A COASTAL FLOOD MONITORING SYSTEM FOR DELAWARE

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1 – Delaware Environmental Observing System
2 – Delaware Geological Survey

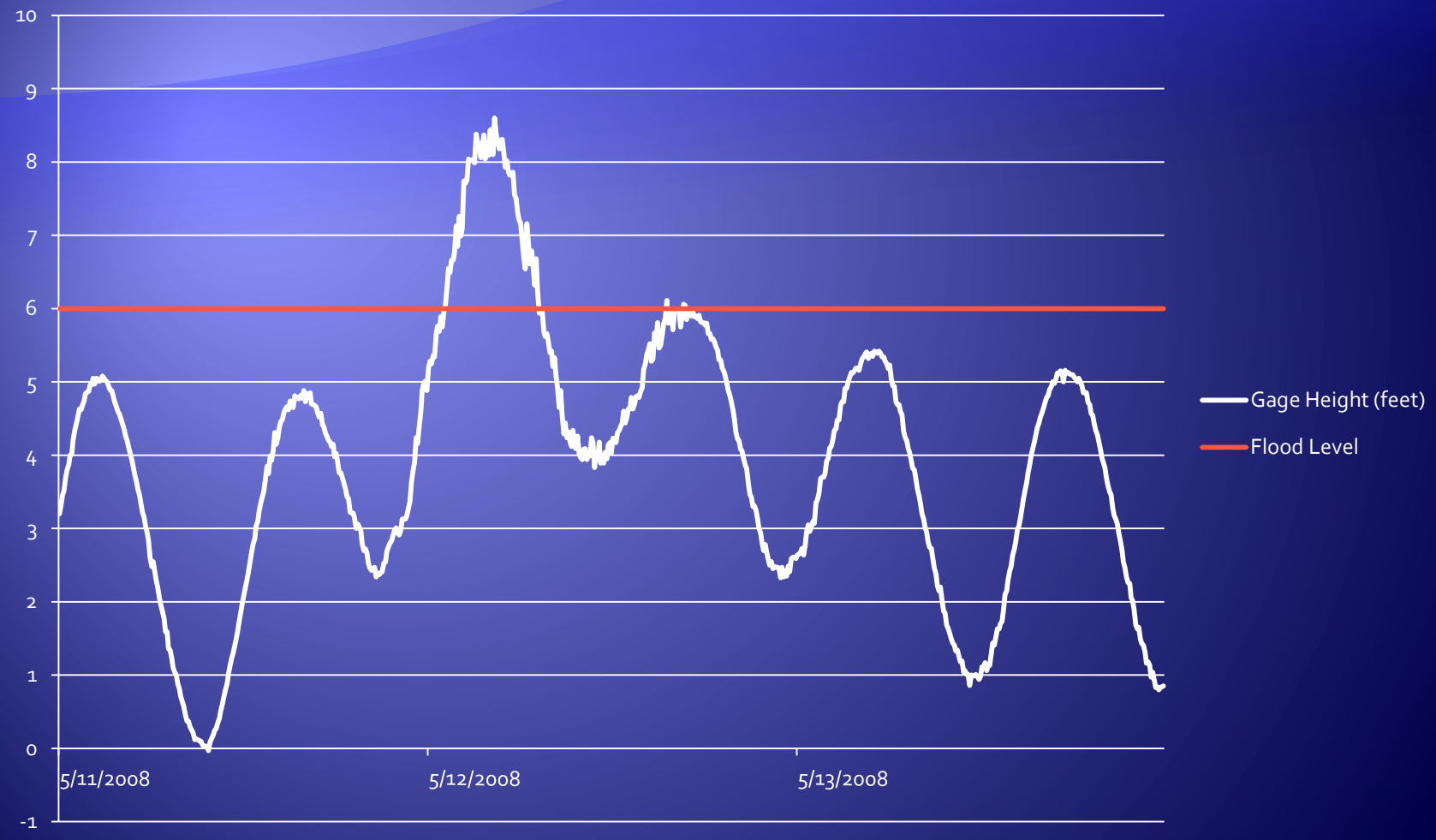
Background

- Delaware is vulnerable to the impacts of coastal flooding
  - Tropical systems
  - Extra-tropical systems
- Numerous communities built up along the coast

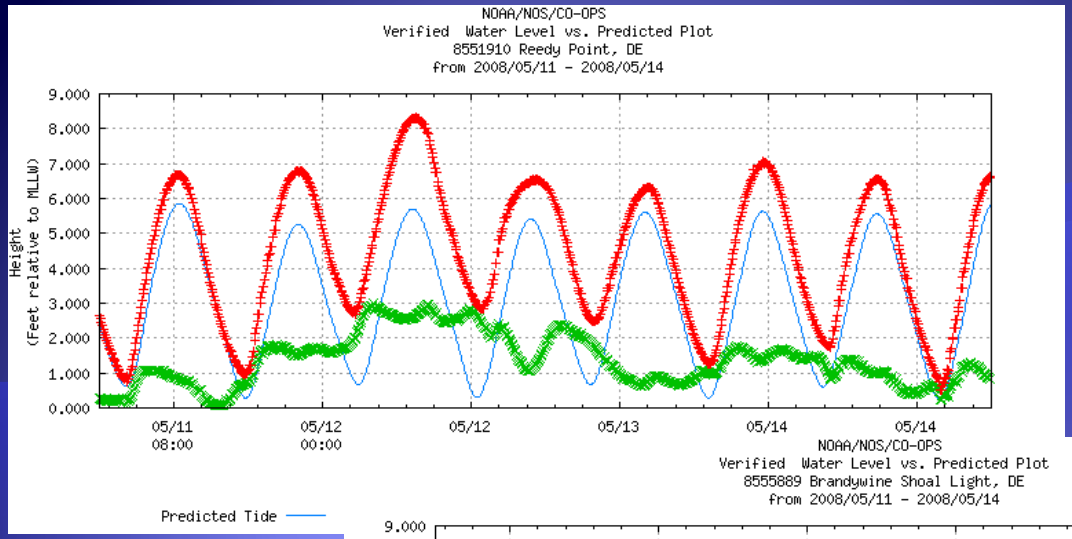
Background

- May 12th, 2008 (Mother's Day) Nor'easter and astronomically high tides caused significant coastal flooding, particularly in Kent County, DE
- Evacuations at Slaughter Beach, Kitts Hummock, Bowers Beach, and Woodland Beach
- Rough seas caused research vessel to capsize off Rehoboth Beach, DE – 1 crewman died
- Estimated up to $2 million in damage (FEMA)

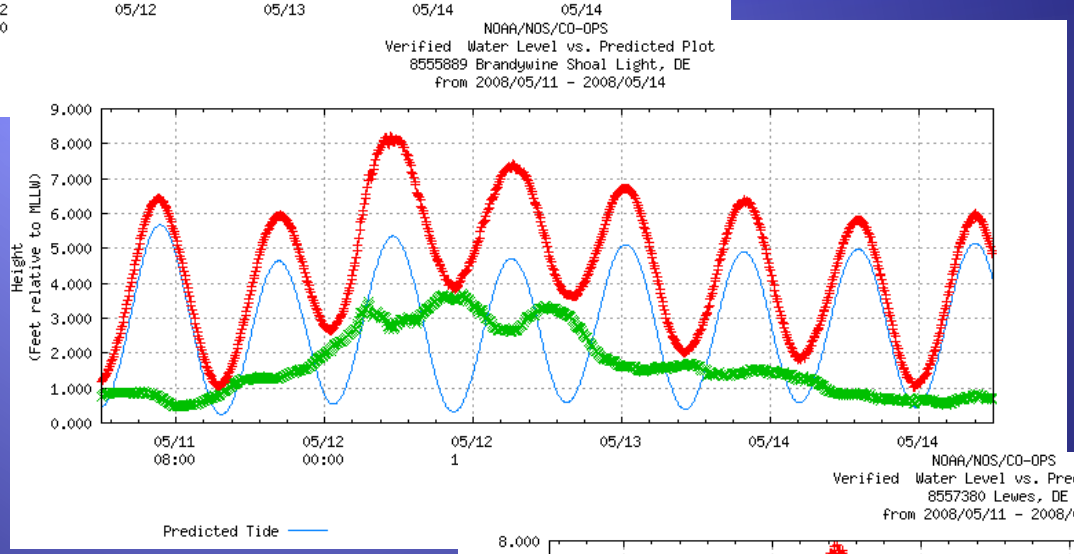
Bowers Beach Tide Gage



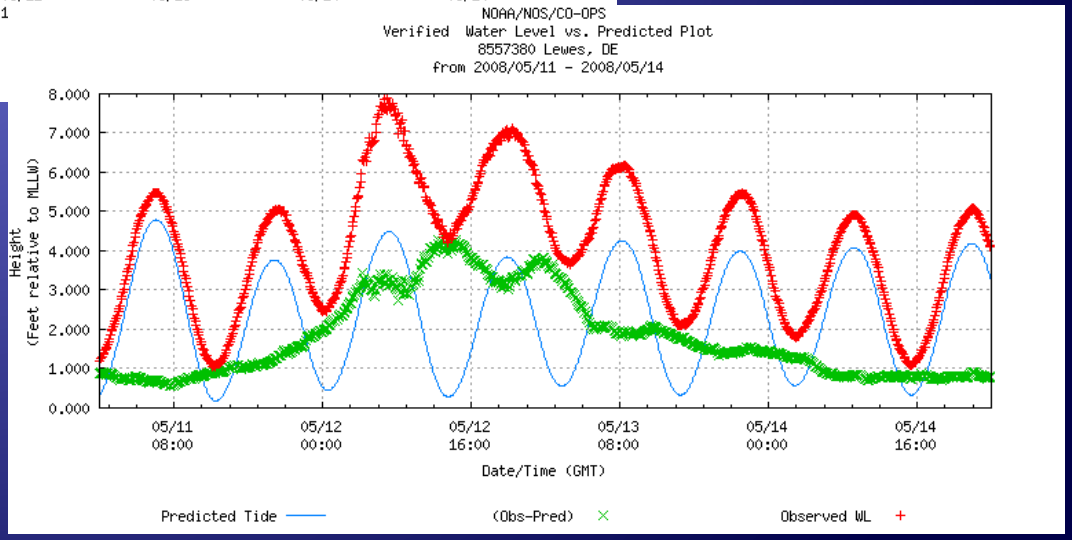
Data Courtesy: United States Geological Survey National Water Information Systems
http://waterdata.usgs.gov/nwis/



Reedy Point



Brandywine Shoal Light



Lewes

NAVD88 meters

Primary Goals

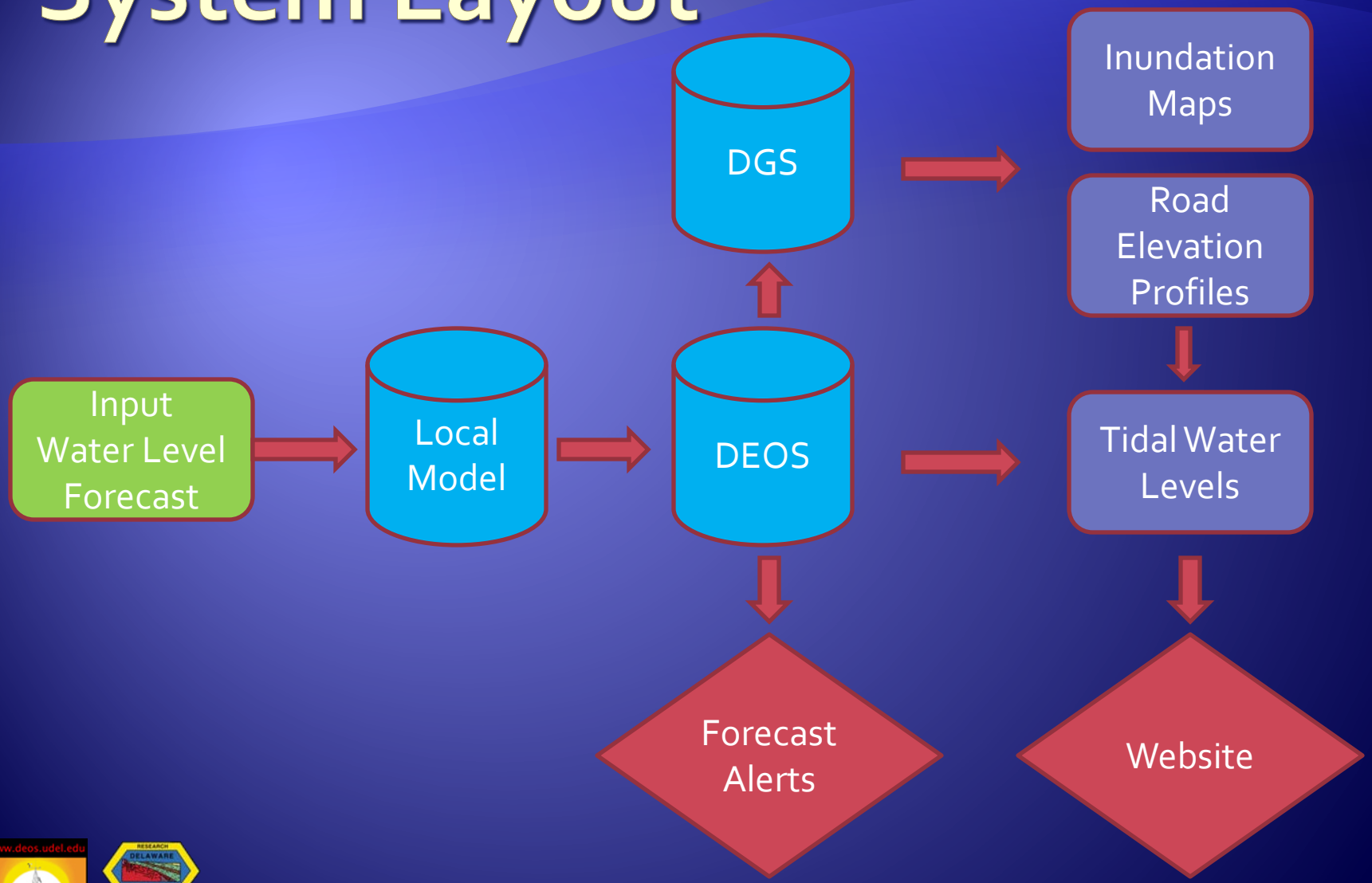
To develop a **near real-time** system that:

1. Alerts emergency personnel when the potential for flooding exists
2. Provides a web-based portal to visualize predicted and current water level conditions
3. NWS Watches/Warnings
4. Works for Delaware coastal communities

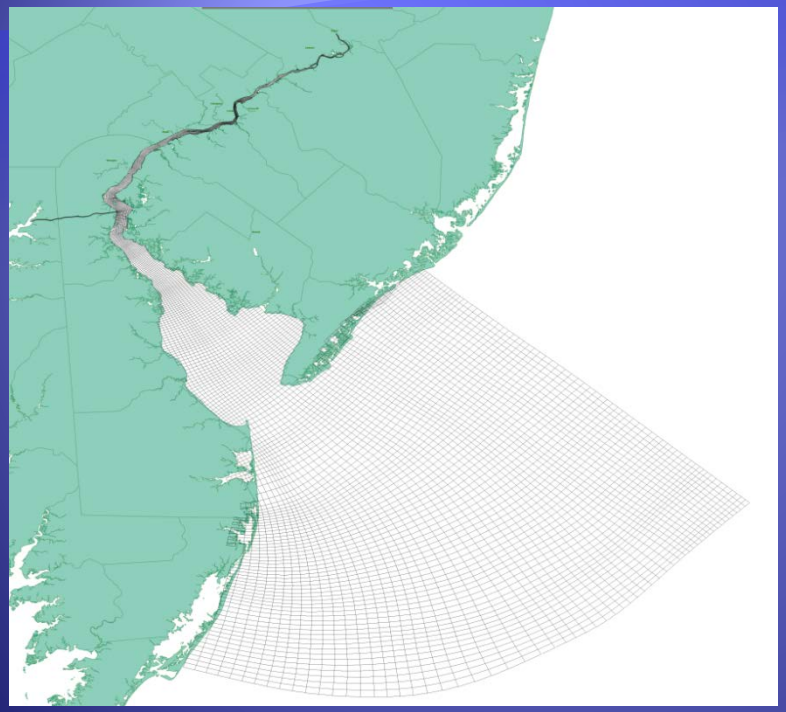
Funding Partners

- Specific Project Funding:
  - DNREC Coastal Programs
  - Delaware EPSCoR
- Funding for Emergency Management Support
  - DEMA/FEMA has provided ongoing support

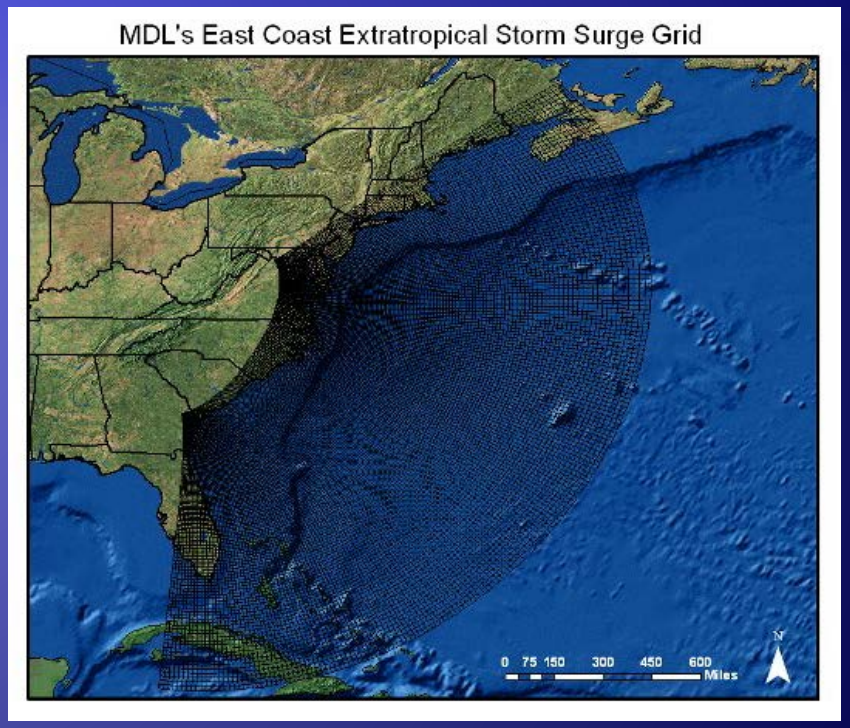
System Layout



Coastal Water Level Predictions (Input)



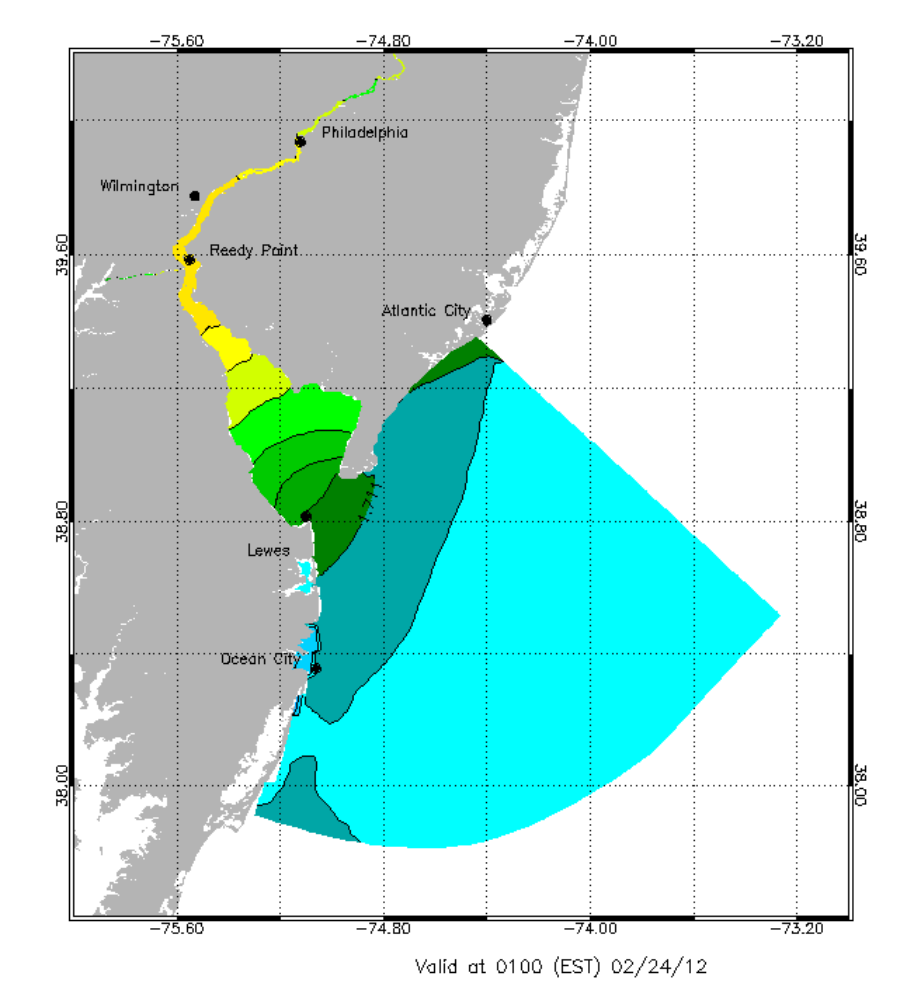
NOS DBOFS



NWS ET-Surge

DBOFS Water Levels

- Delaware Bay Operational Forecast System
- 48-hr prediction
- Water levels, temp, winds, salinity, currents
- Use the nearest grid cell (100 m – 3 km res)



How much inundation?

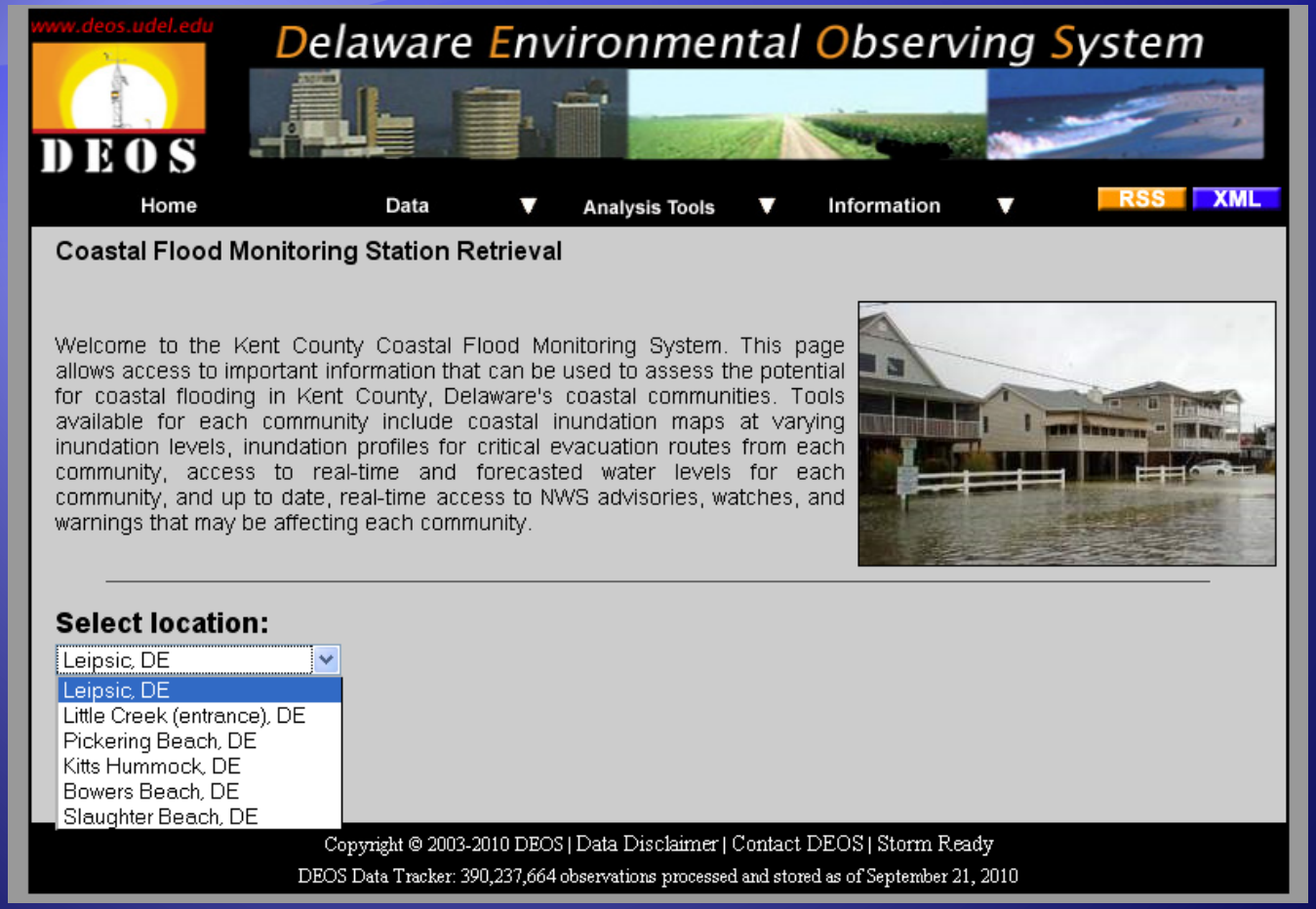
1. DBOFS/ET-Surge used for determining water levels at the coast.
2. For each community, we assign the water level of the nearest coastal prediction.
3. Assume a constant level throughout community (bathtub model.)
4. 6 communities in operation (Kent County); Approx 15 communities south of Reedy Point.

DEOS Forecast Alerts

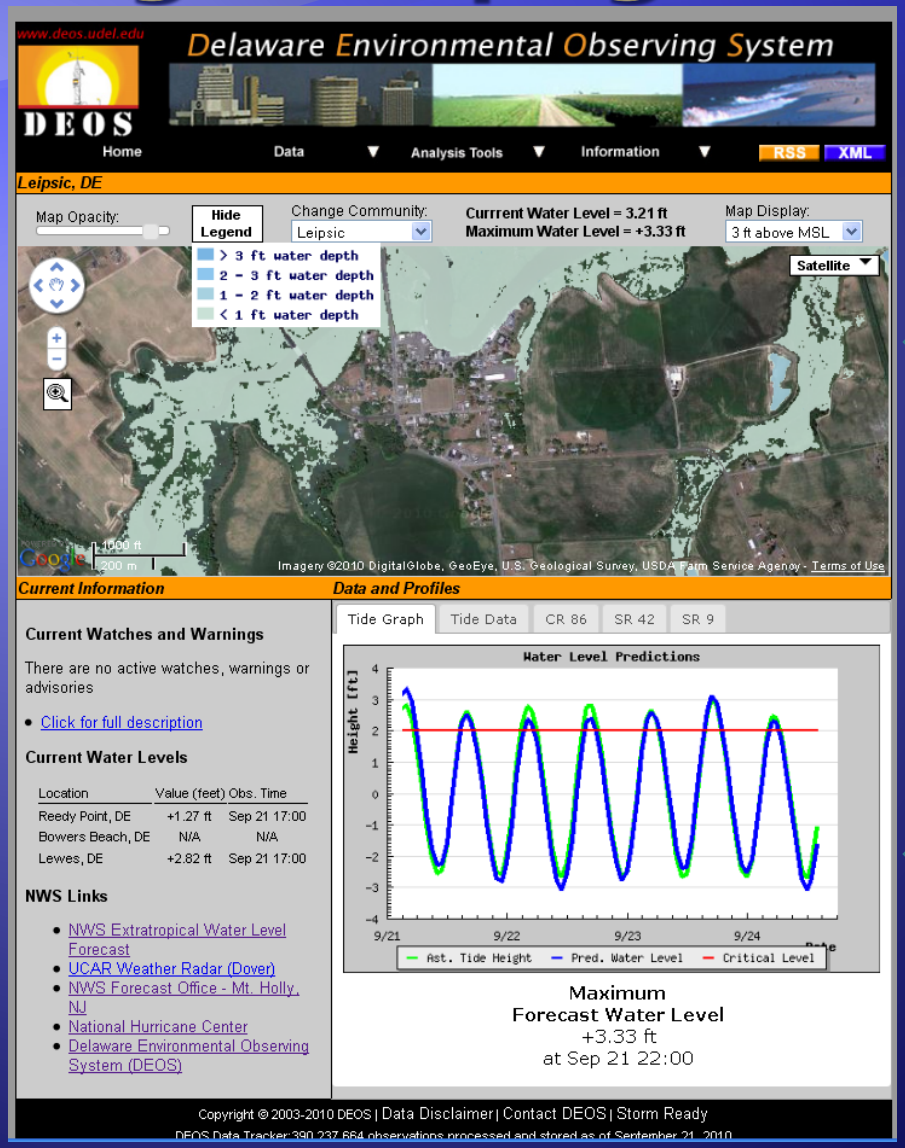
- Each subscriber sets a critical level to be notified
- If that level is reached, at any time within the 48 hour forecast (adjustable), an alert is sent via text and email
- Includes URL link to web portal

- Intended use: Let emergency managers know they need to begin keeping an eye on tide gages and possibly begin preparations for any potential flooding.

Web Portal Entrance



Monitoring Webpage



Inundation Maps

Current NWS Advisories

Real-Time Water Levels

Helpful Links

Tide Data & Elevation Profiles

Inundation Maps

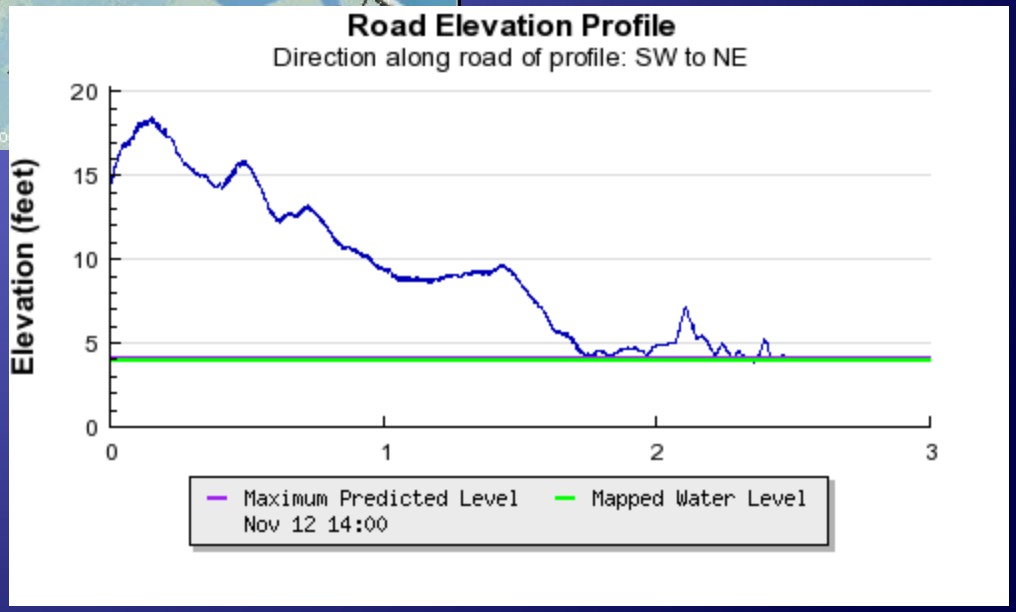
- Show "potential" flood areas
- Assumes water level predicted at the coast is constant across local region (bathtub)
- Show depth from 0 – 10 ft above NAVD88
  - Rounded to nearest foot
  - Darker blue => larger depth of water on land surface

Sample Inundation Map - Bowers Beach

www.deos.udel.edu
DEOS

Road Elevation Profiles

Flood level on map synced with green line on profile



Route 18
Bowers Beach Road

Elevation Data

- Inundation maps and road elevation profiles are based on most recent LIDAR data for Delaware
  - Kent and New Castle Counties – 2007
  - Sussex County – 2005
- Bare earth point observations for all counties sent to NOAA Coastal Services Center to create state-wide, seamless 2-meter DEM
- RMSE: +/- 18.5 cm (37.5 for heavily veg areas)

Current Status

- Launched in Summer 2011 (for Kent County communities only; new communities released soon)
- Predictions do well with magnitude, but seem be out of phase timing-wise by a couple of hours
- User Guide and training workshops

What's Next?
(In Development)

1. New Web Interface

- Initial page will show entire study area with maximum predicted water level within 48 hours
- Each community/local water shed shaded by depth (still using bathtub model)
- Critical levels for each area displayed on tide graph
- A few new web tools

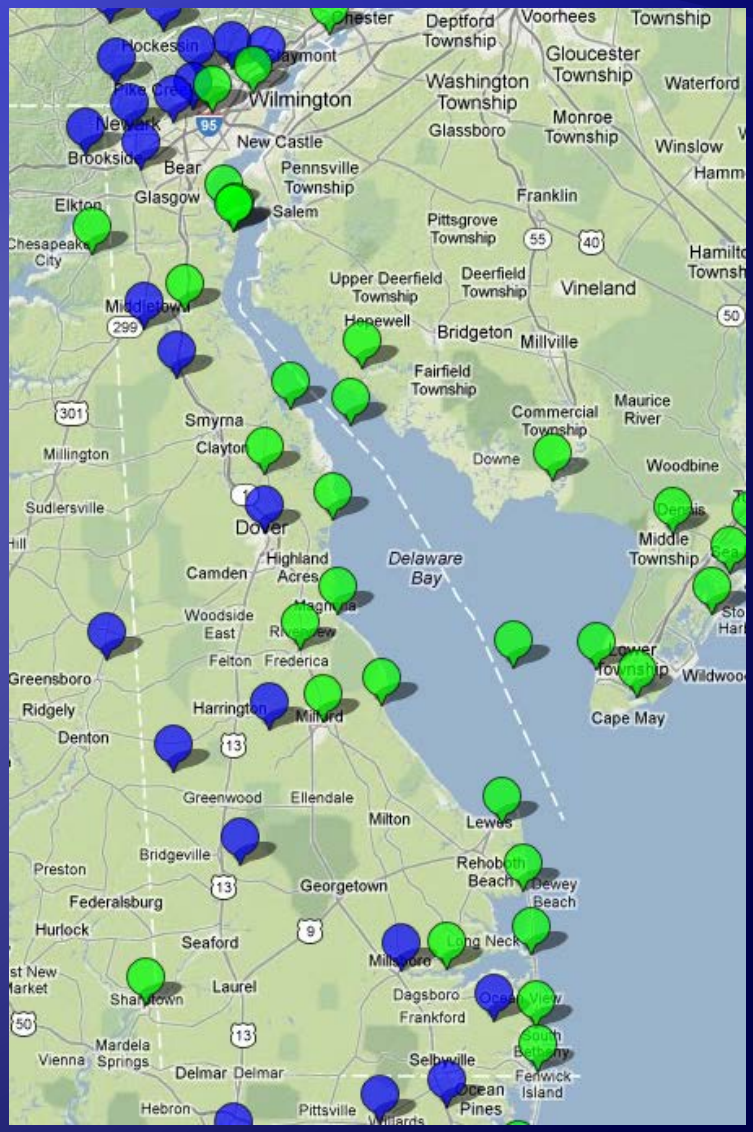
2. Improved ALERTS

- More locations, associated with each community
  - Prototype ONLY has two: Lewes & Reedy Point
  - Soon to have approximately 12-15 locations along Delaware Bay and Atlantic coasts.

- Possibly include inland bays communities
- Improved administrative interface

3. Data Collection

- Installed 6 temporary sensors
  - along the coast and inland in data sparse areas
- Compare the values along coast against forecast models
- Study the tidal relationships upstream on major tributaries
  - Move away from bathtub; model; statistical modifications



Thank You

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