On the Front Line:
Using GIS, LIDAR, and Real Time Data for Emergency Response and Resiliency Planning at the Local Level

Presented by:

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Town of Greenwich
Municipalities are on the front lines when it comes to Climate Change Adaptation and Community Resiliency

- **Emergency Preparedness** – traditionally the domain of our First Responders focused on storm response and short term recovery

- **Land Use Planning** – traditionally Planning and Zoning, Inland Wetlands and Watercourse Commissions, Conservation Commissions with focus on flood plain regulations

- **Long Term Recovery** – not on the radar for most Towns until Sandy
The Challenge for Municipalities: Thinking Out of the Box

1. Expanding roles of land use planners in Emergency Preparedness and Response including Emergency Operation Centers

2. Involving First Responders in Land Use Planning

3. Creating GIS layers that can be used for both planning and emergency response

4. Include long term recovery in planning and preparedness efforts

5. Maintaining sense of place and community
One of the biggest challenges ...

... a public that is on a huge learning curve about basic science relating to natural hazards

- Hydrology – very little understanding of water resources whether it is flooding or drought

- Coastal flooding versus riverine flooding

- Storm surge versus water elevation

- Surface water versus ground water

Any discussion on climate change adaptation – without this basic understanding - leads to confusion and inertia.
Understanding Storm Surge

- The storm surge is the difference between the actual recorded water elevation and the predicted water elevation (predicted tide).

- Surge heights are measured at still water and do not take wave action (surf) into account.

- A storm surge is NOT a big wave or tsunami-type event.

- During a storm event, the highest water elevation recorded does not necessarily occur when the surge is the highest. It depends on the timing of the surge in relationship to the tidal cycle.
New tools are available to help local governments do a better job of planning, monitoring real time weather events, and educating the public.
<table>
<thead>
<tr>
<th>Date</th>
<th>High tide time</th>
<th>Normal predicted water elevation - NAVD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday, January 01, 2014</td>
<td>10:42 AM</td>
<td>4.7 ft</td>
</tr>
<tr>
<td>Wednesday, January 01, 2014</td>
<td>11:16 PM</td>
<td>3.8 ft</td>
</tr>
<tr>
<td>Thursday, January 02, 2014</td>
<td>11:35 AM</td>
<td>4.7 ft</td>
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<tr>
<td>Friday, January 03, 2014</td>
<td>12:08 AM</td>
<td>4.0 ft</td>
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<tr>
<td>Friday, January 03, 2014</td>
<td>12:26 PM</td>
<td>4.6 ft</td>
</tr>
<tr>
<td>Saturday, January 04, 2014</td>
<td>1:00 AM</td>
<td>4.1 ft</td>
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Using the info from the normal predicted tides - now create a chart for emergency operations when storm surge is predicted to reach baseline flooding.

Note: Stamford gage is NGVD. I convert to NAVD as that correlates to our GIS maps and FEMA mapping.
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GIS and tidal gages used to direct fire crews during Sandy.

Same GIS layers were used to provide building department officials with water elevations to conduct post-storm audit of properties.

Same GIS used for planning purposes, infrastructure assessment, and to better understand FIRM maps and prepare evacuations maps for future events.
Using the New LIDAR

- Free download from: NOAA Digital Coast website.
- Covers the entire CT coastline.
- Surveys were taken following Sandy from Nov to Dec 2012
- Data in tiles due to large file sizes
- Combine tiles into single coverage: Mosaic tool
- High resolution: 2ft cell size
  - TOG’s current DEM: 25ft cell size
- Buildings are omitted: Shown as No Data
- Allows better visualization of coastal flooding
- Elevation data reflects infrastructure and buildings
- Generate 1 ft contour lines

- Refine visualization of flooding impacts:
  - Visualize impacts based on real time gauge data
  - Aids in Emergency Planning/Response

- Estimate elevation of infrastructure based on GPS coordinates:
  - Extract value by points tool
  - Catch basins
  - Buildings
  - Roads
Note drainage ditches in wetlands in 1934 aerial. 2008 photo indicates area is now developed.
Questions?

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