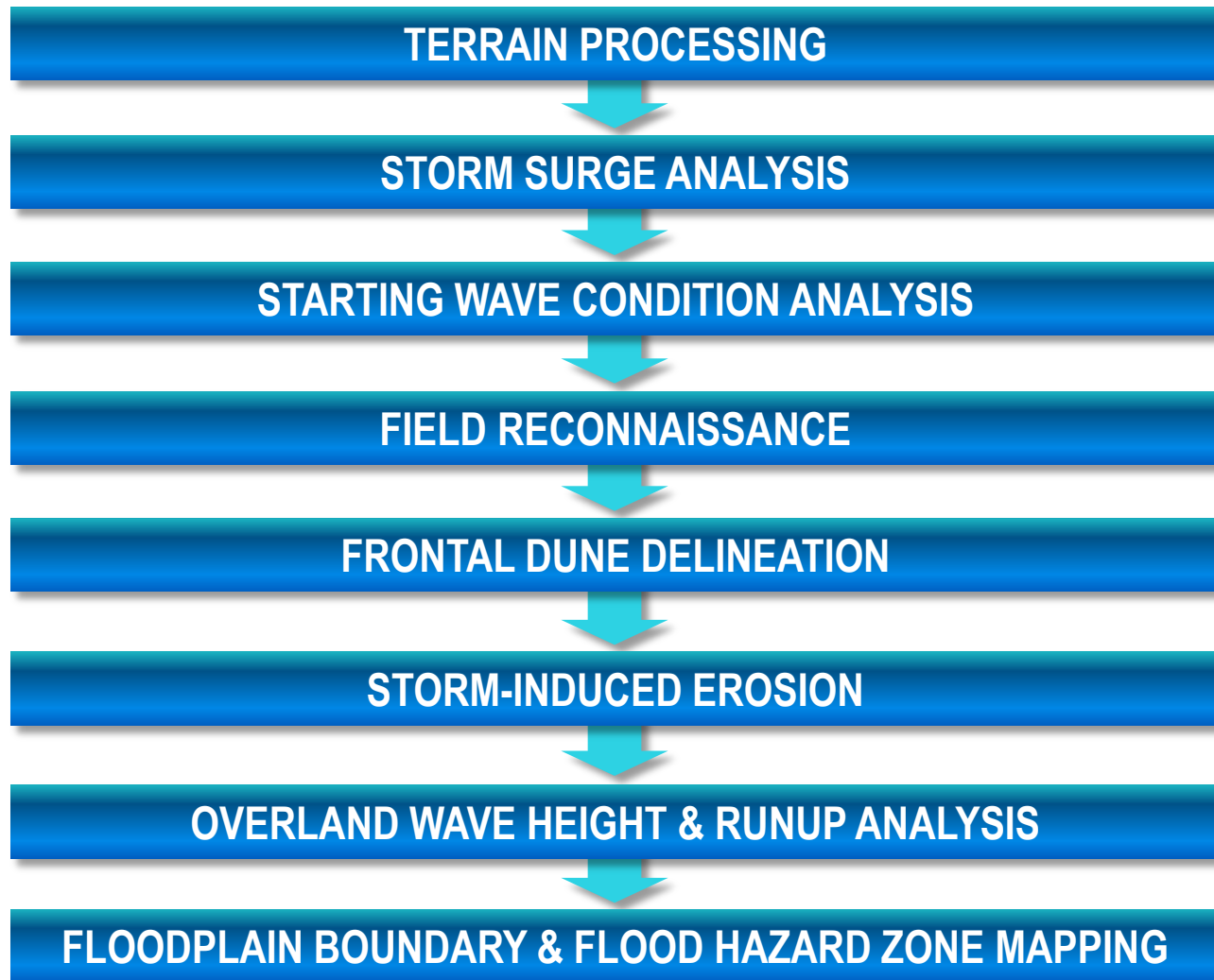
Basic Elements of a Coastal Hazard Analysis

Base Flood Elevation on FIRM includes 4 components:

1. Storm surge stillwater elevation (SWEL)
 2. Amount of wave setup
 3. Wave height above storm surge (stillwater) elevation
 4. Wave runup above storm surge elevation (where present)
- } Determined from storm surge model

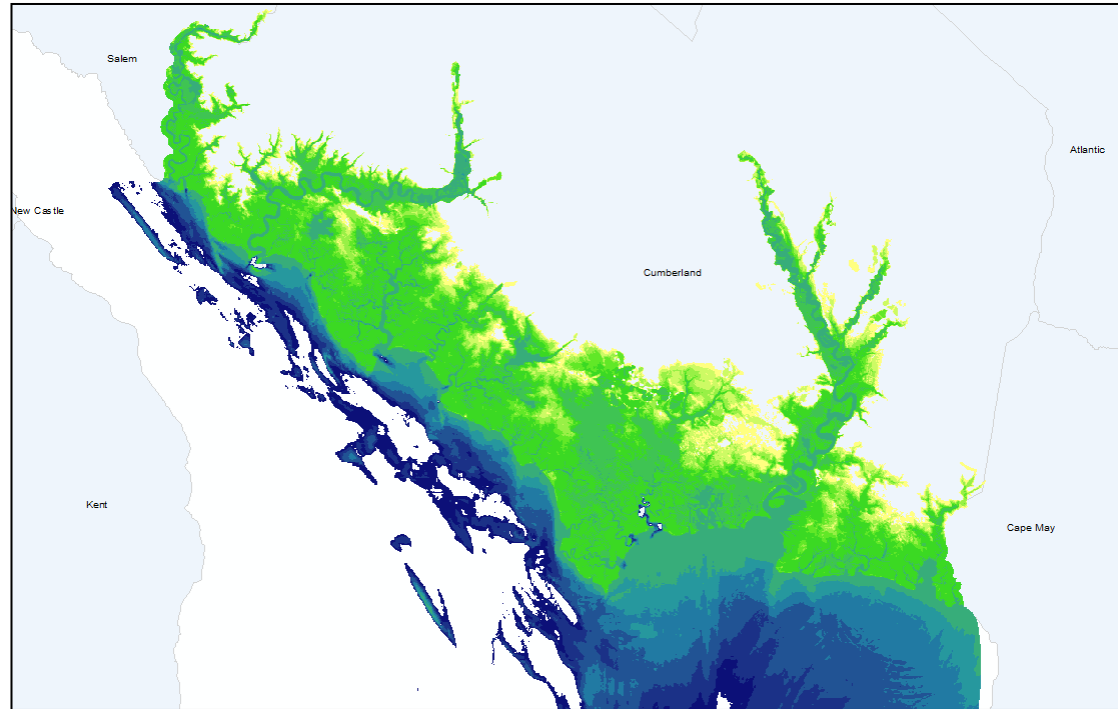


Coastal Study Process



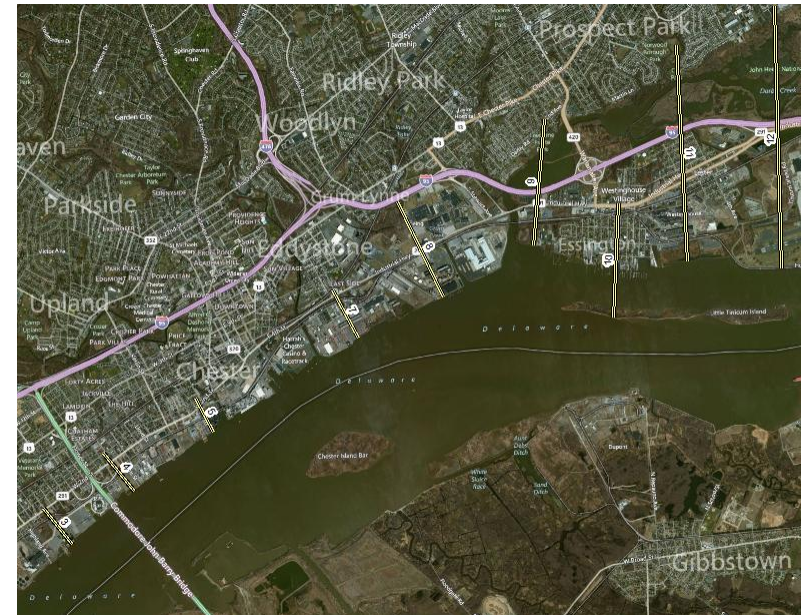
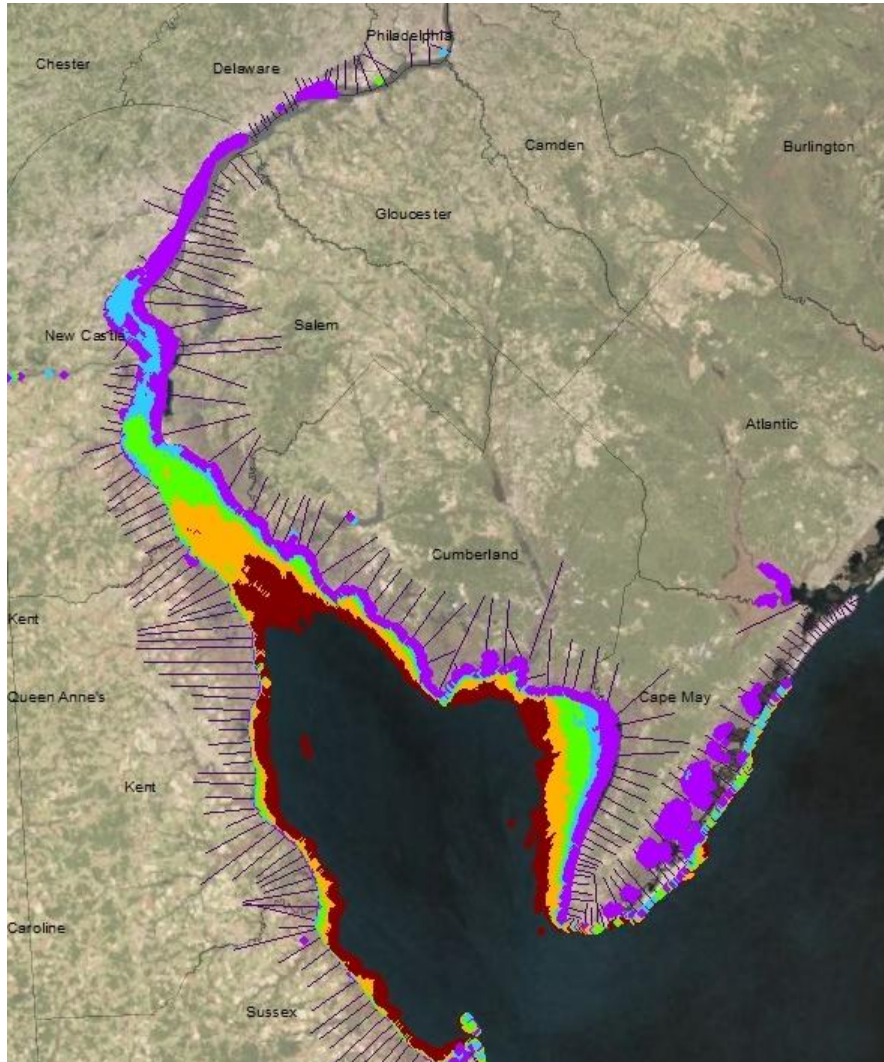
Seamless Digital Elevation Model (DEMs) – Analysis and Mapping

- Topo and Bathy data collected from various sources
- Shoreline extracted from LiDAR data
- Topo, Bathy and shoreline data are merged to create a seamless DEM
- USACE DEM for surge was generated at a 10 m resolution
- DEMs for FIRM studies are generated at 3 m resolution to allow more higher modeling and mapping detail.



Example of the Cumberland NJ 3m (10ft) seamless DEM

Transect Placement



**Proposed Transect Layout for area
in Delaware, PA**

Field Reconnaissance

Coastal Recon v1.0

New Project Load Add Rev Location Attach Images Reports <<<

Transect

TR1 TR10 TR11 TR12 TR13 TR14 TR15 TR16 TR17 TR18 TR19 TR2 TR20 TR21 TR22

Rev Loc

RLT13 RLT31

TR1 Selected Date entered: 4/8/2010 1

County Harford Time entered: 12:24:41 PM

Team Brian Batten & Fred Knight

SourceID TR1

Water Body Susquehanna River LAT N39.55424 LONG W76.091923333333

Location Havre de Grace, 600 block of water street, at transect location.

Coast Type vegetated **Fetch** Limited Fetch


Coast Description Low-lying plateau, extending back towards road, where terrain begins rising. Open space at transect location, cluster of buildings: boat yard to

Structure Present Yes No **Vertical Structure** Yes


Structure Type seawall **Structure Material** concrete

Structure Description Concrete block seawall, approx 2 ft above water level, transitions to wooden bulkhead to S where shoreline orientation changes to NE. Likely

1 2 3 4 TR1, RLT13 Selected UPDATE




OID: 750, RIMG0313.JPG

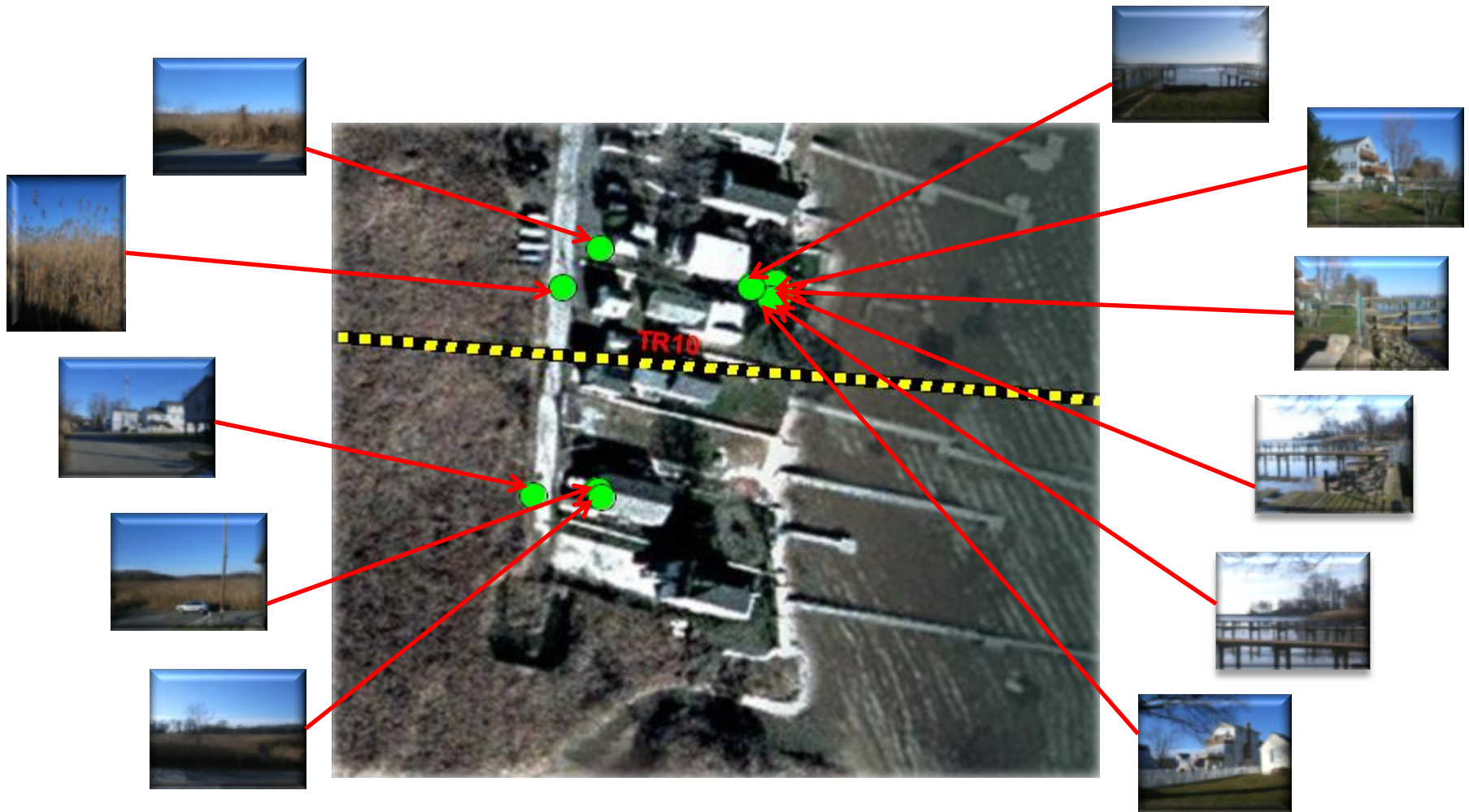


OID: 751, RIMG0314.JPG

Field Reconnaissance Report

Cumberland County Transect No. TR06, Review Location: RLT66, Team: Sagar Deshpande & Yi Zheng 8/26/2010, 3:21:02 PM	
Location Description: Back of transect. On Bay Ave, about 4600ft south of transect shoreline. Representative buildings and marshes	
Latitude, Longitude (decimal degrees): N39.194, W75.019;	
Building Description: Residential houses by the coast, Number of Rows: see aerial, Open Space Ratio: 35%, (see picture: 0425);	
Vegetation Description: None	
Marsh Description: Back of houses and inland, Spartina Alterniflora, Height: 4.5feet, Number of Plants per sq.ft: 36, Base Stem Diameter: 0.1inch, Top Stem Diameter: 0.1inch, (see picture: 0427); Fringing the marsh field, Phragmites Australis, Height: 6feet, Number of Plants per sq.ft: 25, Base Stem Diameter: 0.2inch, Top Stem Diameter: 0.2inch, (see picture: 0426);	
Coast Description: PFD: None	
Fetch Description:	
General Comments: Most houses are on piles, and protected by bulkhead or concrete seawalls. There is no sandy beach between houses and the sea. To east of review location, sandy beach of about 10ft wide transitions to marsh. See photo 0426.	
Photographs and Descriptions:	
	<p>Description: Residential houses by the coast Latitude, Longitude: N39.19376, W-75.01999 Direction: 180.9 degrees #0425</p>

Geo-referenced photos



Obstructions Ready for Modeling



Mapping Transects

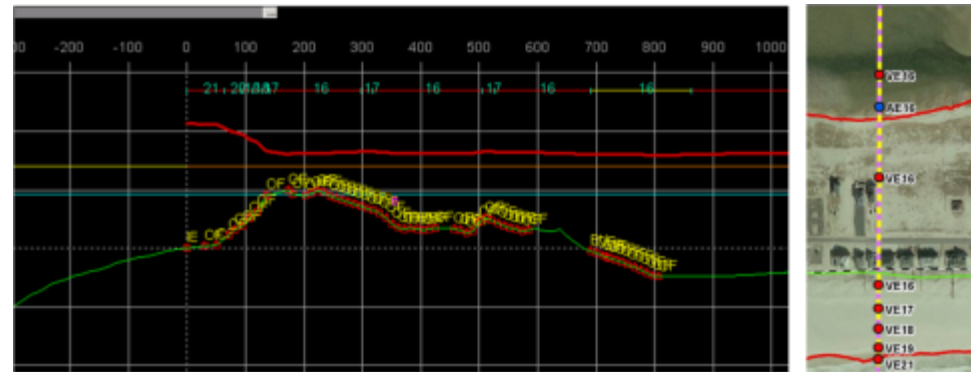


Primary Frontal Dune Line Drawn Based on Aerial Images, Topography and Information Obtained from Field Reconnaissance

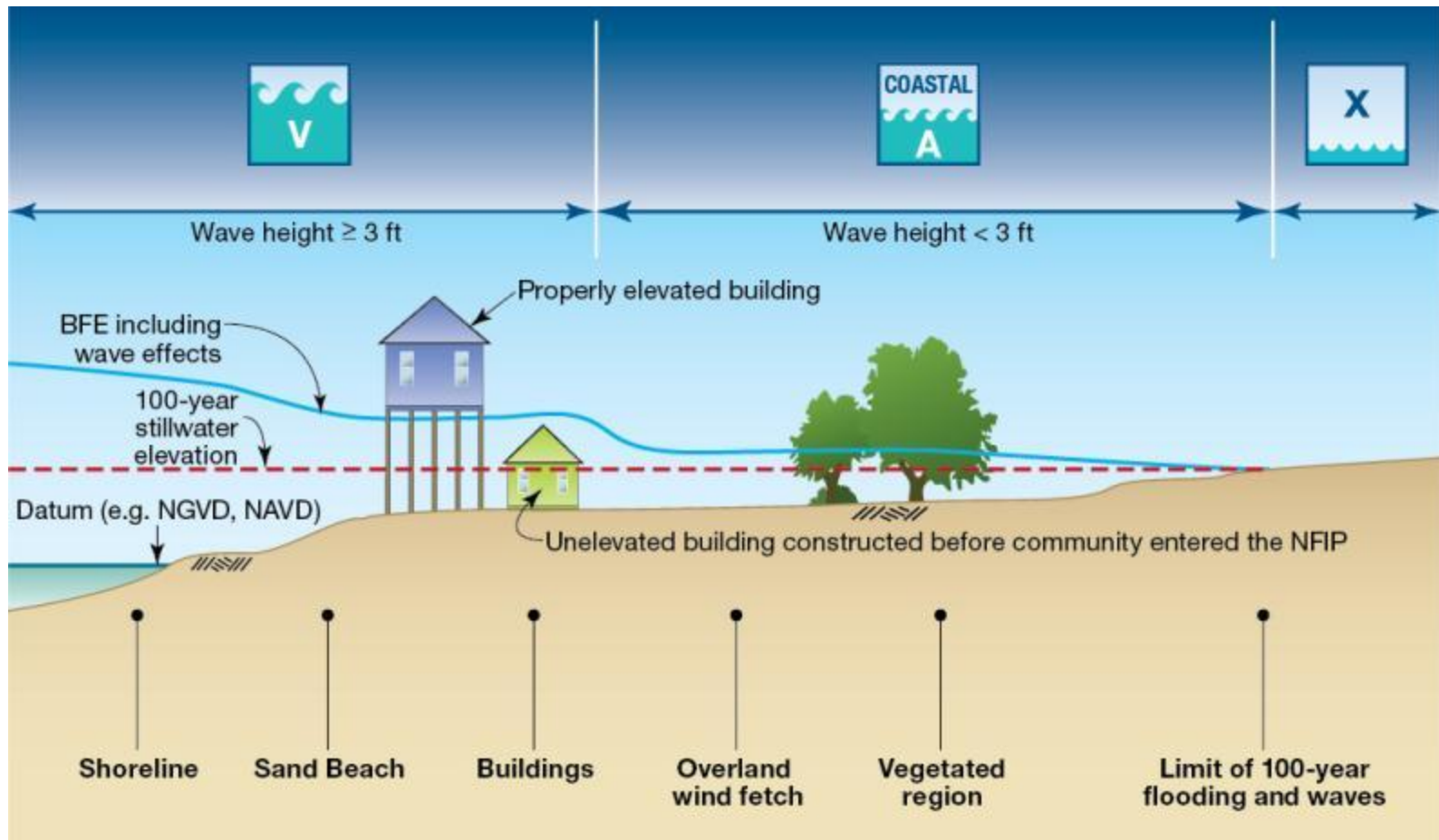


Overland Wave Height and Runup Analysis

- **Storm-induced erosion**
 - Primary dunes, bluffs
 - Shoreline protection structures
- **WHAFIS modeling**
 - Wave height above storm surge (stillwater) elevation
- **Wave runup analysis**
 - Sloped beaches, dunes, bluffs and cliffs
 - Runup 2.0, TAW, CSHORE
- **FEMA 2007 Guidelines and Specifications**

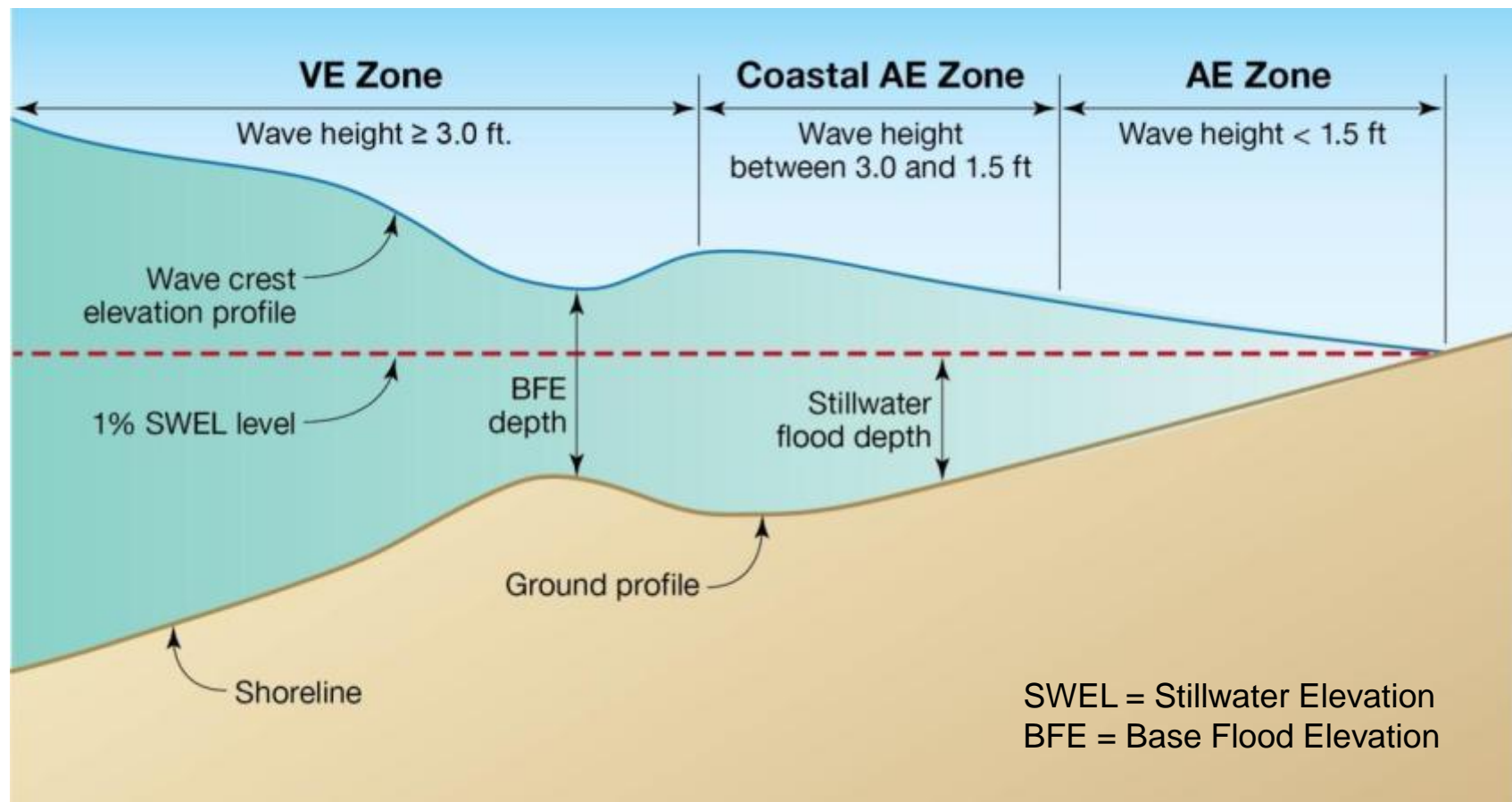


Mapping



Limit of Moderate Wave Action (LiMWA)

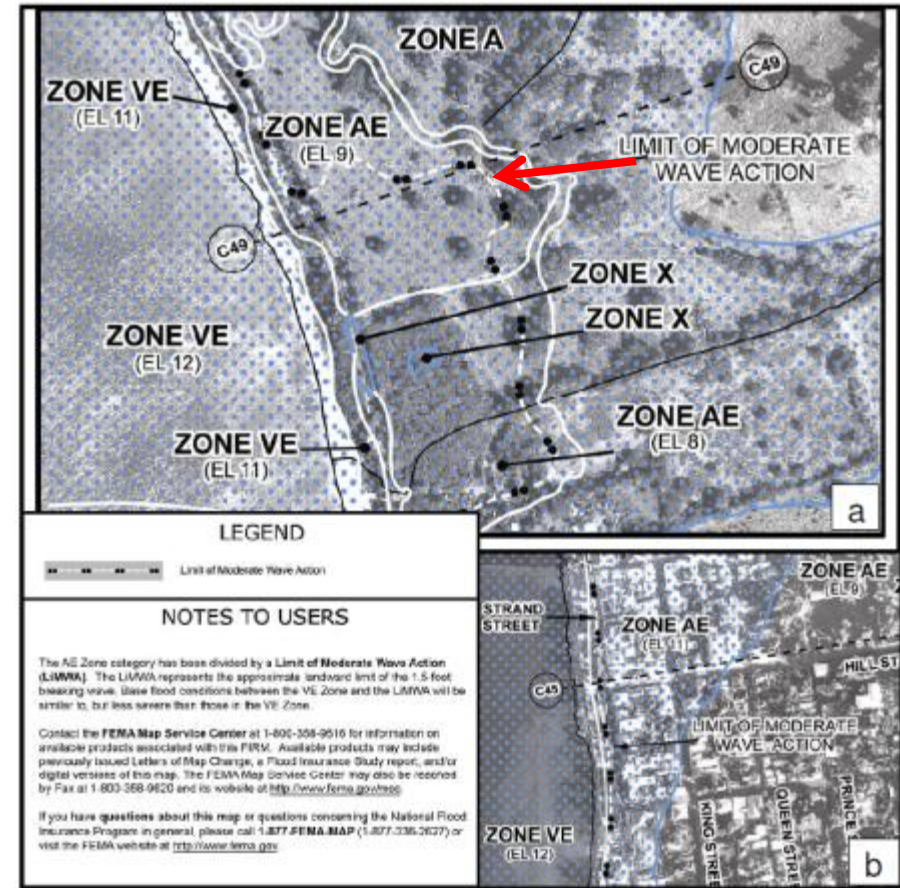
- Defined by the area subject to wave action with waves greater than 1.5 feet in height



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 ft.



Coastal Hazard Analysis Status

■ Modeling Setup

- Transect Layout
- Field Reconnaissance
- Obstruction carding
- Development of a seamless Digital Elevation Model (DEM)
- Primary frontal dune delineation

■ Wave Height Analysis

- Starting wave conditions (wave height and period)
- Wave setup – Determined from the surge model
- Erosion analysis
- WHAFIS modeling for overland wave height
- Wave Runup

■ Coastal Hazard Mapping

**Complete for
DE, PA, NJ
bay shoreline**

